

LIMBURG INVESTS IN ITS KNOWLEDGE ECONOMY

Seven years later

‘The future
of science is
multidisciplinary’

VALORISATION:

commercialising
knowledge

‘The impact is
becoming ever
more obvious’



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FOREWORD

Dear reader,

Seven years ago, in 2015, LINK gave fresh impetus to the local knowledge infrastructure: in Limburg, in Maastricht, at Brightlands, at Maastricht University, and at MUMC+. MERLN and M4i were still at the gestation stage, harbouring very big dreams, ambitious plans, great ideals, and a wealth of ideas. We sought out networks to which we could actively contribute, and got involved. Our circle of acquaintances expanded, almost organically, and we formed friendships. We soon felt at home here.

Around seven years ago, we began building our institutes - literally, at first. We created new workstations, built new labs, and worked on a unique and innovative infrastructure for imaging and regenerative medicine. We were gloriously stubborn in our determination to create a flexible, fun, relaxed and, above all, open working environment; one that is conducive to collaboration and social contact. Our teams quickly grew, as we brought in big grants and lots of young talent. As the colleague count increased, so the ‘corridors’, workstations, meeting spaces, and laboratories steadily filled.

It has taken seven years of hard work to get to where we are now. We have grown in every sense. We work with driven and enthusiastic professionals from all around the world. We have made a name for ourselves locally, nationally, and internationally, with our exceptional results, inspiring projects, and our impact on people and society. We learn, we research, we invest, we experiment, we innovate, we inspire each other, and we inspire the community around us. We discover and do. We have created a thriving ecosystem with unique collaborations that cross the boundaries between disciplines.

Now, seven years on, the power of translational research is more important than ever. A unique initiative such as LINK, in which the parties deploy their knowledge and skills to heighten the impact of unique Limburg research, has proved to be fertile ground for accelerated growth, and a recipe for success. In this magazine, we look back with pride, while looking ahead to a vibrant future. Because this is only the beginning!

Our heartfelt thanks to everyone who has helped M4i and MERLN to grow and thrive.

Warm regards,

Pamela Habibović, Clemens van Blitterswijk, Lorenzo Moroni and Martijn van Griensven on behalf of **MERLN**, **Ron Heeren** and **Peter Peters** on behalf of **M4i**

LINK

(Limburg INvests in its Knowledge Economy)
seven years on
(and how it began)

In this magazine, we look back on seven years of LINK and seven years of MERLN and M4i. It has been a unique adventure, in the course of which we have learned a lot with, and from each other. Much has been achieved since 2015. With a number of the people involved - initiators, directors, and scientists - we look back, and ahead. We also hear from a few researchers, most of them international, who tell us what they are working on, what they hope to achieve, and how they find living in Maastricht. But first: how did it all begin?

2013: presentation of Knowledge Axis Limburg

Maastricht University (UM), Maastricht University Medical Center (MUMC+) and Zuyd University of Applied Sciences - formally joined later on by Fontys University of Applied Sciences - jointly present Knowledge Axis Limburg. This ambitious, 10-year strategic programme seeks, through investment in educational and research projects, to stimulate growth in Limburg's knowledge economy, thereby helping to strengthen the economy and society of Limburg. The parties are also keen to brainstorm solutions to current and future societal challenges. The initiative has the firm backing of the Limburg provincial government.

2015: start of LINK, MERLN and M4i

Two years on, in a momentous change, Knowledge Axis Limburg joins forces with efforts to develop Limburg's top sectors and the Brightlands campuses. Collaboration is vital: other

universities and universities of applied sciences in the Netherlands and abroad are joining. The collaboration with Limburg secondary vocational education (MBO) is being investigated. LINK is introduced as part of Knowledge Axis Limburg. Thanks to this seven-year project, Maastricht University is able to establish two new and promising scientific institutes: MERLN and M4i. Three dedicated, eminent scientists move to Maastricht University and become University Professors. Prof. Clemens van Blitterswijk from MERLN, Prof. Ron Heeren and Prof. Peter Peters from M4i.

About MERLN, Institute for Technology-Inspired Regenerative Medicine

MERLN focuses on regenerative medicine: strengthening the body's ability to repair/regenerate damaged and diseased body parts (cells, tissues, organs) and restore normal function. The new 'components' and cells are made or cultured with the aid of the body's own materials and a range of innovative materials and technologies,

to prevent and cure illnesses.

About M4i, Maastricht MultiModal Molecular Imaging Institute

Research in the Imaging Mass Spectrometry division at M4i broadly focuses on a fundamental understanding of molecular signals which play a role in various pathologies in the fields of neurology, cardiology, and oncology. For this, the researchers are developing innovative imaging mass spectrometric techniques and instruments which serve as tools for personal molecular diagnostics in healthcare. M4i's Nanoscopy division uses highly sophisticated equipment at very low temperatures to work with and research cells, bacteria, and viruses. The primary focus of the research is on clarifying the three-dimensional structure of DNA and protein structures, to more effectively treat diseases such as cancer as well as infectious illnesses such as tuberculosis.

2015 – 2022

LINK invests heavily in the bridge between the Brightlands Maastricht Health Campus and the Brightlands



From Knowledge Axis Limburg, via LINK, to MERLN and M4i

Chemelot Campus: Maastricht University invests €28 million and €26.5 million comes from the Limburg provincial government. The establishment of M4i and MERLN aligns perfectly with the aims that the initiators of Knowledge Axis Limburg had in mind: to develop a stable and sustainable framework for strengthening economic and social structures in our region, thereby increasing the earning capacity of society in Limburg. As an added benefit, the institutes help boost the vitality of the Limburg population and strengthen both the Campus initiatives, and the cohesion and synergy between them. It's fair to say that the co-location of the campuses has engendered an ecosystem that is unique in Europe and that offers unprecedented opportunities for both translational research and for Valorisation.

2022

Both M4i and MERLN have established a solid reputation in their respective areas of expertise. Both institutes are regularly asked to coordinate large-scale international scientific projects. They are allocated many grants, and regularly organize

scientific congresses and/or are frequently asked to make contributions to congresses elsewhere. There are also exciting developments in the field of education that support the growth of the campus. M4i developed the Master's in Imaging Engineering, which was accredited in 2021. The first student intake will be in September 2022. MERLN hopes to soon receive accreditation for the Bachelor programme in Regenerative Medicine & Technology, which is due to get underway in September 2023. In the early days of LINK, the Limburg provincial government, along with the region's knowledge institutions and business community, had the boldness of vision to believe in and - undeterred by the economic climate - invest in an attractive and robust profile for the Brightlands campuses and, by extension, in Valorisation, the infrastructure in general, and the knowledge infrastructure in particular. In hindsight, that was an inspired vision. Limburg now enjoys a positive image that has helped place the region in the national spotlight, with businesses and top scientific talent expressing interest in establishing a base at one of the campuses. Brightlands Maastricht Health Campus now has a strong profile

in imaging, from molecules to human bodies (M4i). In collaboration with the Brightlands campuses in Geleen and Maastricht, a strong profile has also been established in regenerative medicine (MERLN).

What next? 2022-2032

Extended on the back of its success. Although not in line with the original LINK concept, LINK is most definitely set to continue. Over the next ten years, MUMC+ and Maastricht University will be investing eight million euros in MERLN and M4i to give an extra boost to regenerative medicine. This funding will enable five more starting points to be created: research groups that specialize in a niche. Four of them have been assigned to MERLN, the fifth will be set up at the interface between M4i and MERLN. As well as enabling M4i and MERLN to develop and specialize further, these extra specializations will also boost employment and opportunities for businesses.



Albert Scherpbier

MARTIN PAUL AND ALBERT SCHERPBIER TALK ABOUT LINK

‘Medicine needs technology in order to advance’

Plus other reasons why it was a good idea to bring the research institutes MERLN and M4i to Maastricht

It's rather like asking the brewer if their beer tastes good. However, six years or so after the research institutes MERLN and M4i were brought to Maastricht, we ask two of the people most closely involved: why did you think this was a good idea? And has it been a success?

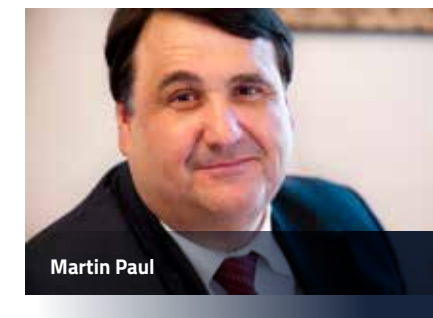
One way of telling whether something is a success is to look at what you hoped to achieve when you started out. To give an example, the *Limburg INvesteert in haar Kenniseconomie* (*Limburg Invests in its Knowledge Economy, LINK*) document published at the time states, under the heading ‘Social impact,’ that the MERLN and M4i institutes had to provide new, sustainable jobs in Limburg. Further aims were to combat the demographic decline and ageing of Limburg's population, stimulate a culture of innovation and entrepreneurship, and establish a healthy and more productive population in Limburg province. These are lofty ambitions. Martin Paul was until recently President of the Executive Board of Maastricht University and, together with Albert Scherpbier – who at that time was dean of the Faculty of Health, Medicine and Life Sciences – he initiated LINK. ‘Yes,’ he concedes, ‘they were big ambitions, but relevant. As a university, we trained students who graduated and did doctorates with us, only to then leave the region. We felt it was important to establish new structures and institutes to create employment, not just for our students, but also by making the region more attractive. The second point is: what those institutes are doing is at the forefront of developments in medicine. Which, of course, benefits the general public. And we wanted to attract people who not only teach and research, but also found companies, people who are entrepreneurs. And it has worked incredibly well.’

Ever more complex devices

Albert Scherpbier agrees with this last statement: the results of LINK are ‘very positive.’ ‘It has drawn large groups of highly educated young people here, and this has helped combat the decline and has boosted the region's reputation. Those young people are very focused on setting up businesses, and this has an economic impact. And most importantly of all, to my mind, is that they have forged so many connections in the hospital and the faculty.’ As to why he felt it was important to get the MERLN and M4i institutes to Maastricht in the first place, Scherpbier explains: ‘We felt we had to invest more in the technical

side, in engineering. Medicine has become more and more technical over the years; ever more complex devices have emerged. Regenerative medicine – which is MERLN's focus – is a field that was pretty neglected here. Later on, Maastricht University also founded the Faculty of Science and Engineering. Medicine needs technology in order to advance, to make headway.’

If you don't talk to surgeons, you won't know the problems they face.’



Martin Paul

Air analysis during cancer surgery

In Scherpbier's view, the connections that MERLN and M4i have forged in the hospital are so important because of the crucial link between fundamental research on the one hand and clinical practice on the other. With diabetes, you can treat symptoms by injecting insulin, but you can also eliminate the cause with the aid of regenerative medicine, by culturing new cells – one of the areas on which MERLN is focusing.

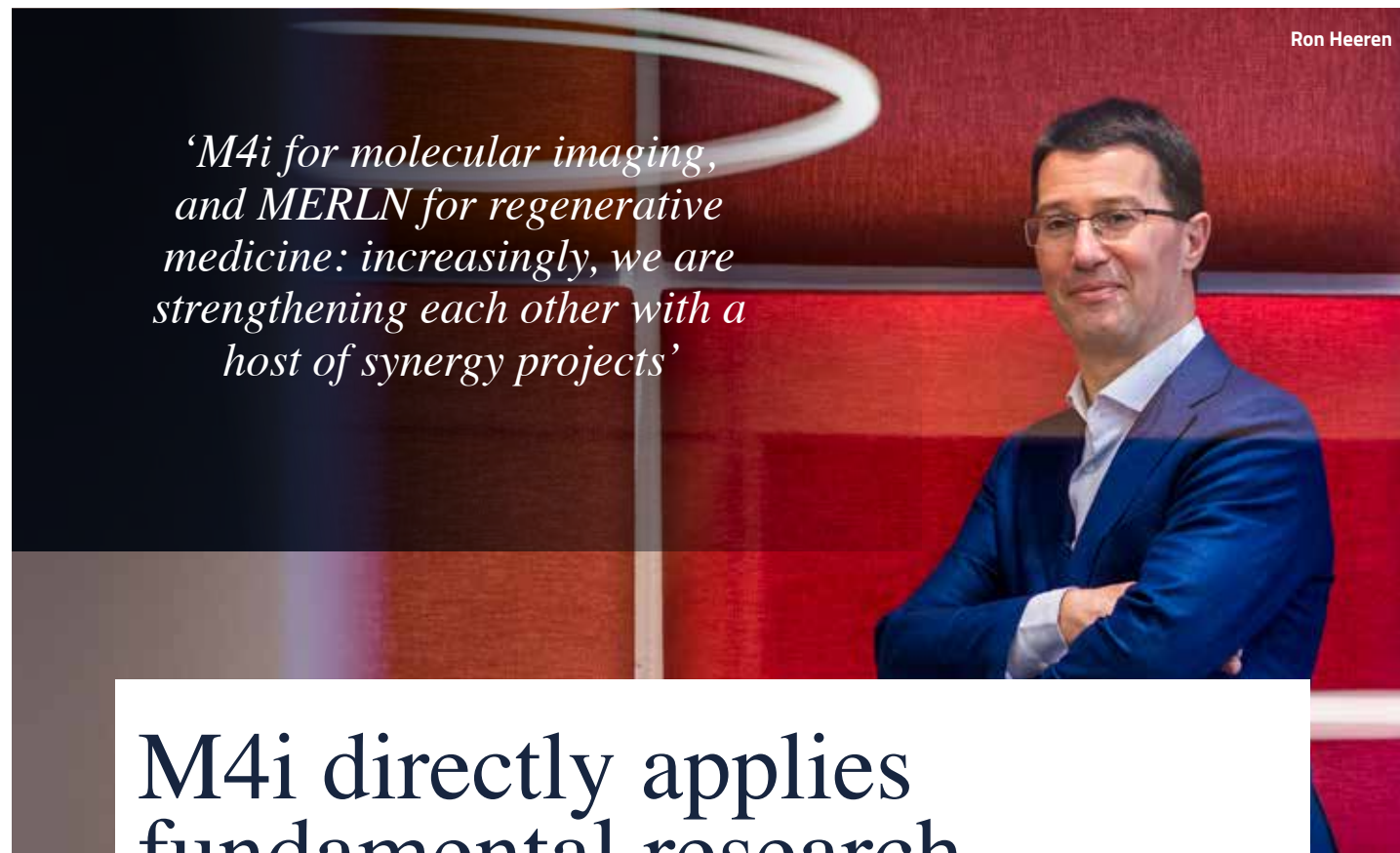
M4i has developed a device that extracts the air above the wound during cancer surgery and instantly analyses it, so that the surgeon knows while operating whether they have removed all the tumour cells. Previously, this analysis process took much longer, and there was a possibility of the patient having to undergo repeat surgery. ‘Science needs to come down from its ivory tower,’ Scherpbier believes. ‘Not just Maastricht University has invested a lot of money in LINK – the Limburg

provincial government did too. That is public money; the public is entitled to know what is being done with that money.’ One term that is frequently used in this connection is socially relevant research. You cannot always know beforehand whether research will be socially relevant. Scherpbier: ‘That's why those connections with the hospital and the faculty are so important. If you don't talk to surgeons, you won't know the problems they face.’ Paul adds: ‘We took a risk. Attracting those institutes was like a football team attracting top players: you don't know whether it will work out. They might get injured. I never imagined it would turn out this well. It's gone better than I dared to hope.’

