VIB TIMES

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YOUR RESEARCH, OUR TECHNOLOGY

WHY VIB CORES ARE NICKNAMED ‘TECHNOLOGY CENTERS OF EXCELLENCE’

When I first visited VIB, I was deeply impressed with the wide availability of advanced technologies. Back then, I was living in the US, where I sometimes felt my work got stuck in first gear. This was often due to the lack or bad organization of core facilities available at the institution where I was employed. As a consequence, I didn’t have easy access to novel technologies.

Clearly, it was quite a contrast to the specialized equipment and services housed at VIB cores, which are fully adapted to the needs of the wider scientific community. And what’s more, VIB’s core researchers spare no effort to provide thorough advice in terms of technology and to obtain data of the highest quality.

Ever since I began counting on the support of these ‘technology centers of excellence’, I’ve been exploring various technological avenues I might otherwise not have tried to pursue. That’s why implementing interdisciplinary technologies in my research feels comfortable now. Even more, it’s driving many of our scientific breakthroughs. The Tech Watch Program also greatly contributes to this: in scouting for ground-breaking technologies and bringing them to VIB labs, centers and cores, this initiative puts VIB scientists directly up front.

In this edition of VIBnews, you will explore the broad offer of VIB cores, which reach far beyond simply providing technological support. You’ll also gain insight into their histories and discover the newest de-risked technologies they make available.

Gabriele Bergers, VIB-KU Leuven Center for Cancer Biology

YOUR RESEARCH, OUR TECHNOLOGY

SCIENCE MEETS SCIENCE

SCIENCE MEETS TECHNOLOGY

SCIENCE MEETS BUSINESS

SCIENCE MEETS PEOPLE

EVENTS

AN INTEGRATED TECHNOLOGY ECOSYSTEM THAT COMES TO FRUITION AT VIB

Geert Van Minnebruggen

VIB is active in several life science disciplines, associated in several centers. Though, rather than operating independently, the various centers, labs and cores act together in an ecosystem built upon advanced technology integration.

The impact of joining forces shouldn't be underestimated, as Geert Van Minnebruggen (Head of the Science & Technology Unit, including the Core Facility Program), Stefaan Derveaux (VIB Nucleomics Core) and Gert Van Isterdael (VIB Flow Core, Ghent) agree. The three experts resolutely put their weight behind the technology ecosystem that crosses VIB borders.

VIB has gained a reputation as a unique technology ecosystem on the European continent. How did this happen?
Geert: "The ecosystem was built in several stages. In 2000, we set up our first core to provide VIB research groups with centralized technology platforms. Since then cores were incubated in VIB campuses in Ghent, Leuven, Brussels and Antwerp, allowing automatic exchange of technological know-how between labs and these newly built cores."

Stefaan: "In 2008, the VIB Tech Watch program came into the picture. This unique program aims to scout and introduce emerging technologies that are possibly applicable for the VIB research community. On a daily base the team analyzes a dozen of promising biotech innovations."

Geert: "The Technology Innovation Lab, which Tech Watch rolled out in 2017, de-risks these emerging techniques, makes them more mature, and facilitates their smooth integration into labs and cores. In doing so, the Innovation Lab ensures that our core facilities only offer reliable technology services to the scientific community. Clearly, the Innovation Lab constitutes the missing link between Tech Watch and VIB core facilities and, as such, boosts the technology ecosystem."

Rumor has it that the impact of the VIB ecosystem is particularly visible in the field of single-cell technology. Why's that?
Gert: "Single-cell technology stands at the crossroads of several disciplines represented at VIB. This is only natural, since research in this field requires diversified expertise. This isn't ignored by the current cores. In order to offer an efficient and qualitative service in this exciting new field, multiple cores join forces to build a kind of virtual single-cell technology platform, while at the same time each core maintains its own identity. Although this is very challenging, it is worth the effort as our users are able to address a single point of contact for their single-cell project."

Stefaan: "So, in a way, this new hub marks the start of a profound collaborative effort between the VIB cores. As we expect future technologies to demand more and more expertise in multiple fields, we will spend ever more effort on bringing knowledge from our cores together in an integrated fashion. The future will tell us whether we should re-orient, integrate existing cores, or build new ones acting in such fields as single-cell technology."

Gert Van Isterdael

Stefaan Dervaux

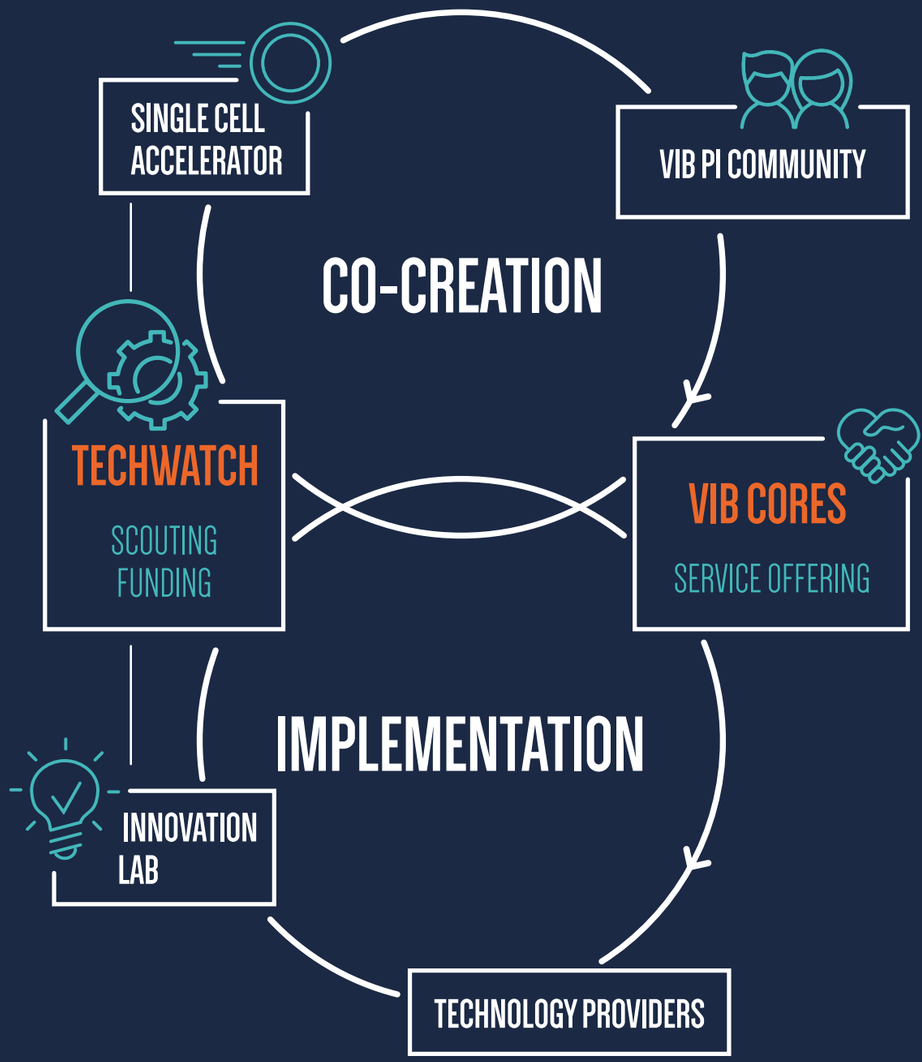
Is there any possibility for the external community to contribute to this ecosystem?
Geert: "Sure. For pharma and biotech companies, for example, it is also important to keep up with technological innovations. But they often lack time and/or expertise to discover and test them, so they connect with us for de-risking and accessing new technologies. Their strategic discussion to team up with us also makes them part of the ecosystem."

Gert: "In return, through service agreements, they partly finance the installment and maintenance of our infrastructure, which is – generally speaking – very expensive. Also, collaborations of this type make it possible for us to significantly decrease our costs per experiment."

How do you make sure that the technology ecosystem at VIB develops in the right way?
Geert: "Every five years, VIB cores are evaluated by a panel of international experts. As a matter of fact, our last assessment led to our current attempts to better integrate the different cores."

Gert: "Of course, this evaluation is an important stimulus for us. But the dynamic work environment at VIB also plays an essential role, since it allows for effective interaction and collaboration between researchers and facility heads. This, in turn, results in an enthusiastic and ambitious workforce, which makes a real difference."

THE VIB TECHNOLOGY ECOSYSTEM



BETTER TOGETHER

THE ADVANCE OF (OMICS) DATA INTEGRATION AT VIB

To remain competitive in the era of big data, VIB seeks to strengthen its position in the field of data integration. As such, the VIB BioInformatics Core Facility – one of the VIB cores – develops reproducible analysis workflows to identify correlations between various 'omics' data sets.

'Omics' is an umbrella term covering genomics, transcriptomics, proteomics and metabolomics, among others. At the initiative of Lennart Martens (VIB-UGent Center for Medical Biotechnology) and Alexander Botzki (VIB BioInformatics Core), VIB hired the first 'omics data integration specialist' at the institute: Oren Tzfadia. We asked him how this new position took shape and which services the VIB BioInformatics Core precisely offers in this field.

A MULTILAYER SPECIALTY

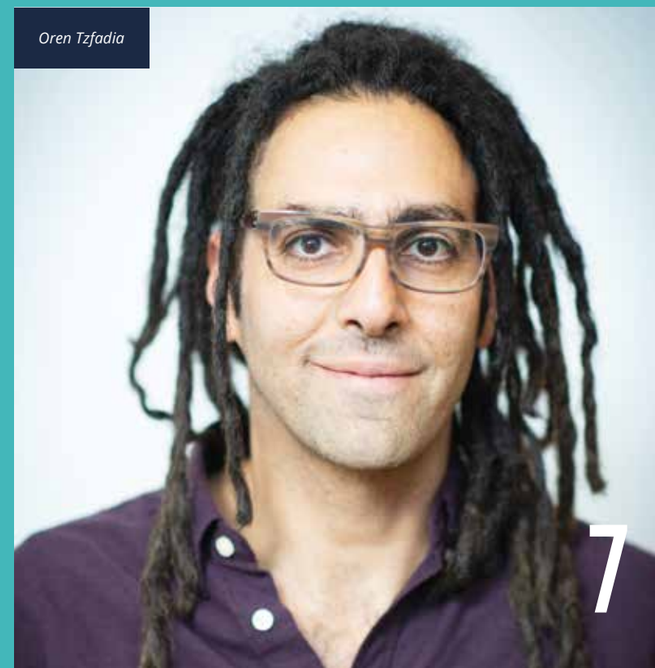
Oren's job goes beyond simply data integration. "Of course, I help VIB scientists discover and understand state-of-the-art tools to analyze omics data from different sources in their labs. With the help of Alex, I render the installations user friendly and make sure they run smoothly by wrapping tools in a Docker container," Oren explains. "However, since plenty of the data at VIB remains unused, it is also my task to expand the concept of data integration to the entire institute – that is to say, beyond the usual scope of omics. As such, I seek to integrate post translation modifications, copy number variations and single cell data."