Tips for the future

Martin Paul recently stepped down as President of Maastricht University, to take up the position of Rector of the University of Bochum. From that relative outpost, does he have any tips for the future of Limburg's knowledge economy? Paul continues with the football analogy: ‘Never change a winning team. There are two things you must now do. We know it works. You have to keep nurturing and supporting it. And secondly: you have to ensure a new influx of young, highly educated people. That is the task for the future.’

‘The Limburg provincial government has invested a lot of money in LINK. That is public money; the public is entitled to know what is being done with that money.’



‘M4i for molecular imaging, and MERLN for regenerative medicine: increasingly, we are strengthening each other with a host of synergy projects’

M4i directly applies fundamental research in a practical setting

At the time - 2014 - uprooting two whole laboratories, complete with their entire infrastructure, from Amsterdam to Maastricht was a first in university circles. Thanks to Ron Heeren and Peter Peters from M4i, plus the support of LINK, science & engineering in Limburg received a huge boost.

Peter Peters came from the Netherlands Cancer Institute - Antoni van Leeuwenhoek Hospital - and was a professor at VU Amsterdam and TU Delft. Ron Heeren developed high-tech analytical equipment at AMOLF, and was a professor at Utrecht University. Both remain driven by a desire to make a difference for patients in the medical setting. ‘Translational collaboration is essential in our academic world,’ says Ron Heeren. The physical distance between our laboratory and the hospital in Amsterdam was a barrier. In Maastricht, we are cheek-by-jowl with the clinic, and we have a direct, open link with the medical specialists at the hospital. Our paths regularly cross, so

we can quickly share information. The translational opportunities in particular were an added incentive for my group to make the move with me. But I did feel the pressure to create a good living and development environment for them in Limburg.’

New technical infrastructure

At the time, Peter Peters was taken aback to be offered so much funding in Maastricht: ‘It meant we could establish new teams and lines of research, which was a wonderful challenge. It presented great opportunities for a new technical infrastructure to develop equipment. My stipulation for coming to Maastricht was that I wanted to make the move with Ron. That’s how M4i was born, and around 60 people work there with us, on average. I estimate that, over

the last seven years, we’ve invested in around 300 young scientists who started out here and who - thanks also to LINK - have moved up in their careers. Our young researchers can go on to start their own group and develop their own potential. The future looks very bright on that score.’

‘M4i publishes in leading journals, and we generate fresh funds in successful public-private partnerships. Four years ago, new, patented technology resulted in a new company: CryoSol. Initially, CryoSol was based at the Brightlands Campus, but this summer we moved to Weert. We also have more space there, to grow from the 25 employees we currently have, to 60 people. Eventually, we can even create enough space for 200 employees



in Weert. We’re trying to tempt some highly educated technicians from Eindhoven to transform our scientific ideas into devices that we can use to solve complications that arise with diseases,’ says Peter Peters. ‘With our new Master’s programme in Imaging Engineering, we can supply companies with professionals who have a science engineering background. We look specifically at what companies need, to ensure that the programme is a good fit for what the market actually needs.’

Academic jobs

Ron Heeren is also justifiably proud of what LINK has created in Maastricht: ‘With the two faculties, we have elevated science and technology education in Maastricht. Students from the Euregion now have the opportunity to do a technical Master’s in imaging engineering with us. LINK has changed the face of STEM education (science, technology, engineering, mathematics) in Limburg.’ ‘As well as improving the health of the people of Limburg, LINK had other objectives: more Valorisation, and creating academic jobs. Our mass spectrometers have made it into operating theatres. We’ve altered the mindset of medical specialists, so they

are now actually using innovative techniques. These days, they approach us directly from the clinic with their questions. We really have set an entire system in motion. With their transparent glass walls, our offices and open laboratories allow everybody to see the science that’s going on. That’s a genuine shift in the positioning of modern science.’

Bolstering businesses in the region

‘Maastricht University had strong biomedical leanings. Technology and innovation have greatly added to this and put us on the international map. We bolster existing and new businesses in Limburg and the region on an ongoing basis, academically, economically, and in social terms. To give you an example, we used the mass spectrometer to demonstrate to a Limburg winemaker how his pesticides spread over the plant. And the iKnife, an intelligent surgical knife, has improved surgical outcomes for patients. We are now also able to create a chemical diary of what’s going on in a person’s body, from a single hair. At M4i, we have investigated whether SARS-CoV-2 (the SARS virus) could also infect the intestines, and we published our findings in the journal

Science. This resulted in Dutch research into traces of COVID-19 in sewage, a practice that has been adopted around the world. So the discoveries we make today can end up having a huge impact. Science engineering as a field will gain more and more clout as the synergy between our companies continues to grow. The 300 researchers who are adept at using our equipment can not only support our own research, but also that of other universities in the Netherlands and abroad.’

‘MERLN’s impact is becoming increasingly visible’

University professor Clemens van Blitterswijk is the founder of MERLN, the institute for regenerative medicine that came to Maastricht in 2014, with the support of the Limburg provincial government (LINK). ‘For Maastricht, the technology approach to biomedical issues was still uncharted territory. I never had any doubts about this move. Here, we got the opportunity to set up something new right beside the hospital. This also encouraged various PhD students, support staff and even the secretary to come along. We had to design new laboratories ourselves, choose our own equipment, and work out how we wanted to convert and furnish our offices. Pamela Habibović succeeded me as director of MERLN at the start of 2019.’

Coming to Maastricht

Until the late 1980s, Van Blitterswijk had a research group in Leiden. In Bilthoven, he founded Isotis BV, a biomedical company that, over a number of years, grew into a listed corporation with 300 employees. That company's research department later relocated to the University of Twente. This group became part of the MIRA institute, of which Van Blitterswijk was the director. ‘When the situation and strategy changed, in 2014 I decided – together with my employees Pamela Habibović, Lorenzo Moroni, Roman Truckenmüller, Jan de Boer, a number of PhD students, and support staff – to take the opportunity to go to Maastricht. I made the decision following constructive and intensive talks with Martin Paul, who at the time was the President of Maastricht University, and the Limburg provincial government. So, I ended up in Maastricht, with my laboratory and 16 staff.’

Brand new

‘Here, we had the opportunity to do things differently. It was great to take the time to reflect on what constituted the state of the art at that time in our field and, based on that, develop a strategy. We decided on a shift in focus: from applying developments in, most notably, orthopaedics, to creating platforms with wider potential uses. This gave rise to applications for ophthalmology and in the area of the kidneys and diabetes, as well as collaborations with doctors working in these fields. We were able to set up RegMed XB by investing a quarter of a million, together with four Dutch universities and the University of Leuven. This initiative is aimed at developing affordable regenerative therapies for kidney failure, type 1 diabetes, osteoarthritis, and cardiovascular diseases. It certainly put Maastricht on the international map. Our team has grown rapidly, to no fewer than 120 people, and I’m proud of that.’

Growth promise kept

Pamela Habibović did have some concerns at the outset: ‘Because we

had promised growth to Maastricht University and the Limburg provincial government, I did find the whole adventure stressful. Failure was not an option.’ Clemens van Blitterswijk concurs that they felt, and still feel a strong sense of responsibility: ‘We know how hard it is to find funding, so with every project you have doubts as to its feasibility. But within LINK we have been able to raise an additional forty million in funding and another twenty from the National Growth Fund to set up a pilot plant for regenerative therapies. So we more than doubled the initial investment. We aim and expect to continue this growth. Not, admittedly, in terms of headcount, because we’ve run out of physical space for more staff. We aim and expect to grow from our current 120 employees to between 250 and 300 people, in order to remain competitive with other biomedical institutes.’

Current situation

Clemens: ‘Our team is decidedly youthful and, with so many PhD students coming through every four years, it is a challenge to hang on to knowledge. Currently, our group is a mix of over forty nationalities. I think that’s fantastic. Having worked chiefly on our position as a knowledge centre in recent years, we now face the challenge of adopting a more commercial outlook. With more and more start-ups, our institute will have a visible impact in Limburg. One example is the pilot plant we will be building. Among other things, we plan to make 3D implants for bones and cartilage there, as well as pancreatic islets for diabetes patients, and synthetic embryos for research purposes. We also want to collaborate with the Cardiovasculair Onderzoeksinstituut Maastricht (CARIM) as regards applications in the cardiovascular sphere.’ ‘For MERLN, the proximity of the Maastricht UMC+ and our location in



the FHML (Faculty of Health Medicine and Life Sciences) is crucial,’ says Pamela Habibović. ‘Coming up with all kinds of technological developments is one thing, but you also need the experts from the clinic to get involved in the development process. So many collaborations have arisen thanks to incentives from the hospital and the university. This has enabled us to broaden our clinical applications, which in turn opens up new funding options.’

Terrific dynamism

‘Interaction with lots of different disciplines is in our DNA,’ explains Pamela. ‘When it comes to research, engineers, biologists, and clinicians all have their own perspective and goals. We must ensure that we understand, and speak each other’s language. Our open doors and the stunning 600 square metres of office space are conducive to this. It’s a nice experience walking into MERLN. It’s one of the most photographed rooms in the university. But it works well and every day is different, because you’re more aware of the work you’re doing at that precise moment and choose somewhere appropriate to do it. This open culture, in which everyone really is equal and you can talk to each other at any time, doesn’t suit everyone. However, MERLN would not be able to operate as efficiently in a standard office setting. The dynamism around MERLN is always terrific. Now that we are a permanent fixture at Maastricht University, we absolutely must not lose that dynamism. On the contrary, we want everyone to get swept along in it, because scientific research cannot be allowed to rest on its laurels. We want to keep trying new things and,

if something works well, we are keen to openly share it.’ Unfortunately for MERLN, Pamela Habibović has been appointed Rector of Maastricht University and has recently left the institute. Lorenzo Moroni stepped into her shoes.

She herself sees this as a positive development: ‘It’s good that a different dynamic will have to be defined at MERLN. MERLN needs this, as a five-yearly refresh to see how things can be improved.’

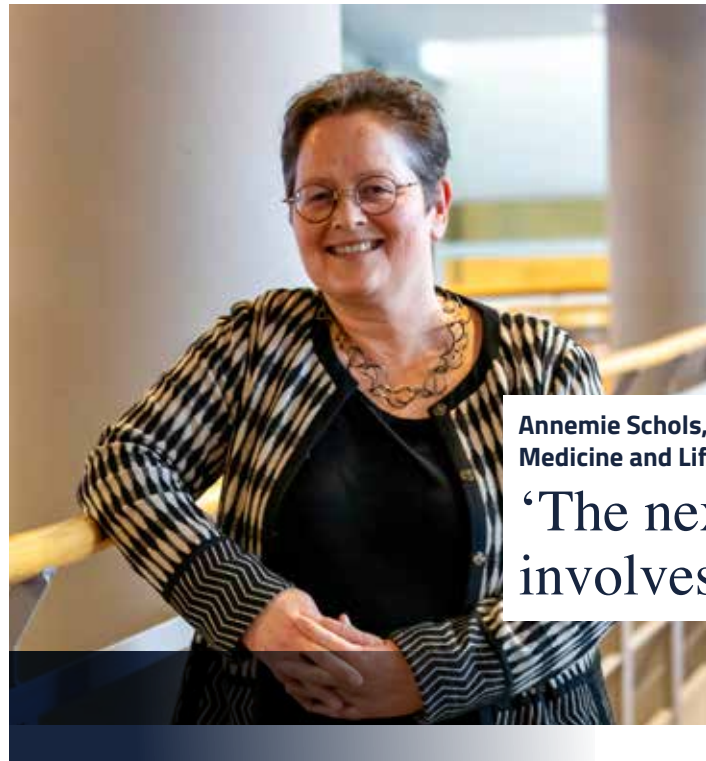


Interesting anecdote

Jan de Boer is one of the ‘founding fathers’ of MERLN. He set up the Cell Biology-Inspired Tissue Engineering (cBITE) department and worked in Maastricht from 2014 to 2018. He now works at BiS-Biointerface Science in Regenerative Medicine, a subsection of the Biomedical Technology department of TU Eindhoven. Jan explains, ‘When Clemens told us - Roman, Lorenzo, Pamela and me - in the autumn of 2013 that he was leaving the University of Twente to set up in Maastricht, we wished him the best of luck there. It didn’t

occur to any of us to go with him, until the visionary dean Albert Scherpbier and Executive Board member Martin Paul came to visit us in Twente and said: ‘Don’t hold back: what will it take to persuade you to come to Maastricht?’ We went out for dinner and summed up in an Excel file what we would want: our own academic positions, equipment, interns, travel allowance, and so on. We presented this list to Albert and Martin, and they said: ‘Consider it done.’ Within two months of Clemens’ announcement, we gave our word that we would come to Maastricht with him. There was nothing on paper at that point, but we trusted each other, and that proved justified. Albert and Martin’s grandiose gesture could only succeed because they knew they had the full backing of the provincial government. LINK is a fantastic example of what can be achieved when people trust each other and when the red tape stays where it belongs, at the bottom of a drawer.’

MAASTRICHT: incubator for new scientific talent'



Annemie Schols, Dean of the Faculty of Health, Medicine and Life Science:

'The next, exciting phase involves taking things forward'

Knowledge Region Limburg has benefited tremendously from LINK's contribution in recent years. The impact on the progress of research and education is reinforced by close collaboration between the educational institutes and the clinic.

'LINK brought new, sophisticated technology and research groups with established reputations to Maastricht. The scientists brought a fresh perspective and a new energy. Thanks to the new tie-ins with our ecosystem and the links with the clinic, from the outset everyone saw the potential of a win-win situation. The institutes occupy an easily accessible location in Maastricht, with physical bridges between the different faculties and the hospital mirroring the metaphorical bridges between disciplines. Over the last few years, the original aims have been achieved with admirable success, and we're still expanding and investing in each other. Scientists from many different backgrounds who, traditionally, do not work together, have come together here. This is partly because they click on a personal level, and partly due to the shared success stories. However, getting sophisticated

technologies and techniques into the practical clinical setting takes perseverance, and investment for the long term.'

'LINK employees participate in teaching in our faculty and create added value for the Science and Engineering Faculty, which trains new scientists with the profile we need for the continued development of our institutes. The FHML Bachelor programme in regenerative medicine and technology is now in the pipeline. This initiative was conceived by MERLN and, for the most part, is being implemented by them, to train the scientists of the future, tying in with research topics. There are currently lots of foreign employees at the LINK institutes. This is a positive development, particularly when we manage to keep hold of them for the region, and deploy them at companies in Limburg and the rest of the Netherlands.

Distinguished by excellence

'For molecular multimodal imaging and regenerative medicine, we're now entering the new, exciting phase of taking our biomedical ecosystem forward. We have to keep seeking out synergies. Exploiting the combined critical mass and infrastructure of the research schools and institutes at the three UM faculties, the hospital, and other facilities on the Maastricht Health campus will be key. If, say, MERLN develops a new product, in order to progress the product, besides sophisticated measuring equipment we also need suitable laboratory animals, test subjects or patients to test effectiveness in a controlled environment, in accordance with the 'rules of the trade.' We have all of that, between us. So the benefit lies in pooling existing top-class facilities and, from that basis, progressing to excellence in order to remain distinctive and create an impact.'

Helen Mertens, President of the Board of Directors of MUMC+:

'As a knowledge region, we're getting better every day'

'In keeping with our motto of 'More knowledge makes us better', here at Maastricht UMC+ we are committed to delivering the best possible care, which we combine with high-quality scientific research and academic teaching. We invest in medical progress and innovation, to improve healthcare and stimulate the regional knowledge economy. By valorizing on the Brightlands campuses the knowledge we acquire, we create absolute added value, something that the region of Limburg can be proud of. What we have here is particularly fertile ground for medical innovation. And LINK has made it even more fertile in recent years.'

International hotspot

'We profit from the knowledge and skills of two renowned centres of

excellence, the upshot being that Maastricht is now an international hotspot for regenerative medicine and molecular imaging. The fundamental knowledge and insights gained here are used to develop treatment methods and diagnostic approaches from which our patients directly benefit. A prime example is the development of the iKnife by M4i, the 'intelligent surgical knife' that distinguishes between healthy tissue and tumour tissue. Another example is research at MERLN into biomaterials and nanomaterials to repair body tissues or for the highly localized administration of medication. This fundamental research contributes to

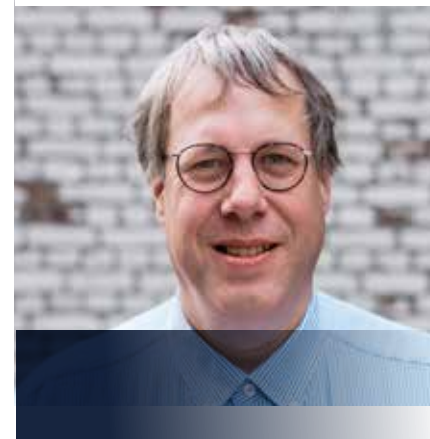


essential innovations in healthcare, and answers questions about how diseases and disorders arise.'

'The interplay between clinic and laboratory that you find at the Brightlands Maastricht Health campus enables us to always go that one step further: from bench to bedside... and beyond. The set-up we have created together draws new scientific talent. With more knowledge, we get better every day, not just here at Maastricht UMC+, but the region as a whole.'

Thomas Cleij, Dean of the Faculty of Science and Engineering (FSE):

'We have a healthy dependence on each other'



'When we were developing our new science and engineering faculty FSE, we needed lots of new employees to teach and do research. Thanks to LINK, lots of people with the right profile were available, because some of the LINK employees also work for us, along with many other employees of the Faculty of Health Medicine and Life Sciences (FHML). This meant we soon had enough critical mass to expand science and engineering in

Maastricht. Plus, by working together, we gained greater visibility in the world of science and engineering.' 'From the outside, Maastricht University looks like a single entity, but internally our faculties each have their own modus operandi. Teaching and research in the FSE differ from FHML; with two such different systems, you have to build bridges to work together. Although this was far from straightforward initially, fortunately the LINK groups are really enterprising. A unique dynamic of mutual dependence and symbiosis emerged. It also brought new disciplines to Maastricht. In materials science, for instance, MERLN enables us to do some great fundamental research.'

New Master's in Imaging Engineering

'The jewel in our crown is undoubtedly the new Master's in Imaging Engineering, which we will be starting next year. This programme relies heavily on the expertise supplied by LINK. Without

them, we would never have been able to develop the programme. LINK has become a key component of our ecosystem. Dozens of LINK researchers help us by teaching and supervising internships. One of the first Maastricht science bachelors, who graduated in 2011, is now a PhD student in the LINK group, for instance. We're becoming more and more interdependent.

'So we're really pleased with the collaborations that have emerged and we have a healthy dependence on each other. Long may it continue, because it delivers exponential growth and development, not just for us, but for Maastricht University as a whole.'

‘We’re getting there, but we’ve not yet fulfilled our promise.’

From a scientific perspective, the LINK project, Limburg INvests in its Knowledge economy, is a big success. MERLN and M4i, the two research institutes that came to Limburg thanks to LINK, now enjoy an international reputation. Jan Cobbenhagen, CEO Brightlands Maastricht Health Campus, and Bert Kip, CEO Brightlands Chemelot Campus, are very much in agreement on this. Bert Kip: ‘From a managerial perspective, it took courage to commit, to invest money in this. Kudos to Maastricht University and the provincial government of Limburg for that.’ But it isn’t all peaches and cream.

‘The scientific knowledge has to be translated into innovations for the market. Whilst it’s great that the knowledge exists, what you really want is for it to benefit the patient, public health and society. And for this to deliver economic growth in the region. There’s still work to be done.’ Says Jan Cobbenhagen: Figures-wise,

This is a major step towards personalized healthcare.

the original business case provided for eight spin-offs; there are now four plus a great licence deal with HTX Imaging.’

Holy Grail

We need, however, to look at the bigger picture. Cobbenhagen: ‘You can look at quantity, but isn’t quality far more important? The four spin-offs that we now have are really great businesses, with tremendous potential, including in

terms of potential impact on society.’ Those spin-offs are CryoSol, Light-house Biomedical, ReGen Biomedical and Dutch Screening Group. The latter includes Hair Diagnostix, which analyses individual hairs to ascertain things such as a patient’s nutrition levels and medication use. This is a major step

towards personalized healthcare, a Holy Grail in medicine. ‘Plus,’ says Cobbenhagen, ‘Valorisation, translating knowledge into patents and innovations in start-ups, is a shared responsibility of the LINK institutes and the Brightlands Maastricht Health Campus. So, we also have a duty to translate knowl-



Jan Cobbenhagen



Bert Kip

edge into impact. And, by the way, quite a few patents have been obtained thanks to LINK. Twenty, to be precise. That’s a lot, and a great basis for boosting business.’

The promise

Bert Kip of the Brightlands Chemelot Campus puts it like this: ‘We’re getting there, but we’ve not yet fulfilled our promise.’ An outsider might struggle to see why LINK is also important to Chemelot; after all, MERLN and M4i are based in Maastricht. Kip: ‘To start with: we work together under a single Brightlands branding, worldwide. These institutes make an outstanding contribution to this. Furthermore, the biomedical field connects the two campuses. Researchers from DSM Biomedical, for instance, work with researchers from MERLN on the In-SciTe research programme. On a practical level, the analytical infrastructure, high-end equipment such as M4i’s electron microscopes, is very important. Researchers in Sittard-Geleen use it. This also results in cross-fertilization, and means that scientists meet each other. Plus, the academic setting in Maastricht is great to begin with, but when a business outgrows it, a more corporate environment is required. Brightlands Chemelot Campus is more suited to providing this, including in terms of space.’ The highest profile example is PharmaCell, a company that began as a start-up in Maastricht, set up a production facility at Chemelot, was taken over by Swiss company

A company that began as a start-up in Maastricht and now produces the Moderna vaccine on the Brightlands Chemelot Campus.

Lonza, and now produces the Moderna vaccine on the Brightlands Chemelot Campus. There’s one more thing that Bert Kip would like to add: ‘When you’re talking about Brightlands anting to acquire a global reputation in brand new areas, obviously it will take more than a few years. It takes decades. You have to be in it for the long haul.’

‘I want it all, and I want it now’

‘It’s true that projects like this require patience. That doesn’t always go down well in politics. As the saying goes, politicians look no further than the next elections. The public can be impatient too, they want results now, those high-quality extra jobs now. It’s like the song by Queen: ‘I want it all, and I want it now.’ But the reality, of course, is not that simple. As a province, you can’t promote Limburg to a globally recognized brand name in the space of a few years. Sustainable employment is, by definition, not something you create overnight. I think we can be very pleased with the results that LINK has delivered for our province and its population up to now. M4i and MERLN are outstanding institutes with an international reputation and that is something worth celebrating. So let’s keep pressing ahead and build on that great start.’

Stephan Satijn,

member of the Provincial Executive for Economy, Land and Education



'To now be in a position of witnessing things that nobody else has ever witnessed...'

M4I'S CORE LAB

Witnessing things that nobody else has ever witnessed

When you invest millions in a research institute, it's only natural, a few years down the road, to wonder whether the money has been well-spent. Yet research and science are not just about balancing the books. Research is also about fascination, about discovering the unexpected. About breaking new ground. Meet the CORE Lab at the Maastricht MultiModal Molecular Imaging Institute, better known as M4i.

'The future of science is multidisciplinary. It's no longer a one-person job; scientists from different fields need each other.'

Picture this. During an operation, the surgeon uses a heated scalpel to instantly seal the blood vessels when making an incision. This produces smoke. Now imagine the surgeon is not using an ordinary scalpel, but an *iKnife*, a surgical knife that analyses the smoke during the operation and immediately tells the surgeon whether they are cutting into healthy or dis-

eased tissue. For anyone looking for fascinating examples of the work that goes on in M4i's CORE Lab, this is a perfect example, because the *iKnife* is now a reality.

Determining whether or not a molecule is healthy

The smoke in question is analysed using mass spectrometry, a meth-

od of identifying molecules by their mass. Based on this, it is possible to determine whether or not a molecule is healthy. Combine this with microscopic images of that same flesh, and you get an insight into the precise location of the molecules in the tissue. This is called mass spectrometry imaging, and this is what M4i's CORE Lab is working on.

About far more than money

Berta Cillero Pastor, Carmen López-Iglesias, and Kèvin Knoops are scientists affiliated with the CORE Lab and, when asked how the Limburg provincial government has benefited from their institute, they answer without hesitating. Employment, for one thing. Unique research facilities that attract a great deal of interest from far-flung

countries. The facility to train people. Carmen López: 'We've built something there that is strong and solid, something lasting. We're growing every year.' But that's not all, and the clue is in the name the CORE, which stands for *Collaborative Open Research Education*. That word 'open' means that the facilities available at the CORE Lab are available not just to researchers from Maastricht University or the Maastricht University Medical Center, but also to external researchers from the Netherlands and abroad. And not just researchers from academic institutions and universities, but researchers from businesses too. Carmen López: 'Right now, ten to twelve companies are using our facilities.' *Open* also alludes to the fact that the CORE Lab is open not just to research in the field of medicine, but also to research in other fields such as food science, cosmetics, and paint. It is possible, for instance, to ascertain precisely which paint was used based on the pigment in that paint – something that comes in very handy when restoring old paintings. The rationale behind these different areas of research is not just 'more clients, more revenue.' It's about far more than money. Berta Cillero: 'The future of science is multidisciplinary. It's no longer a one-person job; scientists from different fields need each other.'

'To boldly go'

Now back to the fascination with science. Kèvin Knoops was born in Parkstad and, after stints elsewhere, is now a researcher affiliated with the CORE Lab. 'I trained as a biologist and specialized early on in my career in microscopy. 'To now be in a position of witnessing things that nobody else has ever witnessed....that's unique.' Or to put it another way: to boldly go where no man has gone before.

VALORISATION: on companies and business activities

MERLN and M4i were tasked with Valorisation wherever possible: getting ideas with potential into society, to the patient and on the market. Which means that research and enterprise go hand in hand. So far, this has resulted in four spin-offs and one licence. And that's just the start; among the many patents applied for, there's some more great stuff to come.