To complete this task successfully, the VIB BioInformatics Core offers customized methodology services for data integration. Oren: "In some projects, we take the lead on data integration, while in others, we serve as a bridge between research question and methodology. We also provide consultancy on data preprocessing and experimental design." Training programs serve the same purpose. "In early November, we organized our first workshop. On day 1, 10 expert trainers from all around the world welcomed 50 to 70 participants – both VIB scientists and external researchers. 25 of them also attended the hands-on course the next day."

TOWARDS A COMPLETE DATA ECOSYSTEM

By integrating information from different research groups, the VIB BioInformatics Core boosts the VIB data ecosystem. "After meeting the heads of the Metabolomics Core and the Proteomics Core in Leuven and Ghent, for example, we set up a plan to streamline omics data flowing to various core facilities, allowing for optimized meta-information to enhance biological discoveries," Oren elaborates.

The aim for the future is to bring this ecosystem to the next level. Oren: "We will not only collaborate more closely with other core facilities to design tools that meet their specific demands, but we will also stimulate data reproducibility efforts across all research groups." To realize this plan, the VIB BioInformatics Core is developing a Nextflow pipeline to analyze various omics data in the same set, using different tools, like MOFA and WGCNA. What is more, VIB recently recruited Vid as 'data steward' – a brand-new function at the institute.



Oren Tzfadia

GOING BEYOND THE HELPDESK

THE EXTENDED OFFER OF VIB CORE FACILITIES

Whoever assumes that VIB core facilities only provide executive services is greatly mistaken. Today, their focus lies on helping biologists expand their knowledge and use state-of-the-art technologies. This kind of collaboration is the key to achieving scientific breakthroughs.

If you ask Saskia Lippens (VIB Bioimaging Core, Ghent), Sebastian Munck (VIB Bioimaging Core, Leuven), Alexander Botzki (VIB BioInformatics Core) and Gert Van Isterdael (VIB Flow Core, Ghent), the mission of the VIB core facilities is to provide technological support to the scientific community – in the broadest sense possible. We gave them the floor to elaborate on how this works in practice. .

There are more VIB core facilities today than there used to be. But in which other ways did they evolve?

Sebastian: "Let me start at the beginning: the first VIB core facilities were founded to facilitate technological approaches to scientific research. VIB was in need of readily available infrastructure and technology experts knowing exactly how to use the installations. We were eager to meet this demand."

Saskia: "Making cutting-edge technologies available to all kinds of users – ranging from beginners to experienced scientists – still constitutes our core business. But gradually, we started to approach our mission differently. Today, the offer of VIB core facilities transcends executive services: technological mentoring and coaching have become equally important."

Sebastian: "To sum up, we strongly engage in three main activities: outreach, referring to the technological services we make accessible, training – both inside and outside VIB – and collaboration."

Where do the outreach, training and collaboration goals of the core facilities intersect?

Alexander: "In the overarching bottom-up approach, I'd say. Our ultimate goal is to bring technology closer to the whole scientific community so that researchers can exploit its possibilities by themselves. To do so, for example, we organize training programs and conferences, which requires close collaboration with industrial, academic and VIB partners. All interested parties are welcome to participate."

Gert: "Clearly, the activities of the research groups and the VIB cores are complementary but mutually dependent. For example, if we present our work at an international meeting, it will always be the result of a joint effort."

How do you establish and maintain deep partnerships without losing your independence as an institute?

Sebastian: "Partnerships are mutually beneficial as long as the trains go in the same direction. However, we make sure to sit in the driver's seat and, as such, take the lead in collaborations with external parties."

Alexander: "Speaking for the VIB BioInformatics Core, we will always need partnerships to enhance our outreach initiatives. Every two years, for example, we organize a bioinformatics conference together with the VIB Conferences Team where other Belgium PI's in the field join our scientific committee."

Gert: "In fact, this holds true for all VIB core facilities. Being connected to like-minded companies and institutes helps us keep pace with rapidly developing technologies, gain visibility in the biotech field and be given worldwide recognition. Thanks to our partners, we're able to remain at the leading edge as technology experts."

What kind of employee profiles do VIB core facilities require to fulfill their ambitions?

Saskia: "In previous years, the Bioimaging Core, might, for example, advertise for a facility head with 'diversified expertise in microscopy'. But since our mission has gradually expanded to include training and consulting, communication and management skills have become indispensable. Without them, it's impossible to pass on technological knowledge."

Sebastian: "In short: we're scientific superheroes – and we haven't even reached the peak of our capacities. *(laughs)* No, seriously, if there's one thing to keep in mind about core facilities, it's this: our teams are responsible for a whole range of tasks – enabling technologies, improving outreach, providing training and building strong partnerships. And this, of course, requires a diversified workforce."

OUR SCIENTISTS ABOUT THE VIB CORES

LENNART MARTENS
VIB-UGENT CENTER FOR MEDICAL BIOTECHNOLOGY

"Thanks to the help of the VIB BioInformatics Core, by means of the Developed@VIB program, we were able to convert our stand-alone Scop3D tool into a web application with extended and improved functionality. This new Scop3D web application has already led to a joint paper (Kreft *et al.*, Journal of Proteome Research 2018) of my group and the VIB BioInformatics Core."

KAROLIEN DE BOSSCHER
VIB-UGENT CENTER FOR MEDICAL BIOTECHNOLOGY

"Thanks to the involvement of, and smooth cooperation between, two VIB cores, Viacheslav Mylka's autophagy paper was produced under the supervision of Saskia Lippens and Riet De Rycke of the VIB Bioimaging Core in Ghent, and Francis Impens of the VIB Proteomics Core."

AT THE INTERFACE OF PROTEOMICS AND METABOLOMICS

MASS SPECTROMETRY INFRASTRUCTURE CONNECTS CORE FACILITIES

Despite their differing research disciplines, the VIB Metabolomics Core and the VIB Proteomics Core often cross each other's paths. Cutting-edge mass spectrometry (MS) takes credit for this: both facilities depend on this rapidly developing technique to measure masses within a sample and, as such, to identify the different molecules it contains.

To gain more insight into how MS furthers scientific discoveries at VIB, we called on three expert technologists, each managing an 'omics' core facility: Geert Goeminne (VIB Metabolomics Core, Ghent), Bart Ghesquière (VIB Metabolomics Core, Leuven) and Francis Impens (VIB Proteomics Core, Ghent).

What makes mass spectrometry so valuable, and how is it used in metabolomics and proteomics?

Francis: "At the Proteomics Core, we use MS to measure the masses of protein fragments, called peptides, which allows us to uncover the peptide sequence and hence the protein identity."

Geert: "The principle is the same for metabolites, even though they're often a lot smaller than peptides and proteins, and more complex to identify. Besides high resolution and high mass accuracy, our most recent instrument – the Vion-IMS-QTOF – enables us to separate isomeric, isobaric or coeluting compounds on the basis of their shape, size and charge. This technique, called 'ion-mobility mass spectrometry', allows for more accurate and more informative data acquisition, which is essential for metabolite identification."

How does MS enable your overarching research goals?

Francis: "We apply MS to biological samples, such as total lysates of tumor cells, rather than to single molecules. The goal is to identify and quantify as many molecules as possible in a single analysis. Once we've mapped out the entire protein image, we can detect the alterations a certain disease involves. In doing so, we work towards a full clinical image to better understand disease mechanisms, to find novel biomarkers for diagnosis or to develop more effective medicines."

Bart: "The Metabolomics Core dives into understanding the organization of nutrient and waste structures. Using MS, we examine the biochemical paths and identify the purposes which specific pathways are activated for. In this way, we gain insight into the biological functions of proteins and genes."

Geert: "Comparative metabolic profiling through MS also constitutes a powerful technique to profile thousands of molecules in a single sample and to detect metabolic changes in, for example, ill versus healthy or treated versus non-treated organisms. By identifying the metabolites that have significantly changed, the researcher understands the metabolic regulation and pathways of specific organisms."

MS clearly reveals new opportunities for further research. Does VIB benefit from this?

Bart: "Yes, definitely. Across VIB core facilities alone, we're exchanging complementary research results and know-how. Our residues, for example, consist of proteins, which enables us to 'play the proteomics card' on the same samples and requires a close collaboration with the Proteomics Core."

Francis: "Of course, all core facilities are complementary, even though – historically – they cover separate scientific fields. They are the foundation of the research ecosystem at VIB. Since we get plenty of opportunities to team up, we conduct analyses for all VIB centers."

To what extent are you collaborating with units outside VIB?

Geert: "Generally speaking, we get plenty of requests from academic and industrial players that want to cooperate with us. In most cases, we introduce them to, and advise them on, the potential added value of MS-based metabolomics for their research projects. Starting from the experiment set-up and sample analysis, we guide them all the way through the generated dataset and provide a comprehensive summary on the statistically processed data."

Francis: "Since MS is still in its early stages, we're mostly offering full-service analysis. Once the technology is more mature and user friendly, we will probably gravitate more towards user access services, empowering scientists to do their research all by themselves."

Despite its newness, MS is a rapidly developing analysis method. How do you manage to finance innovations?

Francis: "If we want to keep up with the latest developments, we need to install new infrastructure every four to five years. Since advanced technologies like MS are expensive, this is only possible as part of an institute that has a funding program. In this regard, VIB holds a unique position in both Belgium and Flanders. Investing in new technologies is part of the vision of our core facility heads."

A close-up of the 2-position 6-port switch valve of the Thermo Scientific mass spectrometers

Bart: "We also partly depend on external funding. Resources from private foundations and European infrastructure grants recently allowed us to install the latest generation Orbitrap Fusion Lumos mass spectrometers in both the Metabolomics and Proteomics Core. Also, biotech companies notice that we're building a valuable ecosystem for MS, which intrigues them and gives them an incentive to invest. In turn, we support both local and international biotech players. By installing their MS infrastructure in our core facilities, for example, we hope to create win-win situations."

OUR CORE FACILITIES

BIOINFORMATICS CORE

Front row: Oren Tzfadia, Frank Vernaillen, Christof De Bo, Łukasz Kreft
Back row: Guy Bottu, Jannick Mathys, Alexander Botzki (Head of Core), Paula Martinez

NUCLEOMICS CORE

Front row: Wouter Van Delm, Jolien Vandewinkel, Ruth Maes, Stefaan Derveaux (Head of Core)
Back row: Kizi Coeck, Rekin's Janky, Stéphane Plaisance, Guy Bottu
Not in picture: Caroline Van Damme & Lim De Swert

NMR CORE

Alex Volkov (Head of Core)

FLOW CORE GHENT-LEUVEN

Pradeep Kumar, Pier Andrée Penttila (Head of Core Leuven), Gert Van Isterdael (Head of Core Ghent), Julie Van Duyse
Not in picture: Kerri Heritage

PROTEIN CORE

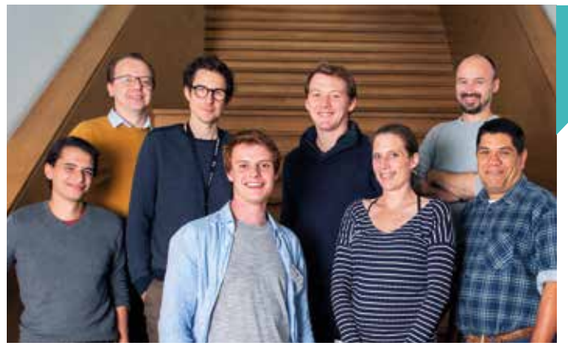
Sander De Batselier, Chantal Eichperger, Kevin Balcaen, Jannick Leoen
Not in picture: Jurgen Haustraete (Head of Core)

BIOIMAGING CORE GHENT-LEUVEN

Front row: Natalia Gunko (Head of Core), Sergio Gabarre, Riet De Rycke, Eef Parthoens, Sebastian Munck (Head of Core Leuven), Saskia Lippens (Head of Core Ghent)
Middle row: Peter Borghgraef, Amanda Gonçalves, Michiel De Bruyne, Evelien Van Hamme, Frank Vernaillen
Back row: Femke Baeke, Axelle Kerstens, Nikky Corthout, Katlijn Vints, Pieter Baatsen

NANOBODY CORE

Front row: Jelle Elseviers, Gholamreza Hassanzadeh Ghassabeh (Head of Core), Jan Van Gompel
Back row: Rolando Paciello, Kristien De Ruyck, Steve Schoonooghe



METABOLOMICS CORE GHENT-LEUVEN

Front row: Mehdi Rifaad, Steven Vandersyppe, Kristien Tirez, Abel Acosta Sanchez
Back row: Wesley Vermaelen, Dries Verdegem, Bart Ghesquière (Head of Core Leuven), Geert Goeminne (Head of Core Ghent)

SCREENING CORE

Le Son Long Nguyen, Dominique Audenaert (Head of Core), Vera Goossens
Not in picture: Andrzej Drozdzecki

PROTEOMICS CORE

Delphi Van Haver, Teresa Maia, Francis Impens (Head of Core), Sara Dufour, Evy Timmerman, Katie Boucher
Not in picture: An Staes, Jarne Pauwels and Hans Demol

HIGH-THROUGHPUT SCREENING UNDERPINS DRUG DISCOVERY

Whether they conduct yeast, plant or animal research, scientists are likely to be confronted with test systems that are too complex for screening. The VIB Screening Core remedies this situation by optimizing and miniaturizing assays.

As head of the VIB Screening Core in Ghent, Dominique Audenaert knows the ins and outs of high-throughput screening and its added value to scientific discoveries. Supported by a team of operational experts, he makes sure that life science researchers – both within and outside VIB – get direct access to automated imaging and screening technologies. In doing so, the core facility paves the way to scientific research and drug discovery.

GETTING THE BIG (CELLULAR) PICTURE

"Whereas the VIB Bioimaging Core conducts single-cell and subcellular analyses in high-resolution mode, we enable single-cell and subcellular imaging in high-throughput mode by using automated microscopy. This allows us to analyze the effect of a large number of molecules – up to 50,000 – in a fast, robust and standardized way," explains Dominique.

"Our work is challenging in the sense that each assay model system is different, involving a range of samples from yeast and plant cells to mammalian cells and 3D cultures. Also, there are plenty of assay read-out technologies, including plate reader-based and high-content imaging technologies. As such, assay optimization and miniaturization require specific intellectual and technical input from our side."

Put in concrete terms, the VIB Screening Core team enhances the technical reproducibility and robustness of an assay and makes it compatible with high-throughput screening for subsequent hit identification through statistical and cheminformatic analysis.

CREATING A HIT LIST

After hit identification, the screening specialists deliver the hit compounds to the research groups, which further develop them for their applications. In doing so, the VIB Screening Core accelerates the discovery of biological processes and delivers starting points for the development of novel products for medical or agricultural applications.

"The VIB Innnovations & Business team as well as VIB Discovery Sciences translate these hits into potential drugs. But we also offer services to external users in both the industrial and academic worlds." Examples from the latter group are Ghent University and the Ghent Cancer Research Institute (CRIG). Clearly, the VIB Screening Core provides a centralized platform to support assay development and screening for the broad life sciences community.

OUR SCIENTISTS ABOUT THE VIB CORES

SARAH-MARIA FENDT
VIB-KU LEUVEN CENTER FOR CANCER BIOLOGY

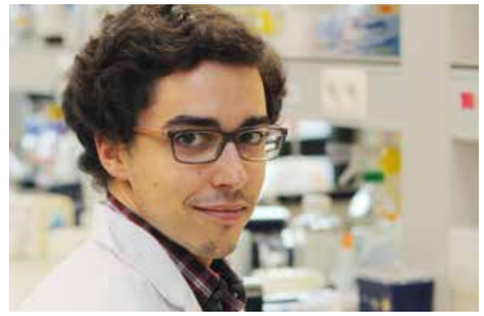
"VIB/CCB Core Facilities are a great resource for biomedical research. Collaborating with them is always a great pleasure and success."

XAVIER SAELENS
VIB-UGENT CENTER FOR MEDICAL BIOTECHNOLOGY

"Thanks to the Nanobody Core Facility, we discovered a new way to strike at the Achilles heel of RSV."

IVE DE SMET
VIB-UGENT CENTER FOR PLANT SYSTEMS BIOLOGY

"Major breakthroughs in the Functional Phosphoproteomics research group and many other groups within the VIB-UGent Center for Plant Systems Biology were made possible through the mass spectrometry-driven proteome analyses the VIB Proteomics Core offers. In the past year, this has resulted in many publications for our center (3 in particular for my group), and we will continue to heavily rely on (phospho) proteome analyses for our future research."



JORGE VALADAS
VIB-KU LEUVEN CENTER FOR BRAIN & DISEASE RESEARCH

"The combination of imaging, behavioral, genetic and biochemical techniques, together with the use of unique disease models allowed us to describe the cellular and molecular defects that lead to sleep dysfunction. This paper was a result of many productive collaborations, including with the VIB Bioimaging Core."

Yvan Saeys

ARTIFICIAL INTELLIGENCE EMPOWERS CORE FACILITIES TO STAY AHEAD

A common theme across all VIB core facilities is the generation of potentially huge datasets that require powerful analysis tools to make sense of the data being generated. As many core facilities explore state-of-the-art technologies, plenty of research is still needed to develop and benchmark data analysis tools that translate this data into new biological knowledge.

AUTOMATING DATA ANALYSIS WITH AI

Traditionally, research labs interact with core facilities to accomplish a task through direct service, consultancy or training. These are complementary types of interaction, where researchers leverage the power of artificial intelligence (AI) to empower core facilities with novel tools to better exploit the data they generate. Over the last 5 years, the Yvan Saeys Lab has pushed the boundaries of what AI techniques can do to automate data interpretation, opening up many new avenues for core facility staff as well as researchers by allowing them to gain new biological insights.

BENEFITING VIB AND ITS WIDER ECOSYSTEM

Together with the VIB Flow Core, the lab has been advancing the novel domain of computational flow cytometry [1]. This now facilitates high-dimensional multi-color flow cytometry analysis. The novel tools developed have been picked up by many labs, both locally within the VIB-UGent Center for Inflammation Research, and internationally. At IRC, this fruitful collaboration has led to many high-impact papers and increased industrial income for the department.

Similarly, together with the VIB Bioimaging Core (BIC), the Saeys lab has been pioneering the bio-image informatics field, empowering BIC with novel techniques for quality control, denoising, automated segmentation, and a new human-in-the-loop Fiji plugin for automated image interpretation. These tools not only shorten image processing and analysis times from weeks to days, but they also avoid biased interpretation and aim to provide robust analysis [2].

A MEANS TO EVER MORE IMPACTFUL BIOLOGICAL INSIGHTS

VIB is convinced that the interaction between research labs and core facilities regarding data analysis and novel tool development has yet to reach its full potential. As a result, it should be regarded as an avenue for further investment that will be necessary to guarantee VIB's position at the forefront of technology development. After all, a technology is only as useful as the tools that exist to interpret the data being generated.

[1] Saeys *et al.*, Nature Reviews Immunology 2016
[2] Roels *et al.*, ACIVS 2016

DID YOU KNOW...

A paper by the Yvan Saeys group was one of 2018's ten most downloaded papers on bioRxiv. The study, 'A comparison of single-cell trajectory inference methods: towards more accurate and robust tools', is the first to benchmark several single-cell trajectory methods and has been accepted by Nature Biotechnology.

The scientists neatly illustrate the capabilities of ALMOST by imaging not only biological samples but also Lego figurines.

OUR MICROSCOPY EXPERTS PUSH THE BOUNDARIES OF 3D MICROSCOPY

Two newly developed methods will help researchers to study the 3D structure of complex surfaces and individual neurons better than ever before. Sebastian Munck and Natalia Gunko report new imaging protocols that will advance neuroscience and (bio)imaging in general.

FROM LEGO TO FLIES: "ALMOST" ALLOWS UNPRECEDENTED 3D SURFACE IMAGING

Recent developments in 3D microscopy have revolutionized biomedical research by enabling the imaging of whole model organisms as well as cleared mouse embryos and organs. In many cases, however, this requires making a sample transparent using chemical 'clearing' methods that are time intensive and can't be applied to every type of sample. That is why Sebastian Munck and his team developed "ALMOST": A Label-free Multicolor Optical Surface Tomography method. It provides a 3D surface reconstruction of non-transparent samples, including information on their color and reflective properties.

Munck believes that many research fields will benefit from this straightforward way of documenting and quantifying 3D surfaces, as ALMOST can be applied to both biological and non-biological samples: "The ability to record the surface of a medium-sized object in 3D opens perspectives for digital repositories of zoological and botanical collections and enables a link to 3D printing of these objects. From pigment analysis to virtual reality, or even art, the possibilities are endless."

Kerstens *et al.*, BMC Biology 2019

FROM SILVER TO GOLD: OPTIMIZING A CENTURY-OLD METHOD TO STUDY NEURONS IN MORE DETAIL

In the late 19th century, Camillo Golgi developed a method to stain the long protrusions of individual brain cells in what he called 'the black reaction'. Now referred to as the Golgi method, the protocol has been refined over the years and proved instrumental for many groundbreaking advances in neurobiology. Nevertheless, it also has an important drawback. After performing the protocol, no additional electron microscopy studies can be done on the stained neurons. This is because the black reaction results in the formation of large, electron-dense silver deposits that mask ultrastructural details from further enquiry.

To solve this problem, Gunko and her team adapted the Golgi method for electron microscopy by replacing silver salts with gold salts, resulting in far smaller particles that are often deposited at the periphery of neurons. "It's the first successful use of a Golgi-based staining technique for tracing neurons over their entire length, preserving the ultrastructural details," says Gunko, who immediately applied the technique to study neuronal ultrastructure in an Alzheimer's disease model.