The aims of Valorisation

Generate impact, establish companies that provide direct and indirect employment in the region, collaborate strategically with parties in and around the campuses, as well as in the Netherlands as a whole and abroad, expand and accelerate Valorisation and commercialization, boost the international stature of the Brightlands Maastricht Health Campus and Brightlands Chemelot Campus and thus improve the region as a business location, discover and break into markets...

Dutch Screening Group (DSG)

In short:
What/from: Spin-off of M4i
Product(s): Hair Diagnostix®
Since: 2018
Employees: 6
CEO/contact: Robbert Koldenhof

www.hairdiagnostix.nl

DSG's slogan is: we make the invisible visible. Take the product Hair Diagnostix: all they need is a single hair. They cut this lengthwise, so that the core can be measured. Using mass spectrometric imaging - a type of molecular photo camera - you can then determine whether a person has used drugs, medicines, nicotine, or coffee or has come into contact with chemical substances. Hair Diagnostix seeks to also measure markers for diseases. The entire process involved in this new screening method is far less invasive, and far quicker than obtaining and processing a urine or blood sample. Not only does it give you an insight into the current situation, it also allows you to ascertain very precisely exposure to environmental factors over months or even years.

CryoSol-World

In short:
What/from: Spin-off of M4i
Product(s): VitroJet
Since: 2019
Employees: 21
CEO/contact: Ben Bormans

www.cryosol-world.com

CryoSol-World develops new technologies and instruments for the preparation of samples (proteins, particles, viruses, bacteria and cells) for advanced electron microscopies, based on prior knowledge and patents, and prototypes from the Nanoscopy group. The device that CryoSol is bringing to market, the VitroJet, is capable of taking very thin samples - from 25 nanometers - which it then vitrifies. Freezing them very quickly preserves the quality of the samples: no ice crystals form, and the samples remain undamaged. Cryo-electron microscopes are then used to look at the samples on the subnanometer scale. The previous incarnation of this device (the VitroBot, which was developed in the same lab by Peter Frederik) has been successfully used for over a decade in over 1,000 laboratories around the world.

As modern electron microscopes and cameras have undergone a huge transformation - a veritable 'revolution in resolution' - there was an urgent need for a much improved successor to the VitroBot. This has been on the market since 2020. Having better samples means that more insight into the biology and structures within cells can be gained. Better samples help us to learn more about diseases such as Alzheimer's, cancer, and tuberculosis as well as potential medicines and treatments. CryoSol-World emerged from M4i's Nanoscopy group, led by Peter Peters, and is an independent enterprise. However, it continues to collaborate closely with M4i's Nanoscopy group. CryoSol also continues to make use of M4i's state-of-the-art infrastructure. The company started out on the Brightlands Maastricht Health Campus and is now based in Weert, Midden-Limburg.

Some of the revenues for UM from Valorisation activities linked with activities under the LINK project (licence revenue and/or dividend/sale of spin-offs) are channelled back to the Limburg provincial government (PL), in accordance with agreements to this effect between PL and UM. To this end, UM prepares an annual report for PL. This agreement runs until the end of 2027.

ReGEN Biomedical BV

In short:
What/from: Spin-off of MERLN
Product: Equipment for the large-scale production of functional small tissues
Since: 2021
Employees: 2-5
CEO/contact: Marianne van der Steen

www.regenbiomedical.com

ReGEN Biomedical is working on one of the four regional production locations of the national pilot factory for regenerative medicine. The new facilities in the regions of Limburg, North Brabant, Utrecht, and South Holland together make up the pilot factory. They cover the entire chain of development and production of smart biomaterials, other smart materials, stem cells, organoids, tissues and microtissues.

Thanks to support from the National Growth Fund, plus investment by the European Union, provincial governments, private parties, and knowledge institutions, an ecosystem is emerging: parties working closely together to bring cures for chronic diseases one step closer. ReGEN Biomedical is focusing on growing large quantities of robust and reproducible small and other-sized pieces of tissue (microtissues) for toxicity & pharmaceutical screening. Functional microtissues are the next step in mimicking the organs of patients and represent the future of personalized medicine. We are building expertise in how to assemble microtissues to form functional pieces of human organs, so-called macro tissues. The microtissues also serve as building blocks for therapies in regenerative medicine. The intention is to fully automate all production steps and endow them with advanced quality control systems. The platform technology used in this initiative can be sold and licensed for specific applications such as screening medicines and the use of *ex vivo* disease models. Large-scale production is key to the development of a new industry and production landscape for affordable solutions in regenerative medicine.

Lighthouse Biomedical B.V.

In short:
What/from: Spin-off of MERLN
Product: A cell carrier to treat type 1 diabetes
Since: 2021
CEO/contact: Vanessa LaPointe

www.lighthousebiomedical.com
(in development)

Lighthouse Biomedical has originated from MERLN. The company is bringing a regenerative treatment to market for patients with the auto-immune disease type 1 diabetes. The research group led by Aart van Apeldoorn came up with the invention. His colleague and spouse, Vanessa LaPointe, is also a scientist, and she will be running the company as CEO. In people with type 1 diabetes, the body no longer produces insulin; the cells in the pancreas that normally produce it - called beta cells - have been destroyed by the person's own immune system. Thus far, these patients have been reliant on insulin pumps and/or pens for regular injections to control their blood glucose levels. The solution that Lighthouse Biomedical wants to offer patients eliminates the need to inject insulin. The idea is to combine an implant with new insulin-producing cells made from stem cells. Those new beta cells will be placed in the recipient, along with the bespoke implant. The implant with the cells then takes over the function of endocrine insulin production from the pancreas.

In the Netherlands alone, there are currently more than 115,000 people with type 1 diabetes (including around 10,000 children). Globally, you're looking at millions and millions of people, and that figure is rising fast. Along with asthma, diabetes is the most common chronic disease among children. At present, and despite daily insulin treatment, long-term type 1 diabetes always leads to complications, such as cardiovascular disorders and disorders affecting the eyes, metabolism, digestion, kidneys and/or urinary tract. Lighthouse Biomedical is still in the start-up phase and, right now, is busy setting up strategic collaborations, including with companies that are developing a cell product.

HTX Imaging

In short:
What/from: Licence from M4i
Product(s): Matrix Sublimator, among others
Since: 2017
CEO/contact: Alain Creissen

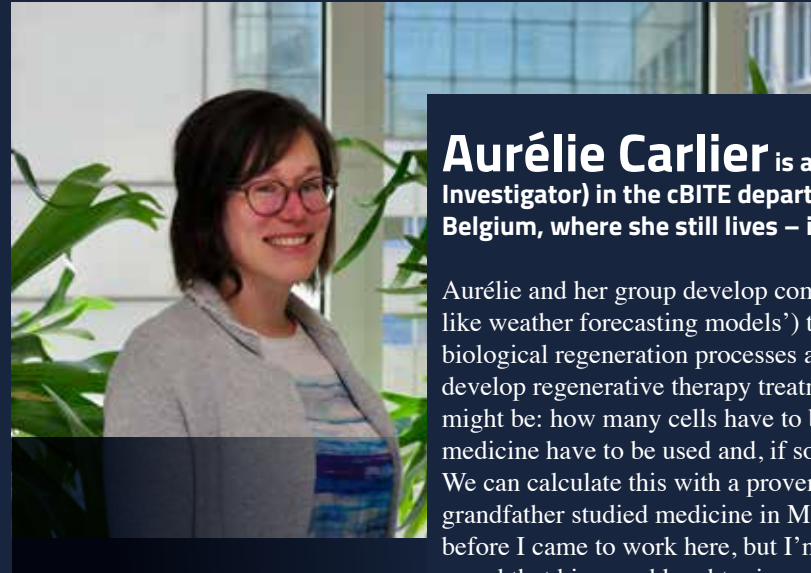
www.htximaging.com

M4i developed the Matrix Sublimator, an innovative research instrument that prepares human tissue for measurement in the mass spectrometer. The device vastly improves the quality and resolution of measurements. With the utmost care, the Matrix Sublimator applies a thin layer of chemical powder to the tissue to be investigated. Once the powder has been applied, the molecules - after energy has been applied with a laser - more readily leave the tissue and enter the mass spectrometer. This greatly improves the quality and resolution of the measurement. After this, the released molecules are weighed in the mass spectrometer's magnetic field. The result is a spectrum, a kind of graph, of the quantity of molecules sorted by weight. Going forward, it will be possible to build a database to determine which type of cells are found in the tissue: healthy cells, for instance, or cancerous cells?

The Matrix Sublimator is the result of a partnership between M4i, DSM Resolve, Maastricht Instruments (engineering, software) and IDEE, Maastricht University's engineering firm. American company HTX Technologies, founded by Alain Creissen, established HTX Imaging B.V. specifically for this technology. HTX Imaging licensed the knowledge and patent from M4i. To make the device more marketable, M4i and HTX Imaging made a few tweaks to it. The market is relatively small and transparent, people know each other, and therefore know existing and potential customers and their requirements. The expectation is that a few hundred devices can be sold.

Tell us what you do!

We put a few questions to a few of the researchers and staff at MERLN and M4i. Such as: who are you, what do you do, and what do you want to achieve? And: how do you like working and living in Maastricht? We got some great answers!



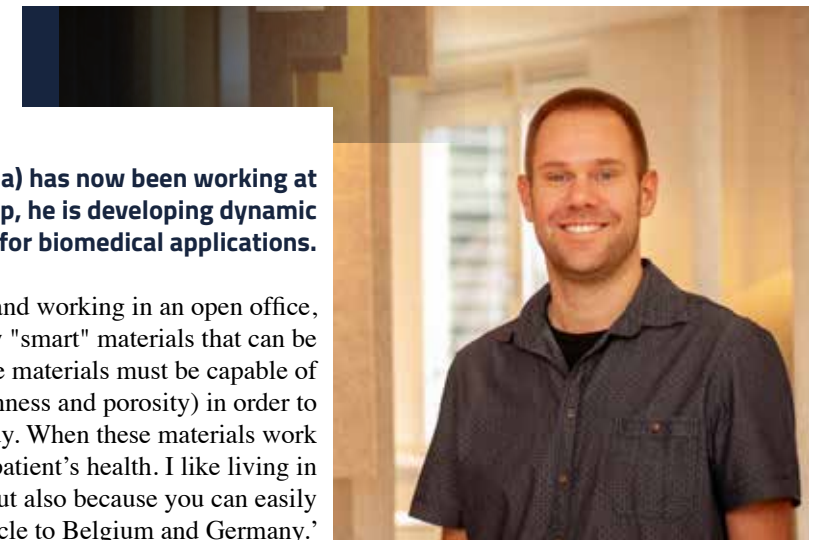
Aurélie Carlier is a PI (Principal Investigator) in the cBITE department. She is from Belgium, where she still lives – in Leuven, to be precise.

Aurélie and her group develop computer models ('a bit like weather forecasting models') to understand underlying biological regeneration processes and, from there, help develop regenerative therapy treatments. 'One example might be: how many cells have to be implanted? Does a medicine have to be used and, if so, in what concentration? We can calculate this with a proven virtual model.' Aurélie's grandfather studied medicine in Maastricht. 'Sadly he died before I came to work here, but I'm sure he would be very proud that his granddaughter is working at Maastricht University in regenerative medicine. It brings things full circle! For me, diversity is typical of MERLN, in terms of scientific background, academic seniority, and culture too. It's a wonderful mix that constantly inspires you to learn new things!'



Lorenzo Moroni (from Italy) is one of the founders of MERLN and, since 1 February 2022, has been its new scientific director. His research group is working on 'biofabrication'.

'We're trying to build new tissues for our body by distributing cells and materials and controlling their position in space and time. It's a bit like playing with Lego blocks, only we work with biological "blocks" made from cells, materials, or a combination of the two. The structure is our tissues. As a place to work, MERLN offers a phenomenal interdisciplinary, collaborative, and international environment with a groundbreaking infrastructure. As a place to live, Maastricht is one the Netherlands' friendliest and most culturally rich cities. Despite being a city of international standing, it has a small-town feel to it.'



Jurica Bauer (originally from Croatia) has now been working at MERLN for around two years. Together with his group, he is developing dynamic and responsive biomaterials for biomedical applications.

'I find the multidisciplinary environment at MERLN, and working in an open office, really appealing. I'd like to design and develop new "smart" materials that can be used in the human body. By "smart" I mean these materials must be capable of altering their physicochemical properties (such as toughness and porosity) in order to cope with foreseen and unforeseen changes in the body. When these materials work efficiently with the underlying tissue, this improves the patient's health. I like living in Maastricht, partly because of the delicious vlaai (flan), but also because you can easily cycle to Belgium and Germany.'



Roman Truckenmüller (born in Freiburg, Germany) has worked at MERLN since it was founded in 2014.

'We do research into micro tissue engineering. Micro tissue engineering is dedicated to applying the principles of micro and nanotechnology to the development of biological tools that can restore, maintain, or improve tissue function. This is a fantastic, stimulating environment in which to work. Maastricht University is modern and open. MERLN really does stand out as always being a very friendly and supportive environment. As a researcher, you have all the freedom you need to develop and mature. Plus, Maastricht is such a fantastic, historic city.'



Stefan Giselbrecht (PI) describes the city of Maastricht as: 'Small, but with the charm of an international city.'