Vints *et al.*, Scientific Reports 2019

REPORTER ON THE ROAD: THE ART OF SHARING SCIENCE

Some Americans shiver when they hear the word 'socialism'. The Cold War era has left a lasting mark on this country's view of economics. But don't worry, I won't be talking about the health care system, the lack of paid parental leave, the tiny number of holidays, or any other issue that blows my European mind. No, I will be talking about how this fear of sharing also seems to have infiltrated academia in the US, and as a case study, I will be discussing core facilities.

When it comes to cores, you are spoiled at VIB. During my VIB years, I had the chance to interact with excellent staff at several of the cores and expertise centers. These people helped take my research to new heights and gave me access to technological know-how that would have been otherwise impossible.

FROM DREAMS TO UNEXPECTED SETBACKS

Moving to Stanford, I expected nothing less. I came here dreaming of the amazing expertise and technology that would be available. It may come as a surprise, but I must say that, regarding cores, it was a very sobering experience. Being familiar with the cores in Ghent and Leuven, the facilities available to me at Stanford indeed often felt a bit outdated. While the staff was friendly and helpful, nothing out of the ordinary seemed possible. Even more, the state-of-the-art equipment that I had always seen at VIB was absent here.

If anything, I expected the US to be a step forward, or at least a status quo environment – not a step back. While there are many top mass spec and microscopy researchers in the US, this expertise often does not trickle down to the universities' core facilities.

WHEN RESOURCES ARE SHARED, EVERYBODY BENEFITS

The core facility model democratizes access to cutting-edge research, and keeping them up to date requires money – lots of it. In essence, this is an idea that parallels our European social welfare system. Just as tax money is used to fund healthcare for all, in this case, grants may be smaller in number or lower in amount. However, that residual money is being used to allow everyone at the institute to access a core facility at deeply discounted pricing. While this does not really help wealthy labs that would be able to afford the equipment themselves, the 'middle-class' labs strongly benefit from this system.

> "I think that when researchers from top US institutions start looking into collaborations with our VIB cores, this tells you exactly how lucky we all are in having access to these amazing centers of technology."

I don't have access to official numbers on differences in funding between American and European institutes, but after talking to core facility personnel, users and colleagues, I can only confirm the stark difference in luxury between VIB and my current institute. Whether this difference truly stems from a discrepancy in the funding of cores between the two continents is something to investigate, but the observation that one of the richest universities in the US (top 5) has outdated cores compared to a research institute in one of Europe's smaller countries begs a sensible explanation.

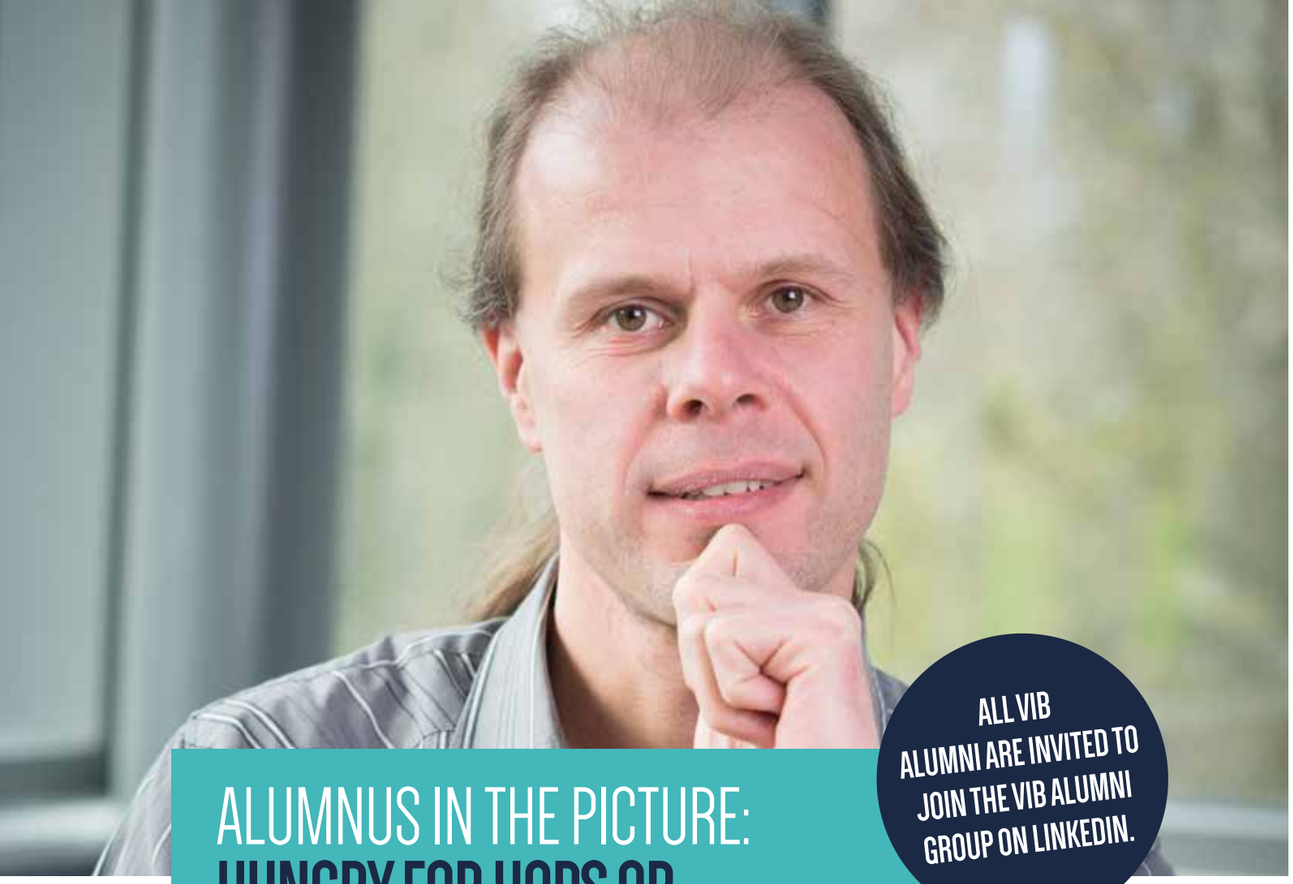
OUTSOURCING ANALYSIS FROM THE US TO BELGIUM

Over the past year, I have been presenting mass spec and electron microscopy data to my lab and numerous collaborators. Each time I do so, people are surprised by the quality of these data, and they immediately ask where I had these experiments analyzed. Unfailingly, they are amazed to discover that my answer is, "An amazing core facility at my previous institute", and I often have to explain that, "Yes, I am sending all my samples on dry ice across the Atlantic for analysis."

On one of my recent trips to Belgium, I heard a VIB core recently received an e-mail from someone at Stanford who was interested in sending samples over for analysis.

Steven Boeynaems is a VIB alumnus who worked at the Kevin Verstrepen Lab (VIB-KU Leuven Center for Microbiology) and the Ludo Van Den Bosch Lab (VIB-KU Leuven Center for Brain & Disease Research). Recently he traded Belgium for the Californian sun. At Stanford University he keeps pursuing his passion for science and science communication.

@steven.boeynaems | @BoeynaemsSteven



ALL VIB ALUMNI ARE INVITED TO JOIN THE VIB ALUMNI GROUP ON LINKEDIN.

ALUMNUS IN THE PICTURE: HUNGRY FOR HOPS OR TECHNOLOGY INTELLIGENCE? MARK VEUGELERS IS YOUR MAN.

Senior Science Policy Manager Mark Veugelers left VIB in August 2017 to follow his two passions: beer and life science technologies. With Enigma Life Sciences Mark provides key technology intelligence and strategic advice to customers worldwide. At the same time, he runs Enigma Belgian Brewery,a professional brewery with eight beers on the market: from the blond thirst quencher Ragnaröck to the 10% strong Hades Imperial Stout.

Your scientific career started at the same time when VIB was founded. What did VIB mean for you during those early days?
"I did my PhD in Guido David's lab at the Center for Human Genetics of KU Leuven, one of the nine original VIB departments, during the '90s. We quickly realized that VIB would give a boost to Flanders' research in biotechnology and biochemistry. But VIB also brought surprises: suddenly there was an interest in commercial applications of our science, which fostered a new mindset."

"I only fully realized the impact of the science at our Department, and at VIB, during my postdoc at Cornell University Medical College in New York. That was between 2000 and 2004. While my own high impact scientific work was done at Cornell - immersed in top science abroad - I started to appreciate the level of high-quality research performed at the VIB labs. At the same time, I was exposed to a whole range of other environments, from investment banking to entrepreneurship and many other exciting new opportunities offered in the Big Apple."

Those experiences have influenced your choice to start working at VIB's headquarters?
"After my New York experience, I started looking at options to build my own group, but discovered an interesting open position at VIB Headquarters. It turned out to be a fantastic opportunity to work together with Jo Bury and Rudy Dekeyser to implement novel strategies to bring the organization to the next level. One of the immediate tasks was to set up core facilities to support the whole VIB research community. While Cornell had multiple core facilities, in Belgium the concept of centralized technology expertise service centers was still new at the time."

You were also involved in the set up of the Tech Watch Team.
"Given that there are tens of thousands of companies developing new life science technologies, it is difficult, costly and time-consuming for individual research groups to find, test and keep up with all the top-notch technologies that could be beneficial to them. During my work at VIB, I also did an MBA at the Vlerick Management School. In the context of this MBA, we developed technology intelligence processes to identify external technologies of interest to VIB. My MBA work evolved into VIB's Tech Watch initiative that finally resulted in the current Tech Watch Team, now led by Halina Novak."

"The idea of Tech Watch is to continually analyze the potential of emerging and potentially disruptive technologies that VIB scientists might need in the future. By scouting these technologies way before they come on the market, we were able to bring them at a very early stage to VIB scientists through licensing deals or special partnerships with developers and suppliers. We've had many success stories where access to the technologies identified through our scouting led to papers in Nature, Cell and other top journals. Of course, such success is only possible when top scientists at VIB recognize the value that such technologies can bring to solving their research questions."

Which Enigma is Enigma Life Sciences trying to solve?
"Being exposed to so many technologies and companies, I reasoned that many life science companies as well as investors could benefit from actionable technology intelligence. Enigma Life Sciences was founded to assists those companies with technology scouting tools and processes to enable market and competitor analysis, as well as identification of technological opportunities in their field of interest."

"But we offer much more than technology scouting. Our Enigma-developed tools can also assist our clients in putting a value on technologies, on the underlying IP, or in the case of possible acquisition, the value of the company owning the technology. Of course, my network and expertise built up in many technological fields from my 13 years at VIB are invaluable in this light."

"In summary, Enigma Life Sciences' aim is to help organizations to implement effective technology strategies to grow their business. There are many enigmas in the world as we have worked with clients from many countries."

You seem to be highly ambitious, because instead of one company, you started two companies. There is also Enigma Belgian Brewery.
"Enigma Belgian Brewery is one of the fastest growing breweries from all those founded in the last few years in Belgium. During my VIB time, I was already a hobby brewer and developed hundreds of beers. One of those beers, Tamera Tripel, got top scores in a competition. At some point I decided to scale up and test the market by commercializing some of my best beer recipes. The reactions were beyond expectations. We also apply many of the scouting tools we use in Enigma Life Sciences to discover novel market opportunities for our beers and this works really well. We have eight beers on the market offered by hundreds of bars all over Belgium. We export to Denmark, the Netherlands, Poland and other countries. And the company has expanded with the help of a couple of people supporting the brewery's growth in Belgium and internationally."