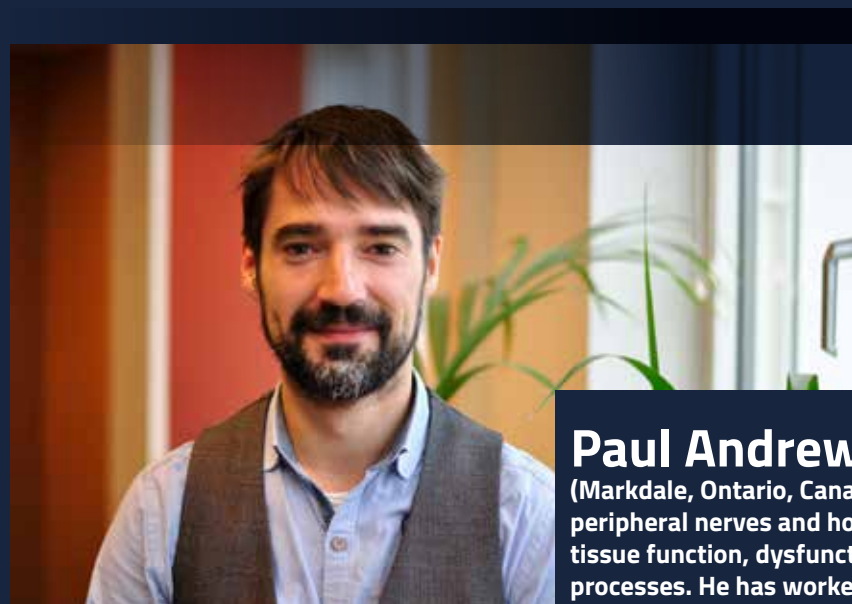
Stefan is originally from southern Germany – Ulm, to be precise – and has worked in the IBE (Instructive Biomaterial Engineering) department at MERLN since 2014. 'My research is driven by the question of how cells know where to go and what function to perform in a growing organism (embryo). I'm curious about how tissues and organs are formed and whether we can emulate these processes and their regulatory mechanisms in the lab. Both in Maastricht and at MERLN, I invariably find people to be friendly and very open-minded.'



Sabine van Rijt (from the Netherlands) has been leading the **Nanomaterials for Regenerative Medicine** group at MERLN-IBE since 2015.

‘Our team develops inorganic nanoparticles, which we apply in various regenerative approaches. We use nanoparticles with unique optical properties to visualize cells or tissues. We also use nanoparticles as coatings or in combination with polymers to create biomaterials with improved properties, such as greater mechanical strength or improved bioactivity.

For me, carnival, vlaai, Limburg wine, the dialect, and the hills are typical of Maastricht. When LINK was launched, we bought a gong. That MERLN gong is still regularly used to announce important events. It's one of the best purchases ever, I reckon!’



Paul Andrew Wieringa (Markdale, Ontario, Canada) is interested in **peripheral nerves and how they influence tissue function, dysfunction, and healing processes**. He has worked in the CTR (Complex Tissue Regeneration) department at MERLN since 2014.

Paul on MERLN

‘There's a great group of PIs at MERLN with diverse and complementary backgrounds, in terms of both scientific expertise, international outlook, and personalities! MERLN is relatively young; our technological approach is supplemented by the more traditional biology-oriented research fields that are based at UM. The contact and collaboration with clinics and a growing emphasis on clinical translation are also very unique. This also mirrors what I see in Maastricht: there's a strong sense of local pride and traditions, along with a marked receptiveness to new influences from a growing international community.’

‘Although my particular focus is on pain receptors, I have a growing interest in the sympathetic and parasympathetic nervous system. These are the nerves that regulate tissue function in the background. To study this in a controlled way, I build 3D *in vitro* models of functional tissues. I combine these with nerves in order to study the interaction and investigate how this can be controlled and used for regenerative purposes.

I love this compact city with its historical European feel – it's so different from where I grew up! The rolling landscape (I mean, wow, hills in the Netherlands!) reminds me a little bit of home. What I do miss, however, is proper snow!’

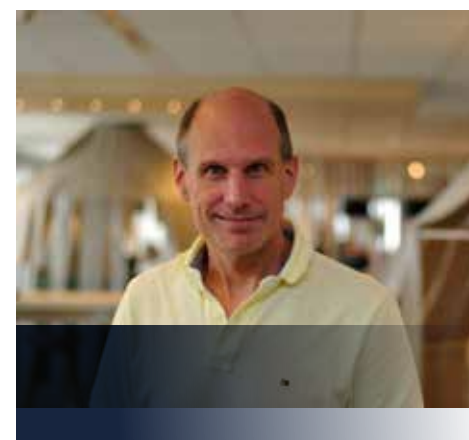


The research group led by PI **Carlos Miguel**

Domingues Mota based in Portugal, uses printers to make three-dimensional structures by combining living cells and supporting materials and creating tissue and organ analogues.

Carlos comes from Portugal and works in the CTR department. His team develops bioprinting and additive manufacturing technologies (3D printing) to produce *in vitro* tissue and organ models and strategies for regenerative medicine. ‘I like to compare the city of Maastricht with the tissue/organ that we want to build in the lab. If we compare the Meuse river to a blood vessel and see all the roads as the little veins and arteries, you can see the landscape as representing the carrier materials. Which makes us, the people of Maastricht, the city's cells. Like fascinating tissue structures in the lab, the city too is constantly changing.

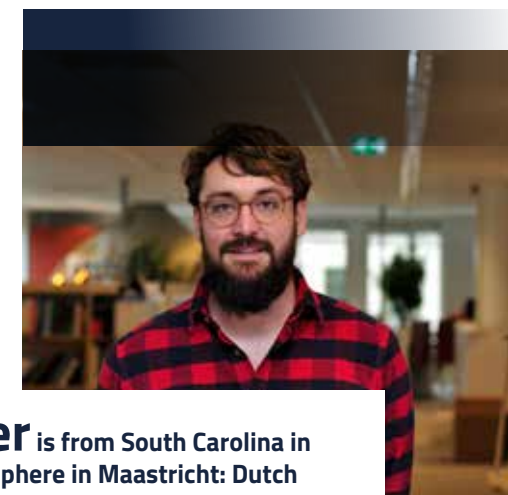
My first involvement with MERLN/LINK was in May 2014, when we did the LINK pitch. We drove from Enschede to Maastricht to set up a stand with a number of examples of the research we'd done as a group at the University of Twente.’



Martijn van Griensven (Leiderdorp, Netherlands) has been working on translational regenerative medicine in the cBITE department for around 2½ years. He is also the Deputy Director of MERLN.

‘Depending on the clinical picture, we look at which molecules there are too many or not enough of, or which are faulty, and which paths have gone wrong. We use that information to develop new treatments based on those molecules, together with stem and other cells and filler materials. We then test this in cell cultures and preclinical models and, eventually, administer it to the patient. We focus mainly on tissues in the musculoskeletal system.

Maastricht has a life-embracing culture and is surrounded by stunning countryside to explore in your free time. At work, we have a great international and interdisciplinary group.’



Matthew Baker is from South Carolina in the USA. He loves the atmosphere in Maastricht: Dutch professionalism combined with a more laid-back attitude – plus amazing food and maybe a glass or two of wine.

Matt has been a PI in the CTR department at MERLN since 2014: ‘The materials in your body are mostly made up of polymers. Over millions of years, the human body has evolved to make really cool and complex polymers. We're trying to mimic some of that complexity with the simpler molecules and polymers we can make in the lab. We want to find out what's important, how we can control cells, or whether we really can make biomimetic materials.’ Biomimetics is the science that takes the best biological ideas in nature and uses them to invent and improve human applications and make them more sustainable.’



Elizabeth Rosado Balmayor from Cuba has been working at MERLN since September 2019. Her research group, Molecular Transfer and Therapy, focuses on gene and transcription therapies for tissue manipulation and regenerative medical applications.

‘We are looking to develop innovative technologies for the efficient delivery of genes, transcripts, and other biomolecules to cells. Our ultimate aim is to direct cell differentiation and promote regeneration.

What I really like about MERLN is the interdisciplinary way of working, the diversity, the good communication, and great colleagues. I love the cheerful nature of the Dutch people around me; they're very open-minded here. One of the things I've learned here is that it's OK to state your opinion on something. In fact, you're expected to do that frequently. What I do still struggle with is that people here have dinner around half past five. That's just too way too early.'

Vanessa LaPointe grew up in Canada and ended up in Maastricht in 2014, via Baltimore, London, and Enschede.

Her research group is called ‘Cell Therapy’, but its focus is broader than that: ‘In regenerative medicine, we try to create new tissues and organs for people with diseases or damage and injuries. To do this, we have to be able to control the cells in our body so that they work as tissues and organs are supposed to function. Our research is about generating the knowledge necessary to control the cells more effectively. Some people would call this fundamental research, but we actually apply it.

I don't think there is anything that is "typically MERLN." I get the sense that we're still in a process of discovery, partly because we've grown so fast. I have lots of memories of the early days of MERLN, when we were a small team getting everything set up. The time we discovered that a huge amount of rain had got into our new laboratory is a painful memory. But I look back fondly on that sunset on the roof of UNS50...'



Pamela Habibovic (Bosnia Herzegovina) is one of the founders of MERLN. Until recently, she led the IBE department and was MERLN's scientific director. Since 1 February 2022, Pamela has been Rector Magnificus and member of the Executive Board of Maastricht University.

‘One major line of research is the development of biomaterials that can be used to repair damaged and diseased bone. At present, serious and tricky bone defects are treated by grafting bone from elsewhere in the body, but you're limited as to how much bone you can use and complications can arise. That's why it's important we succeed in developing good, affordable synthetic biomaterials that are directly available to treat patients. I enjoy the dynamic working environment at MERLN; every day is different here. There are lots of talented people working here on creative research. As one of the founders of MERLN, I'm especially proud that we have succeeded together in building a fantastic research institute out of nothing. This would never have been possible without the support of Maastricht University and the Limburg provincial government.'

Marloes Kamphuis Lab Manager, was born and raised in Enschede and has worked at MERLN since 2014, when the labs were still being set up.

‘I'm responsible for all the cell culture laboratories. It's very varied work, which is great. I make sure the equipment works and is calibrated, check with our biosafety officers that all the genetically modified organisms in our lab are being kept in accordance with the licence, and make sure all the materials are in stock. Training people in how to work in an ML2 lab is another important aspect of my work.

I'm keen on travel, so I love the fact that so many people from other countries work here. You learn a lot about what it's like to live in other places in the world. I now know, for instance, what the Limburg word ‘pratsj’ means: mud!’



Nick Beijer former PhD student: Zaanstreek (youth), Twente (studies), Maastricht (PhD), Bilthoven (work).

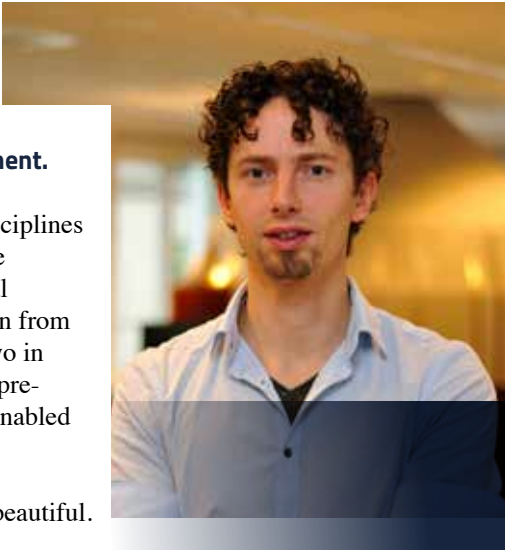
‘At MERLN, I worked on the EU Horizon project STELLAR. Jan de Boer was my supervisor. Straight after I got my PhD, I started work as a scientific associate at the RIVM's Centre for Health Protection. I was trying to find out what happens to cells when they come into contact with biomaterials and, in particular, in response to the physical stimuli from the material. Now, at the RIVM, I use my knowledge of the interaction between cells and biomaterials to predict whether implants are biocompatible and safe, and whether they will cause any side effects.

MERLN is a fantastic international community of creatives and an inspiring environment where nothing is impossible. Maastricht has a great vibe. It felt like being on holiday, despite the fact that I was working really hard.'

Erik Vrij from the Netherlands, postdoc, six years in MERLN's IBE department.

‘What I think is unusual about MERLN is the multidisciplinary approach. Various disciplines examine a problem together and look for possible angles and solutions, with everyone drawing on their own background. It's unique, educational, and effective. My doctoral research is entitled "Modelling embryo implantation on-chip." We use stem cells taken from uterine tissue and microfluidic chips to replicate the implantation process of an embryo in the laboratory. The objective is to use stem cells to create the world's first model of a pre-implantation embryo of a mouse. Support from Limburg provincial government has enabled us to concentrate on this project. We're grateful for that.'

Maastricht is an old and friendly city, but I also think the surrounding countryside is beautiful.





Pinak Samal postdoc, comes from India and, among other things, appreciates the 'cutting-edge science at MERLN'.

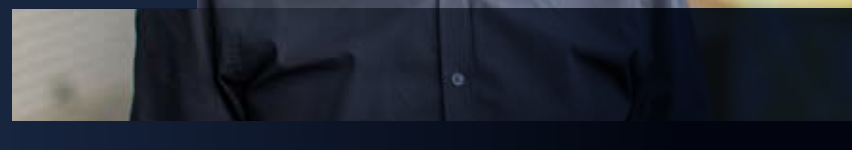
Pinak has now been in Maastricht for six years. 'My work involves designing and making microfluidic platforms to manipulate stem cell differentiation and patterning. These are key processes in tissue engineering and regenerative medicine. The title of her doctoral research in the Instructive Biomaterials Engineering (IBE) department is: Microfluidic platforms to analyse and manipulate stem cell patterning.

'The best thing about MERLN? That we are all working together towards the same goal, each one of us in his or her own field. Plus the interdisciplinary approach, the opportunities you get to flesh out new ideas, the innovative and cutting-edge science, the very international environment of colleagues/friends and the openness, both in the scientific community and the group. The city of Maastricht has that same openness and hospitality!'

Dennie Hebels project manager handling all sorts of different tasks: 'Lots of variety, lots of fun. There are always new challenges.'

Dennie joined the cBITE department in 2015, initially as a postdoc, then as a project leader and, since 2020, as a project manager for the whole of MERLN. 'I work as a data steward, among other things. Good data management is essential to enhancing the reusability of our research data. I also work with colleagues from other departments, faculties, and the Library, to promote Open Science within UM. Plus, I coordinate some of our teaching strategy and lead non-research projects within MERLN, including outreach.

The name MERLN always causes confusion. Aside from its spelling without an 'i', people often wonder what MERLN stands for. Actually, it doesn't stand for anything! The name was chosen because it fits well with our collaboration with Chemelot. The comparisons with King Arthur go even further: we hold an annual roundtable discussion and have a fund called Excalibur!



Christine Woestenburg worked as a project leader with Jan de Boer (cBITE) between 2014 and 2017. She also organized big events.

One such event was the LINK opening, which was held over three days, at AINSI in Maastricht. We'd thought of everything, except the possibility of a heatwave in September. Indoors, the temperature reached a sweltering 35 degrees; the caterer's water supply was used up in no time. 'There was no other option than to make several trips to the nearby supermarkets to replenish stocks.' Christine also has fond memories of 'the secret visit by King Willem-Alexander which, on closer inspection, turned out not to be so secret:' 'It was wonderful to see Willem-Alexander being cheered by lots of UM colleagues, as well as a big group of cleaning staff, on his way from the UNS40 office to the UNS50 lab.' For the last five years, Christine has worked as a Facility Manager at Brightlands Maastricht Health Campus. Christine has lived in Maastricht since 2007. She still derives huge pleasure from the atmosphere in the city, birdwatching in the beautiful countryside, rowing on the Meuse, and the wonderful food and drink...



Daniel de Melo Pereira from Portugal recently completed his doctoral research: Insights into cell-material interactions.

'I'm trying to understand if biomineralized collagen (a synthetic material) can offer a good alternative in clinical situations that normally require a bone graft. I observe how the cells in bone tissue react with biomineralized collagen. I've been living in Maastricht and working at MERLN since 2015.

I've gained a lot from working at MERLN. Besides being able to research what I wanted, we also have a really great working environment here. I'm really drawn to how multicultural it is here; it naturally makes for a very welcoming environment. With people from all around the world, it's easy to be open and talk to people. Great colleagues quickly become friends. I think the hills around Maastricht are unique and interesting. And of course vlaai and carnival instantly come to mind.'



Carlos J. Peniche Silva is a PhD student in the cBITE department at MERLN. He comes from Cuba, and moved to Europe four years ago.

'I've now been working in Maastricht for a good two years. The main focus of my research is the enthesis, the tissue that connects tendons and ligaments to bone. Being a concentration point that's under severe pressure, this tissue is vulnerable to injury. Following an injury, scar tissue forms that is usually weaker, making it more susceptible to fresh damage. We want to research and develop various molecular tools that will help improve the regeneration of damaged tissue.

Limburg is the best region in the Netherlands for mountain biking, which I love. Another very appealing aspect of living and working in Maastricht and at MERLN is the international and inclusive atmosphere. Whether I'm working in the lab or buying cheese at the market in town, I always feel welcome.'



Urandelger Tuvshindorj - 'Just call me Urnaa' - is from Mongolia and obtained a doctorate last year. She grew up hunting young calves on the vast steppe.

'We have different types of cells in our bodies. All of these cells are very different in size, shape, and function. I develop cell culture platforms to alter a cell's shape, depending on cell type, and then investigate how these different morphologies can influence cell function. The short version of the title of my doctoral thesis is: Micropatterned platforms for cell culture. At MERLN, we have lots of different types of equipment and cutting-edge labs such as the cleanroom and cell culture labs. If you have an idea about the relationship between microstructure and cell morphology, you can very quickly create microstructures in our cleanroom and get cells grown on them in the tissue culture lab. It gives you plenty of freedom and opportunities to test your ideas with all the equipment in the labs.

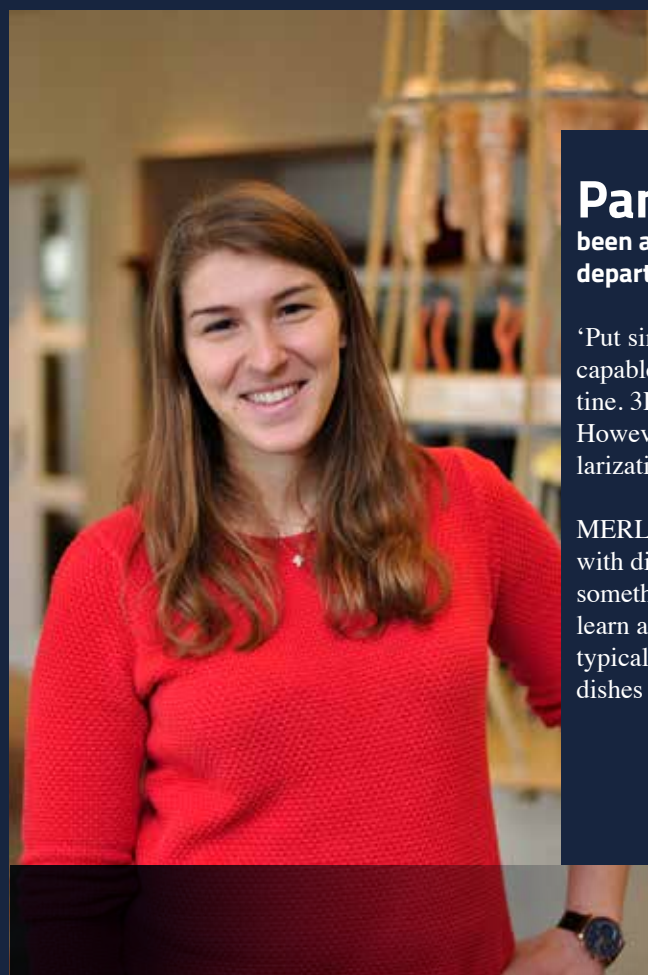
For me, bicycles are typical of Maastricht – I learned to ride a bike here – as well as wandering around the city centre, eating Pinky waffles with my family and, of course, carnival.'



Panagiota Kakni from Greece (Thessaloniki) has been a PhD student in the Instructive Biomaterials Engineering (IBE) department for four years.

'Put simply, I'm working on developing 3D cell culture systems that are capable of replicating structure and functional traits of the human intestine. 3D cell culture systems have lots of advantages over the 2D version. However, because of the variation in size and shape and the lack of vascularization and surrounding systems, their use is still limited.

MERLN is an international institute where people from all over the world with different backgrounds and areas of scientific interest converge. I learn something new every day here. Not just science-related stuff; you also learn about other cultures and civilizations. Friday afternoon drinks are a typical Maastricht thing for me. And on Sunday I love to cook, preferably dishes from different parts of the world.'



Fiona Rosaleen Passanha (first postdoc, now project leader) comes from India and has been enjoying the laid-back lifestyle in Maastricht for five years.

'The title of my research was "Advancing regenerative medicine by generating knowledge of the nature of cadherins in mesenchymal stem cells." What this means? I was working with a family of proteins called cadherins. Cadherins are cell adhesion proteins that attach one cell to another. My research was designed to identify how cadherins influence the function of stem cells. Since recently I'm working as a project leader in Vanessa LaPointe's group.

Maastricht is a beautiful and vibrant city, and the people here are calm and relaxed. Vlaai and the famous Dominicanen bookstore based in a Gothic church are what I think of as typical of Maastricht.'





Denis van Beurden Lab Manager, a true 'Brimbo': born and raised in Brabant, but has now been living in Sittard (Limburg) for 16 years.

'I spent four years working at Maastricht University. I left to work at a small business in Eindhoven. Three years later, in 2015, I returned to Maastricht, to MERLN. I look after the polymer and materials lab, I train people, and I have overall responsibility for the high resolution SEM, the Scanning Electron Microscope. I also have quite a lot of tasks alongside all that: first aider, emergency first responder, chemicals manager, prevention officer and radiation expert.

In Limburg you've got the beautiful hilly landscape as well as a great infrastructure to easily get to the rest of the Netherlands or Belgium and Germany. Working at MERLN combines the academic environment with, to varying degrees, a business mindset. The fact that working at MERLN really is interdisciplinary and international makes every day interesting. Knowing that research is done here to improve quality of life is a very good motivator!'



David Barata from Portugal started his thesis at the University of Twente and, in 2015, 'migrated' along with the founders to MERLN at Maastricht University.

He completed his thesis in Maastricht and worked there as a postdoc until 2019. He is now working as a postdoc at the Instituto de Medicina Molecular at Universidade de Lisboa. 'My thesis "Development of microfluid platforms for screening cell-biomaterial interaction" was very well received: I was a finalist in the NBTE Doctoral Award 2016-17, I won the Julia Polak European Doctoral Award from the European Society for Biomaterials in 2018 and was awarded the UM Valorisation Prize in 2017. As a postdoc, I worked with colleagues on the "organ-on-a-chip." In Portugal, I'm now working on bio-engineering a muscle-on-a-chip: we place nutrients and key factors for the survival of muscle on a tiny chip and try to replicate the connection between motor and other neurons and skeletal and other muscles. Using the knowledge this yields, we can study neuromuscular diseases and explore strategies for precision medicine. Researchers from different backgrounds collaborating on projects is very typical of MERLN. This automatically gives you a dual or multidisciplinary perspective which, in turn, can shed light on new ways forward in solving problems. Engineers doing biology!'



Paul van Schayck PhD in M4i's Nanoscopy division, born in Nijmegen, moved to Maastricht, studied in Wageningen, has been living and working back in Maastricht since 2015.

'I never saw myself returning to Maastricht, but then the perfect vacancy came up at M4i. Now I realize what a luxury it is to live close to your family. I am working to improve the image quality produced by an electron microscope for cryogenic – frozen – samples. We study the 3D structure of things like cellular components, proteins, and enzymes. That information helps us combat illnesses such as COVID-19 and tuberculosis. I'm also working on the development and evaluation of a platform for managing research data for bioscience research groups. Reproducible and reusable research – the Open Science movement – is a hot topic in the research world. As the data sets for research are becoming increasingly large and complex, we've developed and evaluated tools that help researchers manage their research data.'



Yue Zhang PhD from China (Xiaogan City, Hubei Province), has been working in M4i's Nanoscopy division for almost three years.

'I'm working on the Quantum Sorter project, intended for the cryogenic electron microscope. The 'Quantum Sorter' is able to sort an electron into different properties that are relevant following interaction with the specimen. After the interaction, the electron will be analysed by the sorter to help identify the specimen's properties. The technology can be used to identify the specific properties of separate proteins with the smallest possible electron dose, paving the way for future developments in protein identification.

The city of Maastricht is beautiful and quiet, surrounded by green and hills. It's a wonderful place to live and work. I'm a big fan of the Meuse and of the Sinterklaas celebrations.'

Anjusha Mathew is a PhD student in M4i's mass spectrometry division. She is from Kerala in India and has now been working in Maastricht for 3½ years.

'My PhD – Ion Imaging and Structural Analysis of Biomacromolecular Assemblies in Mass Spectrometry Using Timepix Detector – is a NWO domain AES (Applied and Engineering Sciences) project, in partnership with Utrecht University and ThermoFisher Science. This involves me working with some of the best people in the field of mass spectrometry, and I learn a huge amount from them. I enjoy the freedom I have here in my work. They more or less let me do what I want within the confines of the project, provided I learn something new or make scientific progress. I also appreciate the diversity and the interdisciplinary approach to work. I'm an engineer in principle. Ron Heeren (my supervisor and day-to-day support) is a physicist, and my co-supervisor Shane Ellis is a chemist. When we discuss things, each of us looks at the situation from a different perspective. That benefits both the progress of the project and my own development. Plus, M4i is diverse in terms of academic backgrounds and the type of research. This means I can see things as part of a bigger picture, from the perspective of others, and I learn new things in different areas every day.'



Kasper Kaagaard Krestensen (from Denmark) did a Master's in Fundamental Neuroscience in Maastricht. Since 2019, he has been a PhD student in M4i's Mass Spectrometry division.

‘During my internship in Boston, where I first encountered mass spectrometry, Ron Heeren was my internal supervisor. That led to me doing a PhD in that field. My project is entitled: high throughput contextual cellular analysis: imaging and "omics". I’m investigating the relevance of small molecules such as fats or proteins and how they interact in a biological context, using a combination of metabolomics/proteomics and mass spectrometry imaging. Specifically, my focus is on investigating certain fat molecules that play a role in cancer of the bile duct (cholangiocarcinoma). This may help us predict the progression of the disease and the treatment.

The distinctive Limburg landscape around the city, with its hilly trails, is perfect for me as a triathlete. The international atmosphere in Maastricht and at M4i means you get to interact with people from very different cultures, which I find really interesting. Plus there's vlaai that's eaten to celebrate absolutely everything. No matter how big or small the occasion.’



Postdoc researcher **Roel Tans** from Limburg, now lives near Eindhoven. He loves the dynamism at M4i: ‘Both science-wise and people-wise.’

‘Leishmaniasis is an infectious disease caused by a parasite. At M4i, we're using mass spectrometry imaging to measure and visualize molecules of infected tissues. We identify which molecules are present, and where, in the tissue, and that helps us to understand how the Leishmania parasite is able to survive and cause infection. When we understand which molecules are crucial to the parasite's survival, we can develop medicines/vaccines that will switch off the parasite's survival mechanism. We cover a whole lot of areas at M4i, such as instrument design, application development, and applying our techniques in the life sciences. That, coupled with colleagues from all over the world, makes it a great place to work.’



Assistant Professor **Ian Anthony** from the United States rates the standard of science and knowledge at M4i as world-class.