"It is a challenge to find the balance between running the two companies but I am determined to make both a success. Cheers to that!"

CROSSING BORDERS TO EMPOWER TOP TECH

HOW THE NANOBODY EXPERTISE OF JAN STEYAERT'S LAB CONTRIBUTES TO NEW DISCOVERIES

Christel Minet (Confo Therapeutics), Richard Henderson (MRC), Jan Steyaert and Cedric Ververken in front of the Cryo EM

2018 was a year full of highlights for Jan Steyaert (VIB-VUB Center for Structural Biology) and his research team, with two papers published in Cell and four in Nature. The trend continues in 2019, with two Nature publications, one Cell paper and a key technology licensing agreement already in the books.

The main focus of Jan's lab – single-domain antibodies, known as Nanobodies® – has proven indispensable to the scientific and commercial goals of a range of different partners in Belgium and abroad. These high-impact research avenues highlight the fact that excellent science isn't done in a vacuum: collaborations with other institutes and industry players are essential to VIB's impact on the world.

NANOBODIES GET AN UPGRADE

Nanobodies, which were discovered over two decades ago by VUB scientists, can be used to study the molecular shapes of proteins, which contributes to detailed insights into disease markers and more effective therapies. The success of these tiny antibody fragments has given rise to multiple Belgian VIB spin-offs in the last few years, including AgroSavfe, Ablynx and Confo Therapeutics.

Thanks to Jan and his team, Nanobodies recently underwent a major makeover that responds to new technological needs with commercial applications. While their small size is often an advantage, other applications – such as cryo-electron microscopy, or cryoEM – require scaled-up versions of the antibodies. CryoEM generates high-resolution 'images' of the structures of biomolecules, which is especially useful in the study of drug interactions.

"Small proteins don't provide enough contrast in cryoEM images," Jan elaborates. "Larger, less flexible Nanobody configurations are needed to be able to see protein structures with precision." Responding to this need, Jan's team developed 'scaffolds' that keep the fused Nanobodies rigidly in place – called Megabodies, and published three papers on their results.

VIB-VUB spinoff Confo Therapeutics immediately recognized the value of these Megabodies, entering into an exclusive global licensing agreement with VIB. "Megabody technology will give us an outstanding toolbox for drug discovery," asserts Cedric Ververken, CEO of Confo Therapeutics.

THE ATOMIC WORKINGS OF MITOCHONDRIA

As the famous quote by biologist Philip Siekevitz goes: "The mitochondrion is the powerhouse of the cell." Because mitochondria are so crucial to our existence on a molecular level, any disfunctions in the mechanisms that drive them are linked with many diseases. As a result, these tiny cellular structures are the subject of intense scientific scrutiny. The best tools to study them? Nanobodies. In collaboration with the Nanobody ninjas of the Jan Steyaert lab, and with the assistance of Diamond Light Source (Harwell, UK) and the European Synchrotron Radiation Facility (Grenoble, France), scientists from the MRC-MBU in Cambridge, UK used nanobodies to shed light on the proteins that shuttle compounds in and out of mitochondria.

The researchers zoomed in on a protein responsible for carrying about 50kg of ADP and ATP (substances needed to fuel cells) per day through a membrane that surrounds the mitochondria so that it can be consumed. Nanobodies and X-ray crystallography were used to determine the molecular structure of this carrier protein, revealing how it is able to change its shape to transport ADP and ATP without allowing other small molecules to leak through the mitochondrial membrane.

"These results are especially groundbreaking because it's likely that other carrier proteins work in a similar way," Jan asserts. "For the first time, we have seen how genetic mutations affecting these proteins cause a range of neuromuscular, metabolic and developmental diseases. This leads to new opportunities in the search for effective treatments."

These are just a few recent examples of how cutting-edge VIB expertise and discoveries both fuel and are fueled by collaborations between institutions, industry players and universities. The cross-border transfer of knowledge – and the specific resources needed to translate discoveries into society-changing products – is ever more essential to VIB's future and the future of the global life sciences ecosystem as a whole.

Laverty *et al.*, Nature 2019
Masiulis *et al.*, Nature 2019
Uchanski *et al.*, bioRxiv 2019
Ruprecht *et al.*, Cell 2019

A HOST OF IMMUNOLOGICAL INSIGHTS IN JUST 3 MONTHS

DIRK ELEWAUT'S TEAM PUTS THE PEDAL TO THE METAL FOR MULTIPLE NATURE COMMUNICATIONS PUBLICATIONS


Dirk Elewaut


Isabelle Cambré


Koen Venken


Srinath Govindarajan

Scientists in the lab of Dirk Elewaut (VIB-UGent Center for Inflammation Research) are no strangers to challenging schedules. Achieving three separate publications in Nature Communications between November 2018 and January 2019, Dirk's team was hard at work during the holiday season, bringing the latest immunity discoveries to the wider scientific world.

The last handful of months have seen new studies emerge from the Dirk Elewaut lab that address key questions in immunology related to chronic joint inflammation, immune-regulating stress responses and the role of rare immune cells in spondyloarthritis.

ARTHRITIS DOESN'T AFFECT ALL JOINTS

Rheumatoid arthritis and spondyloarthritis are painful and disabling conditions that cause inflammation in joints and other tissues, with each condition affecting 1% of the population. A key historical sticking point in the study of arthritis, why particular joints are more affected than others, has finally been answered by Isabelle Cambré and Dirk Elewaut.

"The reason why certain joints are more susceptible to arthritis is mainly a biomechanical one," Isabelle explains. "We studied bone erosions caused by inflammation to identify musculoskeletal 'hot spots' that are more prone to the debilitating effects of the disease."

However, other factors are also at play in the so-called 'patchy' distribution of arthritic joint inflammation. "Mechanical stress releases inflammatory mediators, such as chemokines, which bring white blood cells into the area and cause the tissue damage," continues Isabelle. "Now that we have unveiled these insights, we are in the process of studying the underlying molecular pathways of the process – it's a unique area of research that combines inflammation and mechanobiology."

INVOLVEMENT OF KILLER T CELLS IN DIFFERENT DISEASES

The *Nature Communications* study led by Srinath Govindarajan from Dirk's lab, zeroed in on the remarkable ability of immune cells – natural killer T cells – to protect the body against diseases, cancer, infections and more.

"Natural killer T cells are such efficient fighters because they can generate huge amounts of cytokines, which allow different types of immune cells to communicate with each other," Srinath asserts. "Our study shed more light on how natural killer T cells make these molecules."

"Our team found that a specific stress-related response controls the function of these cells – and not other types of immune cells," Dirk elaborates. "It's a very specific mechanism. We believe that modulating this stress response could lead to new therapies for immune diseases driven by natural killer T cells."

A DIFFERENCE IN TREATMENT OF CHRONIC RHEUMATIC DISORDERS

When it comes to treating spondyloarthritis, a therapy called IL-17 cytokine blockade has greatly improved the lives of these patients. Rheumatoid arthritis, another type of chronic arthritis, failed to respond when treated with the same therapy.

"There is a difference between the clinical presentations of spondyloarthritis and rheumatoid arthritis, and also in their responses to treatment," says lead researcher Koen Venken. "But these observations have never been explained. We discovered that there are phenotypical differences between rare immune cells – known as unconventional Tcells – in SpA and RA patients, changing the way they mediate inflammation."

"Our results demonstrate that these specialized immune cells play major roles in inflammatory diseases – and also that human immune cells are even more biologically diverse (i.e. at the transcriptome level) than we realized," Dirk sums up. "The transcriptional details that we uncovered may reveal effective new treatment avenues for a range of inflammatory disorders."

Cambré *et al.*, Nature Communications 2018
Govindarajan *et al.*, Nature Communications 2018
Venken *et al.*, Nature Communications 2019

QUICKSCAN

1

#Lag phase #Metabolic memory

When cells are switched from one environment to another, they stop growing while they adapt. The lab of Kevin Verstrepen (VIB-KU Leuven Center for Microbiology) studied the determinants of the duration of this lag in the specific case of yeast cells adapting to different sugars. Their results show that the lag phase is shorter when cells return to an environment to which they were recently exposed. Contrary to what has been hypothesized, this history-dependent behavior does not depend on changes in transcriptional regulation and chromatin structure, but instead derives from slow transitions between respiration and fermentation.

Cerulus *et al.*, eLife 2018
Perez-Samper *et al.*, mBio 2018

2

#Frontotemporal dementia #Granulin #Tauopathy

Julie van der Zee and Yalda Baradaran-Heravi from the lab of Christine Van Broeckhoven (VIB-UAntwerp Center for Molecular Neurology), in collaboration with the Early-Onset Dementia Consortium, have identified a possible link between GRN and Tau astrogliopathy. They identified a novel mutation in the GRN gene, coding for progranulin and one of the 3 key genes involved in frontotemporal dementia. GRN mutations are typically associated with TDP-43 proteinopathy. Yet in this Spanish family, the proband showed additional prominent glial tauopathy. Further investigation will be of interest to determine if an interaction exists between progranulin and tau protein within the neurodegenerative process.

Gómez-Tortosa *et al.*, Neurobiology of Aging 2018

3

#Cancer #RAS #Ubiquitin

Mutations in RAS proteins initiate the most aggressive tumors, and the search for RAS inhibitors has become a priority in the battle against cancer. Michail Steklov, Francesca Baietti, and colleagues from the Anna Sablina lab (VIB-KU Leuven Center for Cancer Biology) identified LZTR1 as an evolutionarily conserved component of the RAS pathway. Genetic studies overwhelmingly point to the role of LZTR1 in a wide range of human disorders. The researchers discovered that LZTR1 contributes to human disease by acting as a part of the ubiquitin ligase complex that mediates the conjugation of ubiquitin to RAS proteins. This conjugation reduces RAS activity and downstream signaling.

Steklov *et al.*, Science 2018

4

#Proximity labeling #Base editing

Proximity labeling techniques such as BioID are gaining popularity in protein complex mapping. However, virtually all studies use forced expression to introduce the system, and suitable control conditions remain challenging to find. The lab of Sven Eyckerman (VIB-UGent Center for Medical Biotechnology) has introduced a novel design for BioID experiments on endogenous bait proteins. The method relies on a CRISPR/Cas9 base editing step to inactivate a 2A autocleavage peptide separating the bait and labeling protein in engineered cells. The work provides an exciting first view of the proximity map of p53, a key protein in cancer.

Vandemoortele *et al.*, J. Proteome Research 2019

5

#Arabidopsis #Stomatal development #Polarity

Researchers from the lab of Jenny Russinova (VIB-UGent Center for Plant Systems Biology) uncovered a novel mechanism that controls the decision for asymmetric cell division or differentiation in the stomatal lineage of Arabidopsis. They reported that the substrate specificity of the cytoplasmic GSK3-like kinase BIN2 is regulated through scaffolding, and that the transient polarization of this kinase to the plasma membrane is required for asymmetric cell division.