‘In my view, the research I've been doing here since 2019 isn’t possible anywhere else in the world. The combination of our unique infrastructure and our team of doctors, engineers, and scientists is truly unique. We use imaging spectrometers to create molecular images of surfaces. Unlike microscopes, which produce colour images, imaging mass spectrometers produce images of the molecular mass. Scientists use these images of mass to simultaneously identify and make visible hundreds or even thousands of molecules and elements on a surface. Mass spectrometry with imaging is a fairly new field, and the capabilities of the instruments are rapidly improving year by year. My research is looking to make imaging mass spectrometry faster, more detailed, and more reliable. If we can do that, scientists, doctors, and engineers in fields ranging from surgery to semiconductor manufacture will be better informed, and able to make faster decisions.’

Berta Cillero Pastor from Spain has been working at M4i since 2015, where she runs the CORE lab and is also a PI (Principal Investigator).

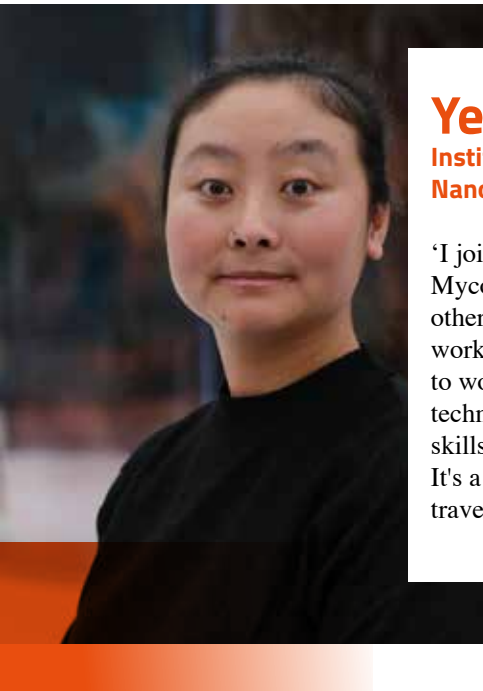
‘The IMS CORE lab provides service, training, support, and access to Mass Spectrometry imaging and proteomic technologies. For my research (spatial omics for ageing), I am trying to understand the molecular mechanisms behind ageing, using techniques that enable me to study local tissue changes. We can then prevent or limit the development of age-related conditions such as osteoarthritis – a form of arthritis whereby the cartilage in the joint gets worn – and look for more personalized treatments.

I love the freedom that the Dutch given their children (children make their own decisions at a young age, and that's really important later in life). Work-wise, I love the flexibility and freedom that I have. UM is a terrific university at which to grow and develop yourself. What's typically Dutch? Eating sandwiches for lunch... But I just can't get used to that.’



Sebastiaan Van Nuffel (Antwerp, Belgium) has been working since December 2020 as an Assistant Professor in M4i's mass spectrometry division and Maastricht University's Faculty of Science and Engineering.

‘My research group is working on the development and application of imaging mass spectrometry techniques such as Time-of-Flight Secondary Ion Mass Spectrometry (ToF-SIMS) in the context of bioscientific research. One specific objective is to develop multi-scale, multi-omics approaches for investigating biological models and clinical specimens from atoms to anatomy. With this holistic, multimodal imaging approach we hope to gain fundamental insights into biological processes, disease mechanisms, pharmacology, and toxicology. Ultimately, this will improve the lives of people and society as a whole. As a budding academic, it's so great for me to work at a young and dynamic university like Maastricht University. M4i has an outstanding infrastructure and is home to lots of researchers who are among the best in their field. This is a place where amazing science is made possible. People here aren't afraid to do things differently. Quite the opposite.’



Ye Gao is originally from China. She obtained a PhD at the Max-Planck Institute of Biophysics in Germany, and now works as a Senior Researcher in M4i's Nanoscopy division.

‘I joined Peter Peters’ group in 2016 to do research into the ESX-1 complex that helps Mycobacteria tuberculosis to evade macrophages – white blood cells which, among other things, mop up pathogens – and then cause the illness tuberculosis. I enjoy working at M4i. There's plenty of scope for different ideas and styles, and you learn to work with international colleagues from different disciplines. We use the latest technologies, and that benefits our bioscientific research. I’m really pleased with all the skills I’ve developed and improved since joining M4i. I also enjoy my life in Maastricht. It's a compact and beautiful city. Everything here is very accessible without too much travelling time.’



Raimond Ravelli - ‘My surname is Italian but I was born in the Netherlands, near Utrecht, where I went to school and attended University’ – has been working in M4i’s Nanoscopy division since 2014.

‘When I take the kids to school in the morning and cycle over Sint Servaas bridge, I enjoy the view of the city and the river. It’s different every day of the year, but always beautiful, particularly early in the morning. I’m researching structural biology: from diseases, biochemistry, and cell biology to teaching and technology. From bonds and interactions in space and time, you can learn what changes when, for instance, you develop a genetic disease. Or when – very topical – a new SARS-CoV2 variant emerges. To find out how life works at the finest level, we work with the best possible instruments, computers, and software algorithms. I’m endeavouring to make a modest contribution to their development. I enjoy teaching our next generation. We need good people who are inspired to discover more about the nano world, and who are trained to work with these instruments and algorithms.

Do I have any special memories of LINK? The only place where I’ve ever seen elevator pitches in an actual elevator was during the opening of LINK at Ainsl.’

Michiel Vandenbosch completed a Bachelor’s and Master’s in biomedical forensic sciences at KU Leuven (Belgium), followed by a PhD there with research into forensic toxicology.

‘My first visit to M4i was a collaboration during my PhD in 2019. They must have liked me, because in 2020 I was made an official member of M4i when I started my postdoc. After my first year, I renewed my contract for another three years, so the feeling is mutual and I really like the people here, too. I’ve been recruited to a project on Parkinson’s disease. In 5-10% of cases, Parkinson’s can be caused by mutations in DNA, including in one specific gene (GBA1). When this gene is switched off, we get a build-up of specific lipids in the brain. To make this visible, we used a brand-new advanced technique called post-ionization MALDI. This enables us to visualize and identify the distribution and accumulation of these lipids in the brain. We’ve developed and optimized a quantitative approach that is new in the imaging world. At the start of 2022, I began a project for a pharmaceutical company.

One thing that’s typical of Maastricht University and of M4i in particular is the ethos: science must be open. We can all make progress when we are able to use each other’s expertise to find a solution together.’



Limburg hospitality and vlaai

Michiel Vandenbosch: ‘I live in the town of my birth Sint-Truiden in Belgian Limburg. Like the people of Maastricht, we’re very proud of our heritage. At home, we call it the ‘Limburg feeling.’ People are just so friendly and eager to help. Everyone is welcome to drop by for a cup of a coffee and a slice of vlaai.’

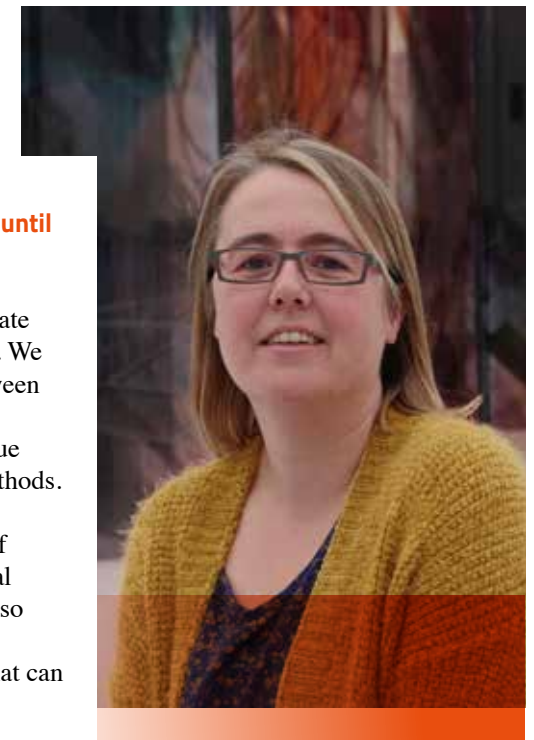


Benjamin Balluff is Assistant Professor of Imaging Bioinformatics in the Imaging Mass Spectrometry division of the Maastricht MultiModal Molecular Imaging Institute (M4i).

‘I’m originally from Germany. I’ve been in the Netherlands since 2012 and in Maastricht since 2015. My research looks mainly at analysing data produced by mass spectrometry imaging experiments. This is a technology for obtaining information about the chemical composition of tissue samples in a spatially resolved way, hence the term imaging in the name. This technology produces a huge quantity of data (up to several hundred gigabytes per experiment), which calls for special expertise in the area of data processing and analysis. Our institute is always ahead of the field in science, so we’re very competitive, pioneering even, in our specialist field. What’s typically Dutch for me is how child-friendly Dutch society is (I have two children myself). What’s typical of Maastricht is the “everything will turn out okay” attitude. Typical of M4i is, as I said, the ambition to always be at the forefront of science.’

Eva Cuypers had a job as Assistant Professor at KU Leuven Toxicology until she decided, in September 2019, to move to M4i.

‘I enjoy working at M4i because of all the different people here. Everyone is passionate about science, and daily chats over coffee often lead to new ideas and collaborations. We work as a team and that results in more far-reaching science than collaborations between independent researchers. I have developed a method for visualizing and identifying individual cells in a patient’s tissue based on their molecular fingerprint. What’s unique about my method is that it’s more objective and quicker than the current standard methods. The ability to visualize the distribution and interactions of different cells in a tissue without any labelling opens up new possibilities in understanding the development of diseases, their evolution, and possible treatments. In clinical practice, time is a critical factor. The quicker the patient can be diagnosed following a biopsy, the better. I’m also working with my team on developing new, perioperative instruments based on mass spectrometry. One interesting example is the development of a surgical instrument that can instantly tell whether the surgeon is cutting into tumour or normal tissue.’



Unique way of collaborating

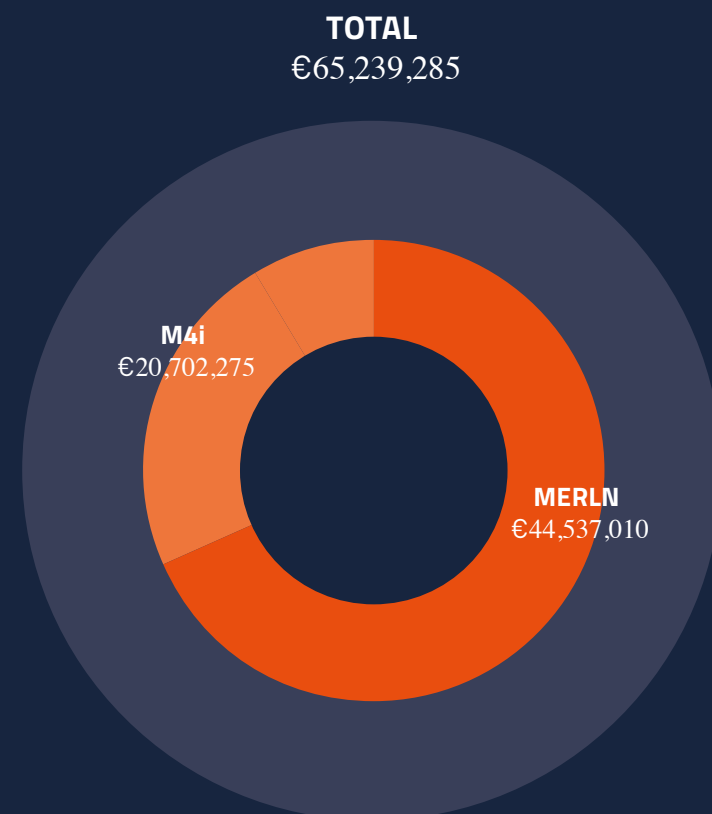
Eva Cuypers: ‘What’s pretty unique at M4i and UM/MUMC+ is the fact that everyone helps each other without a typical academic hierarchy. Most people are very open when discussing projects and coming up with new ideas and solutions together, with everybody providing input drawing on their own expertise. I had the good fortune to work for three months with Amanda Hummon, who obtained Fulbright funding for her work at M4i. We were able to do some very interesting research together. These opportunities to meet new people and collaborate with pre-eminent international researchers makes science at UM even more exciting.’

FACTS & FIGURES

(and other interesting snippets)

Raising funds

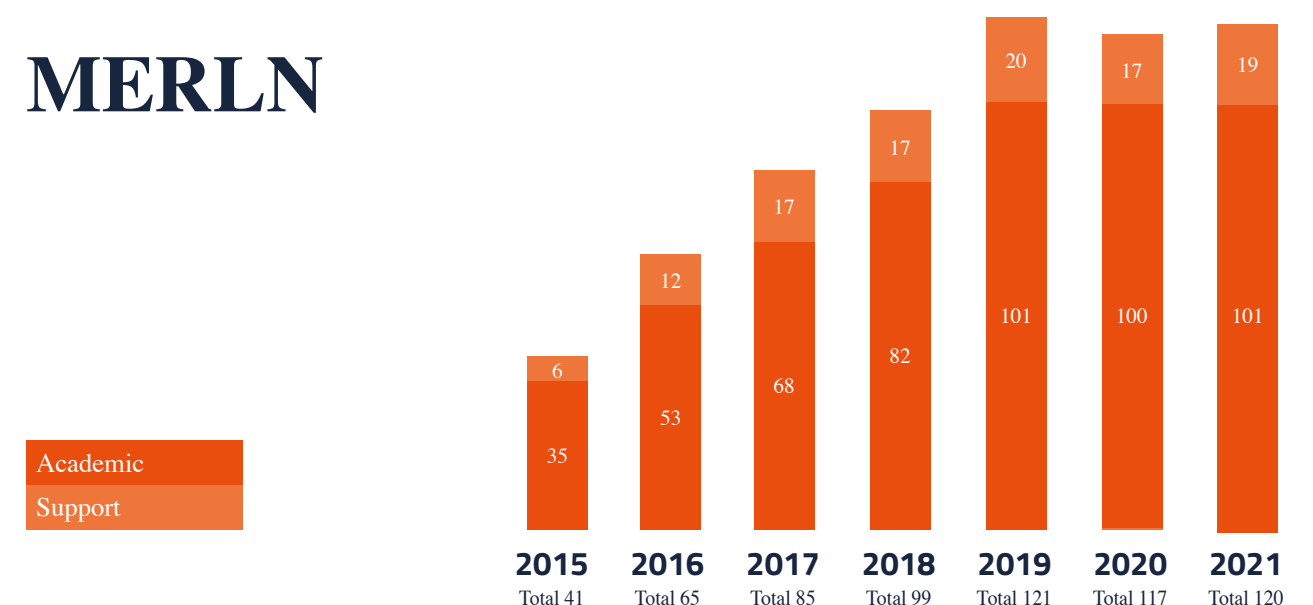
The Limburg provincial government and Maastricht University initially invested heavily in M4i and MERLN. One of the conditions was the research institutes themselves would raise a considerable amount of funding. To be specific: in 2014, a target amount of €47 million was set for both institutes combined. This was easily met.