Houbaert *et al.*, Nature 2018

6

#Autophagy #Inflammation #Glucocorticoids

Side effects confound long-term anti-inflammatory strategies based on glucocorticoids, which calls for alternative approaches. The team of Karolien De Bosscher, who just started her own lab at the VIB-UGent Center for Medical Biotechnology, studied the molecular mechanisms underlying the action of the classic glucocorticoid receptor (GR) ligand dexamethasone compared to the selective GR modulator CpdA in LPS-treated murine bone marrow-derived macrophages. They found that although both compounds are able to induce autophagy, they differentially regulate NRF2-dependent genes. Among those, the autophagy receptor SQSTM1, not GR, was found to mediate the anti-inflammatory action of CpdA in macrophages.

Mylka *et al.*, Autophagy 2018

7

#Vision #Locomotion

Scientists from the Vincent Bonin lab at NERF (imec-KU Leuven-VIB) uncover how behavior modulates the processing of visual information in the brain. The researchers investigated how neuronal responses in both the visual cortex and the visual thalamus change during movement, in the presence of different stimuli, e.g. fast or slow moving, with varying degrees of detail. Their findings suggest that locomotor modulations are much more widespread than previously appreciated.

Aydin *et al.*, Nature Communications 2018

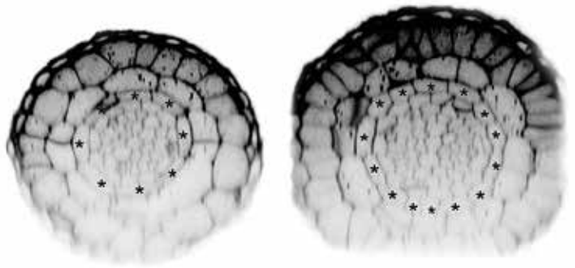
8

#Neuroinflammation #Infection

The protease MALT1 mediates pro-inflammatory signaling in immune and non-immune cells. Hyperactivation of MALT1 is associated with autoimmunity and some cancers, making it an interesting therapeutic target. Using a mouse model of rabies virus infection combined with genetic or pharmacological inhibition of MALT1, the Rudi Beyaert lab (VIB-UGent Center for Inflammation Research) discovered that MALT1 also plays an important role in virus-induced neuroinflammation. Remarkably, the pathological function of MALT1 was found to be dependent on virus virulence. These results illustrate the potential of MALT1 inhibition for therapeutic intervention in virus-induced encephalitis.

Kip *et al.*, Journal of Virology 2018

NEW INSIGHTS INTO RADIAL EXPANSION OF PLANTS CAN BOOST BIOMASS PRODUCTION



Control cross section through root

DOF2.1 overexpression leading to radial growth

Besides the obvious longitudinal growth, plants also enlarge in the radial sense. This thickening of plant stems and roots provides physical support to plants, provides us with wood and cork, and plays a major role in sequestering atmospheric carbon into plant biomass. The tissues responsible for this radial expansion are the vascular tissues which transport water and nutrients around plants and are visible as concentric circles in tree trunks known as annual growth rings. Finally, radial growth is important for the production of many edible structures such as turnips, carrots, sugar beet and potatoes. Despite this obvious importance of lateral growth for both plant growth and our everyday lives, we know very little about how this process is controlled.

In two joint publications, Bert De Rybel (VIB-UGent Center for Plant Systems Biology, Belgium) and Helariutta (SLCU, UK) research groups contribute to our understanding of plant radial growth by showing that several DOF-type transcription factors control oriented divisions in specific cells belonging to the vascular tissues called procambium cells.

Bert: “Our results suggest that the seemingly homogenous set of cells in the procambium in fact contains distinct zones of high proliferation and strong quiescence depending on the position of the cell within the vascular bundle.” While loss-of-function results in a dose-dependent loss of vascular cells, overexpression is able to trigger massive radial expansion by inducing oriented cell divisions in all cells in the root meristem. “This understanding will assist future breeding of economically important crops and trees to obtain higher yields and is able to improve atmospheric carbon sequestration by increasing plant biomass”, adds Bert.

Miyashima *et al.*, Nature 2019
Smet *et al.*, Current Biology 2019

IDENTICAL TWINS LIGHT THE WAY FOR NEW GENETIC CAUSE OF ARTHRITIS

Juvenile idiopathic arthritis is the most common form of all childhood rheumatic diseases. It is defined as arthritis that starts at a young age and persists throughout adulthood, but which does not have a defined cause. Patients present with a highly variable clinical picture, and scientists have long suspected that different combinations of specific genetic susceptibilities and environmental triggers drive the disease.

A SINGLE GENE MUTATION

In a new study by researchers at VIB, KU Leuven and UZ Leuven, the cause of juvenile arthritis in a young pair of identical twins was traced back to a single genetic mutation.

“Single-cell sequencing let us track what was going wrong in every cell type in the twin’s blood, creating a link from genetic mutation to disease onset,” explains Stephanie Humblet-Baron, one of the researchers involved in the study. “It was the combination of next generation genetics and immunology approaches that allowed us to find out why these patients were developing arthritis at such a young age.”

MODELLING A HUMAN DISEASE IN MICE

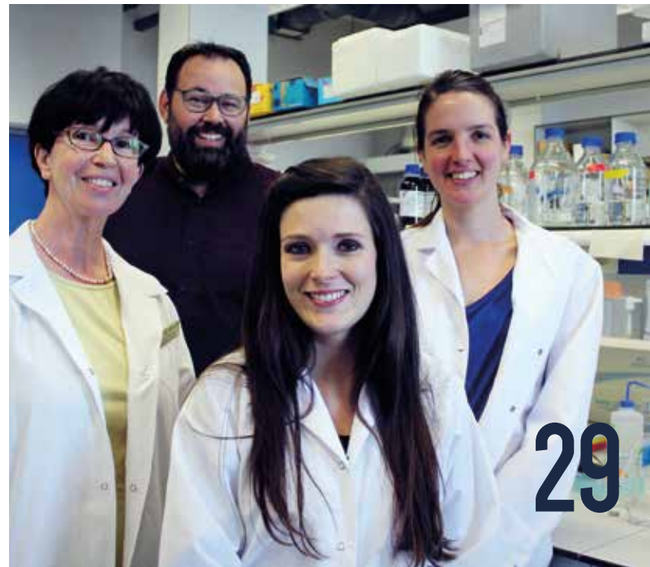
Parallel studies in mice confirmed that the gene defect found in the patients’ blood cells indeed led to an enhanced susceptibility to arthritis. Susan Schlenner, first author of the study, stresses the relevance of this approach: “New genetic editing approaches bring mouse research much closer to the patient. We can now rapidly produce new mouse models that reproduce human mutations in mice, allowing us to model the disease of individual patients.”According to Adrian Liston such insights prove invaluable in biomedical research: “Understanding the cause of the disease unlocks the key to treating the patient.”

FROM CAUSE TO CURE

Liston’s team collaborated closely with Carine Wouters (UZ Leuven), who coordinated the clinical aspect of the research: “The identification of a single gene that can cause juvenile idiopathic arthritis is an important milestone. A parallel mouse model with the same genetic mutation is a great tool to dissect the disease mechanism in more detail and to develop more effective targeted therapies for this condition.”

And the young patients? They are relieved to know that scientists found the cause of their symptoms: “We are delighted to know that an explanation has been found for our illness and more so because we are sure it will help other children.” Thankfully, the youngsters’ arthritis is under good control at the moment. Thanks to the new scientific findings, their doctors will be in a much better position to treat any future flare-ups.

Schlenner *et al.*, Annals of the Rheumatic Diseases 2018



A GUT FEELING FOR MENTAL HEALTH

The first population-level study on the link between gut bacteria and mental health identifies specific gut bacteria linked to depression and provides evidence that a wide range of gut bacteria can produce neuroactive compounds. Jeroen Raes (VIB-KU Leuven Center for Microbiology) and his team published these results in the scientific journal Nature Microbiology.

In their manuscript entitled 'The neuroactive potential of the human gut microbiota in quality of life and depression' Jeroen and his team studied the relation between gut bacteria and quality of life and depression. The authors combined faecal microbiome data with general practitioner diagnoses of depression from 1,054 individuals enrolled in the Flemish Gut Flora Project. They identified specific groups of microorganisms that positively or negatively correlated with mental health. The authors found that two bacterial genera, Coprococcus and Dialister, were consistently depleted in individuals with depression, regardless of antidepressant treatment. The results were validated in an independent cohort of 1,063 individuals from the Dutch LifeLinesDEEP cohort and in a cohort of clinically depressed patients at the University Hospitals Leuven, Belgium.

Jeroen: "The relationship between gut microbial metabolism and mental health is a controversial topic in microbiome research. The notion that microbial metabolites can interact with our brain - and thus behaviour and feelings - is intriguing, but gut microbiome-brain communication has mostly been explored in animal models, with human research lagging behind. In our population-level study we identified several groups of bacteria that co-varied with human depression and quality of life across populations."

Previously, Jeroen and his team identified a microbial community constellation or enterotype characterized by low microbial count and biodiversity that was observed to be more prevalent among Crohn's disease patients. In their current study, they surprisingly found a similar community type to be linked to depression and reduced quality of life.

Jeroen:"This finding adds more evidence pointing to the potentially dysbiotic nature of the Bacteroides2 enterotype we identified earlier. Apparently, microbial communities that can be linked to intestinal inflammation and reduced wellbeing share a set of common features."

The authors also created a computational technique allowing the identification of gut bacteria that could potentially interact with the human nervous system. They studied genomes of more than 500 bacteria isolated from the human gastrointestinal tract in their ability to produce a set of neuroactive compounds, assembling the first catalogue of neuroactivity of gut species. Some bacteria were found to carry a broad range of these functions.

Mireia Valles-Colomer:"Many neuroactive compounds are produced in the human gut. We wanted to see which gut microbes could participate in producing, degrading, or modifying these molecules. Our toolbox not only allows to identify the different bacteria that could play a role in mental health conditions, but also the mechanisms potentially involved in this interaction with the host. For example, we found that the ability of microorganisms to produce DOPAC, a metabolite of the human neurotransmitter dopamine, was associated with better mental quality of life."

These findings resulted from bioinformatics analyses and will need to be confirmed experimentally, however, they will help direct and accelerate future human microbiome-brain research.

Jeroen and his team are now preparing another sampling round of the Flemish Gut Flora Project, five years after the first sampling effort.

Valles-Colomer *et al.*, Nature Microbiology 2019

Sara Vieira-Silva, Jeroen Raes, en Mireia Valles-Colomer, hoofdonderzoekers van de studie.

REMARKABLE FACT

Less than a week after publication the paper figured amongst the top 60 in Altmetrics of all papers of the same period (covering all journals).