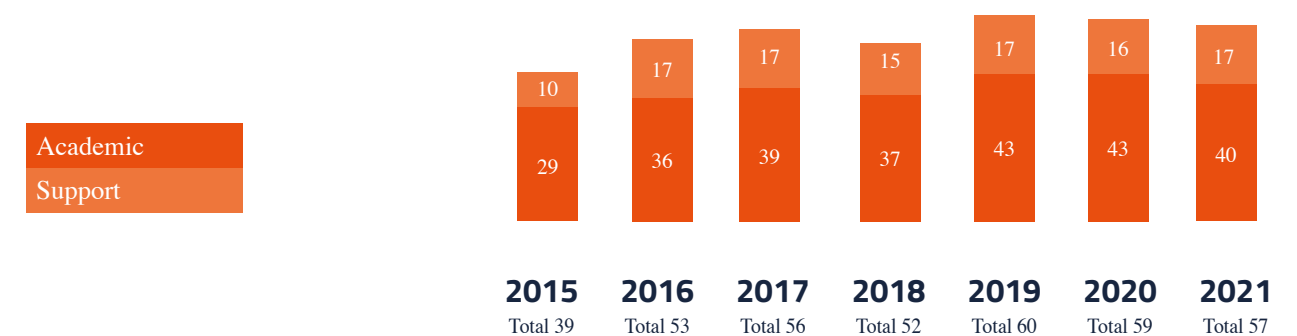
Employment

At the end of 2021, nearly 180 people were working at M4i and MERLN combined. Most of them are scientists, but there are also quite a few people in supporting roles. It is equally important to bear in mind indirect employment at the university (buildings have to be furnished and maintained, for instance) and in the region. Almost all of the 180 people who work here, live here – which is good news for estate agents, removal firms, interior furnishings companies, supermarkets, primary schools, bicycle sellers, restaurants and so on.

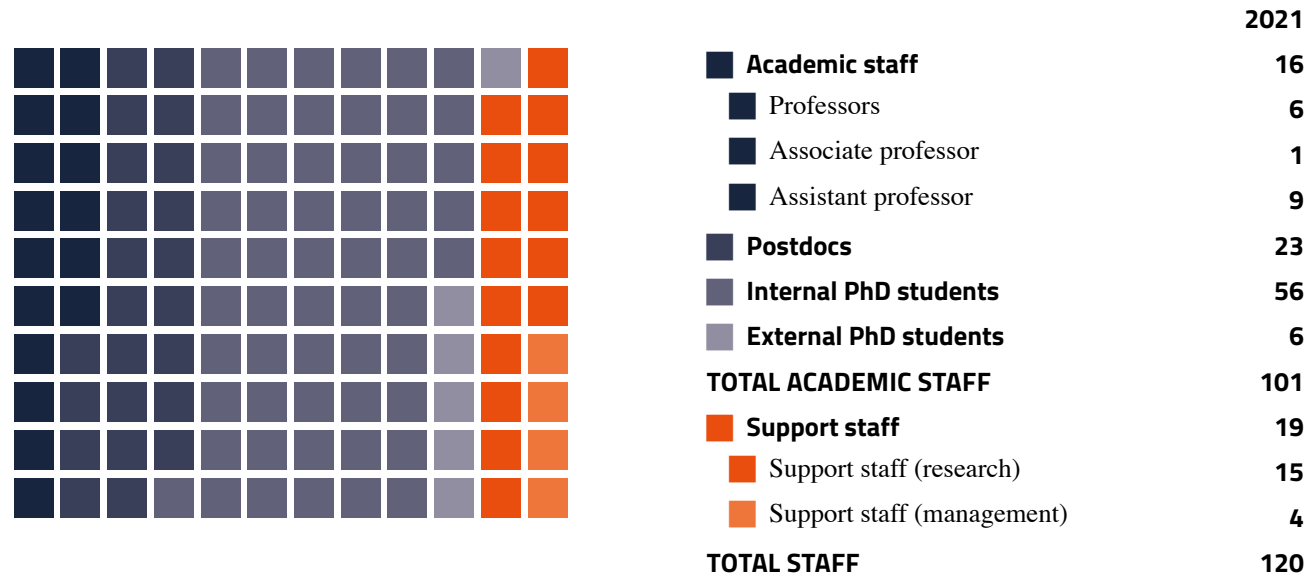
MERLN



M4i



MERLN: Distribution of posts

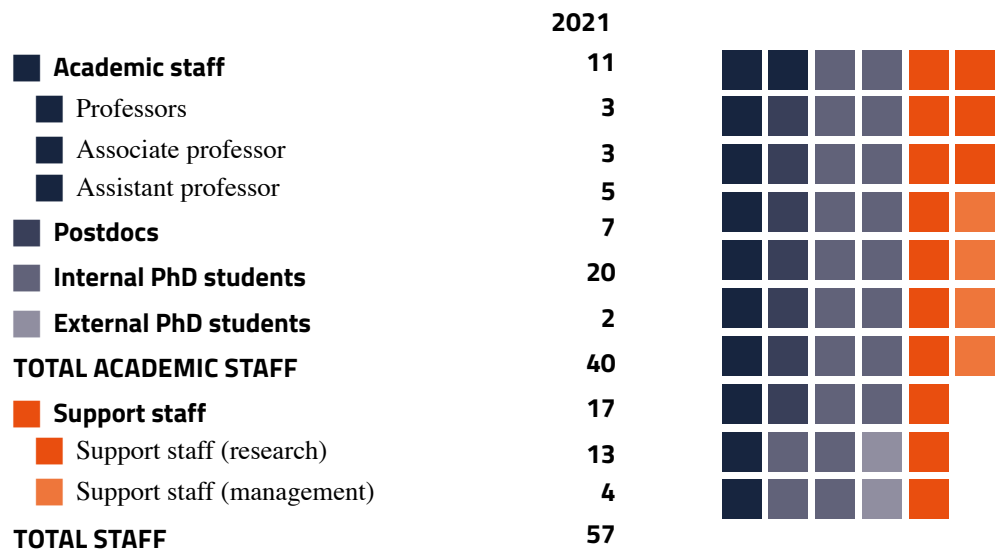


Scientific publications 2014-2021

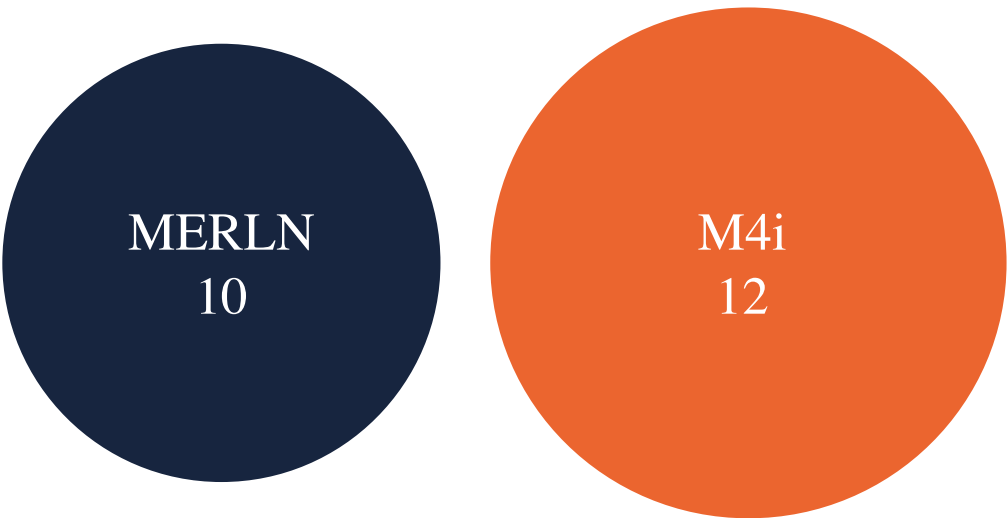
YEAR	2014	2015	2016	2017	2018	2019	2020	2021*
M4i	25	30	32	28	32	48	48	54
MERLN	31	13	60	53	43	46	84	106
TOTAL	56	43	92	81	75	94	132	160

*As at 09-12-2021

M4i: Distribution of posts



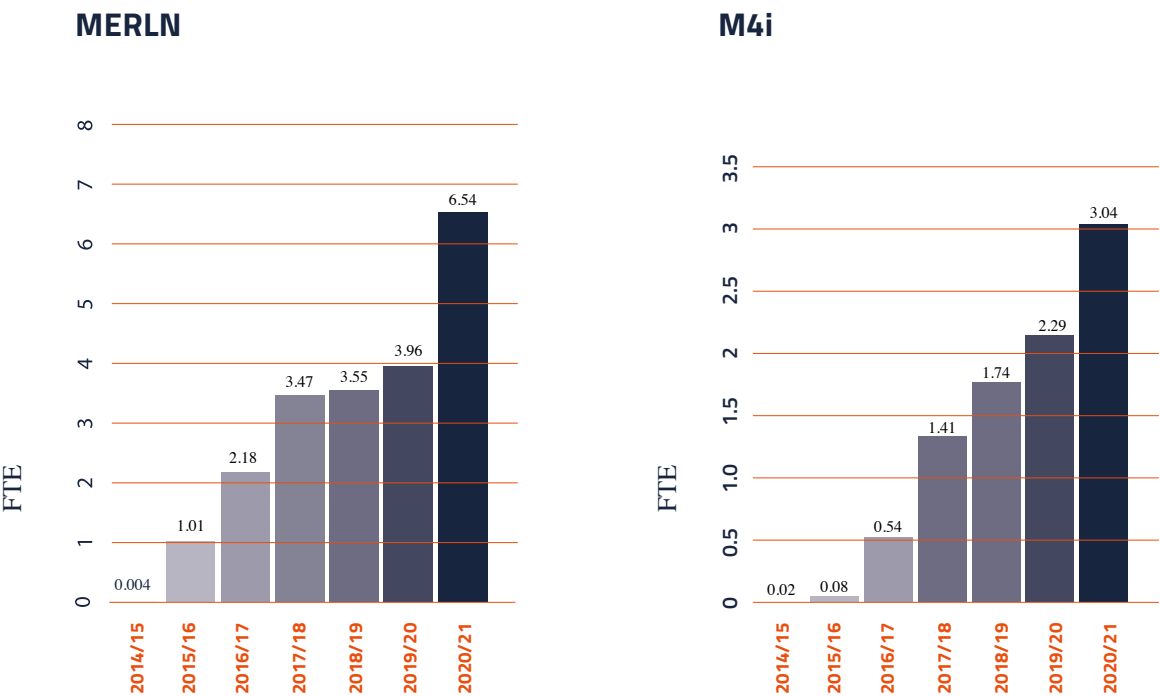
Patents applied for and granted



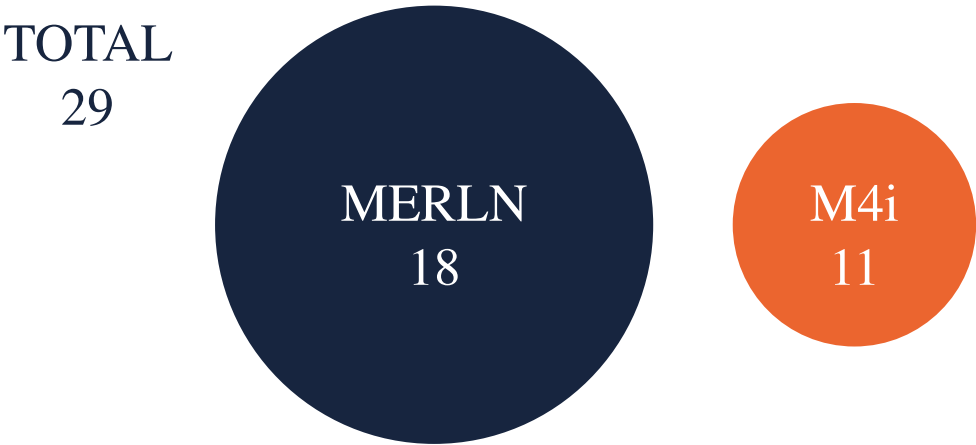
Teaching students at Maastricht University

Scientists who work at a university have another important task besides research: teaching. A tentative start was made with teaching in 2014/2015 and, since then, teaching time at Maastricht University has rapidly increased.

FTE = full-time equivalent (1 FTE = 1650 hours)



Doctoral theses up to the end of 2021



Targets and results

Seven years after LINK was launched, we take stock. Have the specific targets actually been achieved?

Target when LINK started	Result after 7 years of LINK	
Work for 120-130 employees	177 employees	😊
Obtain ten patents	22 patents applied for and granted	😊
Set up eight spin-offs providing 20-40 jobs	Four spin-offs set up with 32 jobs	😐
Cumulatively generate approx. €47 million of additional funding	Over €65 million of funds generated	😊
Raise the international stature of Brightlands Chemelot Campus and Brightlands Maastricht Health Campus	MERLN and M4i have become leading institutes that are firmly embedded in both Brightlands campuses. They regularly feature in the news, have over 700 scientific publications to their name and are on the international map	😊