RESEARCHERS ANSWER DECADES-OLD QUESTION ABOUT PROTEIN FOUND IN ALZHEIMER'S BRAIN PLAQUES

Alzheimer's-affected brains are riddled with so-called amyloid plaques: protein aggregates consisting mainly of amyloid-β. However, this amyloid-β is a fragment produced from a precursor protein whose normal function has remained enigmatic for decades. A team of scientists at the VIB-KU Leuven Center for Brain & Disease Research led by Joris de Wit and Bart De Strooper has now uncovered that this amyloid precursor protein modulates neuronal signal transmission through binding to a specific receptor. Modulating this receptor could potentially help treat Alzheimer's or other brain diseases. The results are published in Science.

More than 30 years have passed since the amyloid precursor protein was first identified. In the late 1980s, several research teams across the globe traced the protein fragment found in amyloid plaques back to a gene located on chromosome 21. The gene encodes a longer protein that is cleaved into several fragments, one of which ends up in amyloid plaques.

Decades of research have focused on the cleavage process that leads to the formation of the amyloid-β fragment and its subsequent aggregation, in the hope of identifying new therapeutic avenues for Alzheimer's. Meanwhile, an important question remained unanswered: what does the rest of the amyloid precursor protein actually do?

IN SEARCH OF A BINDING PARTNER

To answer this question, Heather Rice, a postdoctoral researcher in the labs of Joris and Bart, set out to identify the nerve cell receptor that interacts with the amyloid precursor protein.

"We knew that the amyloid precursor protein exerts its role through the part of the protein that is released outside of the cell. To understand its function, we needed to look for binding partners located on the cell surface," explains Heather.

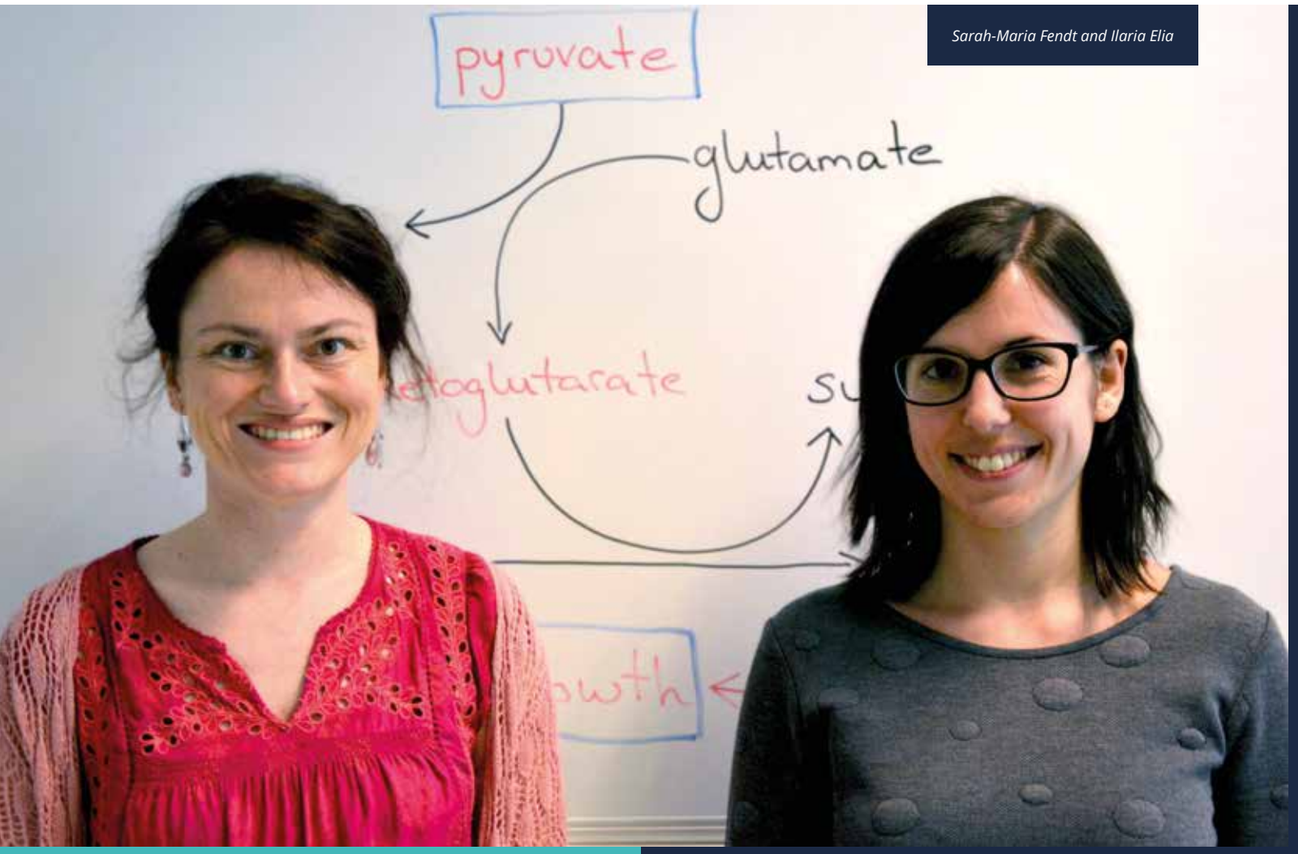
The researchers identified a receptor present at the synapse, the structure where two different neurons connect to pass on signals. "We found that the secreted part of the amyloid precursor protein interacts with a receptor called GABABR1a, and that this in turn suppressed neuronal communication at the synapse," says Heather.

MODULATING SIGNAL TRANSMISSION

"Although mutations in the amyloid precursor protein in familial cases of Alzheimer's disease all affect the production of amyloid-β, we don't really know whether other aspects of the protein's function contribute to Alzheimer's as well," says Bart. He believes that the new findings add a fresh perspective to previous studies on the amyloid precursor protein and Alzheimer's disease. "The newly identified role of the amyloid precursor protein may underlie the neuronal network abnormalities we see in mouse models of Alzheimer's disease and preceding clinical onset in human patients. It is exciting to consider that a therapy targeting this receptor might attenuate these abnormalities in people with Alzheimer's."

Joris adds that the clinical implications may reach much further than just Alzheimer's: "Interestingly, GABABR signaling has been implicated in a diverse range of neurological and psychiatric disorders, including epilepsy, depression, addiction and schizophrenia. Now that we know how the secreted part of the amyloid precursor protein modulates neuronal signaling through the GABAB receptor, we could think of new ways to develop drugs that can restore this type of neuronal signaling in other clinical contexts."

Rice *et al.*, Science 2019



Sarah-Maria Fendt and Ilaria Elia

UNCOVERING THE ROUTES THAT MAKE TUMORS GROW AND SPREAD

Tumors grow and proliferate, and to do so cancer cells require the duplication of building block molecules. They are also inclined to spread beyond the organ they originated in. When cancer cells move to a new environment, they need to 'restyle' their new home to effectively undergo metastasis formation. Both processes – cancer cell proliferation and metastatic outgrowth – are aspects of cancer that contribute to its 'success'. Therefore, they are excellent targets for the development of effective treatment strategies. Research from the lab of Sarah-Maria Fendt (VIB-KU Leuven Center for Cancer Biology) has revealed new ways in which tumors grow and proliferate and form metastases. These findings could provide new targets for effective, treatment strategies that spare healthy cells.

Fatty acid metabolism is an essential process for tumor growth. Despite different attempts to block fatty acid metabolism as a therapeutic strategy to reduce tumor size and growth, the outcome was not always positive. Kim Vriens, Stefan Christen and colleagues in the lab of Sarah-Maria Fendt (VIB-KU Leuven Center for Cancer Biology) now demonstrate that certain tumor cells use an alternative – previously unexplored – pathway to produce fatty acids. This finding can explain the resistance of particular cancer types to fatty acid metabolism inhibition. It is essential to gain more insights in this process to develop novel therapeutic strategies. The results are published in the renowned journal Nature.

To grow, tumors require the duplication of building block molecules. This includes fatty acids to make the cell membranes. Thus not surprisingly, many cancer cells have upregulated metabolic reactions that lead to increased fatty acid production. Current developed therapies focus on the inhibition of fatty acid generation to block tumor growth. Surprisingly however, this effort had limited success. The researchers from the Fendt lab now found that some cancer cells exploit an unusual metabolic pathway to produce mono-unsaturated fatty acids. This pathway – novel in cancer cells – requires the enzyme fatty acid desaturase (FADS2) and results in the production of the unusual fatty acid sapienate.

Prof. Sarah-Maria Fendt (VIB-KU Leuven Center for Cancer Biology): "Since fatty acids are essential for tumor growth we expect that further dissection of the sapienate metabolism pathway will lead to a better understanding of how cancer cells grow and will thus open new avenues to better target this deadly disease."

Beyond growing, though, cancer tends to spread – metastasize – and detrimentally affects various tissues as it does so. For example, most patients that die of breast cancer do so because their cancer spreads to new organs in a process called metastasis formation. When cancer cells spread to different organs, and specifically to the lungs, they first need to reshape the healthy lung environment into a so-called metastatic niche that can support the growth of cancer cells. A new study by Prof. Sarah-Maria Fendt and PhD student Ilaria Elia has shown that breast cancer cells require the nutrient pyruvate to do this. These results will also be published in Nature.

The researchers have now discovered that breast cancer cells that reach the lung require the nutrient pyruvate to restructure the healthy lung environment so that cancer cells can grow into metastasis. Specifically, pyruvate drives the production of a small molecule called α-ketoglutarate. This small molecule increases the activity of collagen prolyl 4 hydroxylase which is an enzymes that allows cells to produce hydroxylated collagen. In turn, hydroxylated collagen desposition in the lung environment is required for the metastatic outgrowth of breast cancer cells. Importantly, only cancer cells or cells supporting the spread of cancer cells to distant organs seem to rely on this pyruvate-dependent mechanism to create a pro-tumor environment in the lung. This means that stopping breast cancer cells from taking up pyruvate is sufficient to greatly impair metastasis formation in different breast cancer mouse models.

These two studies show that healthy and cancer cells use different metabolic pathways and nutrients to drive their growth and to shape their environment. By specifically targeting these newly uncovered pathways and nutrient dependencies, novel therapies can be developed that are increasingly able to specifically target cancer cells while sparing healthy ones. This increases not only the probability of survival and recovery of cancer patients, but also the quality of life during treatment.

Vriens *et al.*, Nature 2019.
Elia *et al.*, Nature 2019.

VIB PARTNERS WITH BIO-LEGEND ON THEIR TOTALSEQ™ ANTIBODIES TO BOOST SINGLE CELL MULTI-OMICS

An increasing number of VIB labs are incorporating single-cell RNA sequencing into their standard research workflows. Using oligo-tagged antibodies, single-cell transcriptomics and proteomics can now be combined at the same level of resolution in a single reaction. This technology has generated interest in multiple VIB groups across the different VIB centers, resulting in a partnership between VIB and antibody provider BioLegend. Earlier this year, BioLegend entered into an agreement with the New York Genome Center to commercialize their CITE-seq antibodies as TotalSeq™ reagents. These TotalSeq™ antibodies are now being used in multiple applications in a variety of research areas at VIB.

TotalSeq™ antibodies will make a major impact on cancer research. Diether Lambrechts, director of the VIB-KU Leuven Center for Cancer Biology says: "We are using CITE-seq to deeply characterize tumors and their microenvironments to develop new immunotherapeutic approaches." Jo Van Ginderachter (VIB Center for Inflammation Research, VUB) adds: "Functionally important cell types and activation states will be identified and characterized in the steady-state and diseased brain; generating unprecedent insights into the molecular make-up of single cells." TotalSeq™ antibodies will allow Martin Guilliams and Charlotte Scott (VIB-UGent Center for Inflammation Research) to screen for cell-specific surface proteins in their efforts to map the different myeloid cells for the Human Cell Atlas project.

Yvan Saeys and Niels Vandamme (VIB-UGent Center for Inflammation Research) say: "TotalSeq™ antibodies provide novel opportunities for research in computational biology, paving the way towards single-cell multi-omics data integration." Over the coming months, VIB will work towards setting up established CITE-seq protocols for this technology on a broad range of different sample types.

OXFORD NANOPORE TECHNOLOGIES OFFERS VIB SCIENTISTS NEW INSIGHTS INTO THE HUMAN GENOME

When scientists launched the Human Genome project in 1990, many hoped that it would reveal a cure to all genetic diseases. Although this hasn't been realized, the genome project paved the way for modern-day genetic research, enabling scientists to pinpoint disease-causing genes and mutations. In addition, it became apparent that the human genome appears to be far more complex than a mere series of nucleotides. Variations such as deletions, duplications and repeats lead to the complexity of the genome that defines an individual's traits, including disease risks. Identifying variations often requires labor-intensive assays, posing a significant hurdle to personalized medicine.

Oxford Nanopore Technologies, a UK-based company, commercializes nanopore-based long-read sequencing platforms that can analyze lengthy nucleic acid fragments. This platform is currently being used by the Center of Molecular Neurology, which aims to unravel the genetic causes of neurological diseases. Recently, the teams of Christine Van Broeckhoven and Kristel Sleegers (VIB-UAntwerp Center for Molecular Neurology) submitted two articles on bioRxiv highlighting the power of nanopore sequencing in neurogenetics. Both teams developed powerful tools that can be used in conjunction with the PromethION, a high-throughput Oxford Nanopore platform, to analyze structural variants.

The GridION and PromethION platforms are currently being set up and service on both platforms will be rolled out in 2019 by respectively the Nucleomics Core and the Genetic Service Facility to offer all VIB scientists the opportunity to use both platforms.

MISSION BIO JOINS FORCES WITH VIB TO REVOLUTIONIZE SINGLE-CELL DNA ANALYSIS

Many researchers are interested in defining the genetic landscape of various tumor types to determine cancer vulnerabilities that can be tackled with targeted therapies. However, differences in the mutational background of individual cancer cells within the same tumor can influence their sensitivity to the targeted treatment, and residual resistant cells can remain present after eradication of most of the tumor.

Marlies Vanden Bempt (VIB-KU Leuven Center for Cancer Biology) says: "The logical next step in cancer research would be to profile the genetic landscape of a tumor on a single-cell level in order to identify subclones harboring possible resistance mutations, which can initiate relapse in patients under treatment."

For that reason, the Tech Watch team is collaborating with Mission Bio, a San Francisco-based biotech company, to implement their cutting-edge single-cell DNA sequencing technology at the VIB-KU Leuven Center for Cancer Biology. Mission Bio's Tapestri platform uses a combination of droplet microfluidics and targeted in-droplet DNA amplification to identify single-nucleotide variants (SNVs) and indels at the DNA level in up to 10,000 single cells per run. Mission Bio not only provides fixed panels for sequencing of acute myeloid leukemia drivers, chronic lymphoblastic leukemia drivers, drivers of various myeloid disorders and hotspots in solid tumors, but also provides a service to generate custom panels including a personalized set of specific research-related genes.

These custom panels allow the platform to address specific research questions, attracting the interest of several PIs, including Jan Cools, Diether Lambrechts and Jean-Christophe Marine. Llucia Alberti Servera, postdoc in the lab of Jan Cools adds: "We have designed a panel containing 108 frequently mutated genes in acute lymphoblastic leukemia, or ALL, which covers more than 1,000 reported SNVs. With this custom panel, we can explore the heterogeneity of ALL at diagnosis and follow the clonal composition of ALL during treatment to identify leukemia clones that are more resistant to therapy."

The adoption and implementation of Mission Bio's single-cell DNA sequencing platform complements the ongoing efforts at VIB to boost research in the single-cell field. Tapestri will be added to the recently established Single Cell Accelerator (SCA) program, where multiple single cell analysis devices are being evaluated. "Moreover, combining single-cell Tapestri applications with other single cell omics technologies will lead to major breakthroughs and further unlock secrets of cancer progression," states Toon Swings, life science technology specialist at VIB Tech Watch and project lead for the implementation of the Mission Bio technology.

TOP STORIES FROM THE VIB SPIN-OFF WORLD

The excellent scientific research performed at VIB does not only advance the boundaries of knowledge, it also leads to the creation of new companies. Below follows a brief glimpse of how VIB spin-offs help shape the biotech-eco-system in Belgium and beyond.

Els Beirnaert (CEO Aelin Therapeutics) and Frederic Rousseau (VIB-KULeuven Center for Brain & Disease Research) receiving the Life Star Award

GRANTED THE OPPORTUNITY TO PURSUE 'UNDRUGGABLE' CANCER TARGETS
INVESTOR AWARD AND VLAIO FUNDING FOR AELIN THERAPEUTICS

Founded in 2017 based on the research of Joost Schymkowitz and Frederic Rousseau (VIB-KU Leuven Center for Brain & Disease Research), Aelin Therapeutics explores the concept of protein aggregation to target proteins implicated in numerous disease conditions. This novel technological approach, branded Pept-ins™, won the spin-off Life Star Award at the Jefferies 2018 London Healthcare Conference in November. Only one month later, the Flemish Government granted the company EUR 1 million in non-dilutive funding to extend its research focus – which was initially limited to the development of antibiotics – to include cancer therapeutics.

Thomas Mannheim (head of Global R&D for Premium Products EuroChem) and Isabel Vercauteren (CEO Aphea.Bio)

CO-PREPARING A NEW GENERATION OF FERTILIZERS APHEA.BIO JOINS R&D FORCES WITH EUROCHEM AND ACADEMIC RESEARCH DEPARTMENTS

As incorporated in the brand promise "applied nature for better agriculture", Aphea.Bio develops next-generation biostimulants and biopesticides based on natural organisms. This biotech spin-off, launched by VIB, Ghent University and KU Leuven in June 2017, unites resources and expertise from the labs of Sofie Goormachtig (VIB-UGent Center for Plant Systems Biology) and Jeroen Raes (VIB-KU Leuven Center for Microbiology). EuroChem Group AG and Aphea.Bio recently signed an R&D agreement to collaborate with a leading global fertilizer producer to significantly increase the uptake of key nutrients by plants. A recent EUR 1.2 million grant from the Flemish government also enables the spin-off to team up with research experts at Ghent University (Department of Applied Biosciences) and UCLouvain (Laboratory of Mycology) and to explore the field of fungal microorganisms.

BRINGING YEAST FERMENTATION TO A HIGHER LEVEL
GLOBALYEAST ENTERS INTO INNOVATION PARTNERSHIP WITH KEVIN VERSTREPEN

Focused on developing and deploying innovative solutions for the fermentation industry, GlobalYeast seeks to boost ethanol production in an environmental and profitable way. The start-up's recent partnership with Kevin Verstrepen (VIB-KU Leuven Center for Microbiology), facilitated by EUR 1 million of VLAIO funding, increases the likelihood of success. Pioneering yeast strain development for industrial applications, Kevin greatly contributes to the commitment of GlobalYeast to achieve operational excellence in the field of industrial fermentation.

globalyeast
Selected By Excellence

AWARDS

DIETHER LAMBRECHTS – AGILENT THOUGHT LEADER AWARD

Diether Lambrechts (VIB-KU Leuven Center for Cancer Biology) was awarded with the Agilent Thought Leader Award by Agilent Technologies Inc. on 20 February 2019. Agilent Technologies manufactures analytical laboratory technologies and presents this award, alongside other forms of support, to thought leaders in the field of life sciences, diagnostics and chemical analysis. Diether Lambrechts has been recognized for his pioneering research in cancer genomics.

"I am thrilled to receive this award from Agilent," Diether states. "This kind of support is essential to advance research and discover novel biomarkers for checkpoint immunotherapy in cancer patients. Immunotherapy has created a paradigm shift in the treatment of advanced-stage cancers, but it only delivers durable clinical responses in a relatively small fraction of cancer patients. By applying a combination of single-cell profiling methods, we hope to have a major impact on patients receiving these therapies."

Diether Lambrechts

Martin Guilliams

MARTIN GUILLIAMS - LAUREATE OF THE ROYAL FLEMISH ACADEMY FOR SCIENCES

Martin Guilliams (VIB-UGent Center for Inflammation Research) obtained the Laureate of the Royal Flemish Academy for Sciences for the category of Natural Sciences. This is the most prestigious scientific award of the Royal Flemish Academy for junior investigators (younger than 40). Martin Guilliams received this prize for his team's work on the development and functional heterogeneity of myeloid cells, including the study of the cellular origin of tissue resident macrophages.

"I am very proud and humbled to have been selected for this prestigious award," Martin says. "It feels great to receive this recognition for all the hard work that has been put into these studies, which, I must emphasize, has been real teamwork. As this prize is for the whole team, the lab members joined me at the award ceremony. I'm very grateful to be able to work with such passionate scientists."

PHILIP VAN DAMME – EURORDIS BLACK PEARL SCIENTIFIC AWARD

Philip Van Damme (VIB-KU Leuven Center for Brain & Disease Research and Neurology Department UZ Leuven) received the Black Pearl Scientific Award on 12 Februrary 2019 for his research and dedicated patient support in the field of amyotrophic lateral sclerosis (ALS). The Black Pearl Awards are presented by the rare disease non-profit alliance EURORDIS each year in Brussels to recognize individuals who have made significant contributions to science, advocacy, policy and media that benefit the rare disease community.

"I am truly honored to receive this year's scientific award. Combining clinical work with research is often challenging and only possible thanks to the excellent teams both in the clinic and in the lab I am working with. This award will encourage me to keep looking for solutions for patients with this dreadful disease," says Philip.

Philip Van Damme

DID YOU KNOW

LIFE AT VIB NEVER STANDS STILL. A SEMINAR YESTERDAY, A GROUND-BREAKING PROJECT TODAY, AN INNOVATIVE TECHNOLOGY LAUNCHING TOMORROW... STAY IN THE LOOP WITH THIS OVERVIEW.

Did you know that...

- **Hilde Nelissen** became co-group leader of Dirk Inzé's group System Biology of Yield, at the VIB-UGent Center for Plant Systems Biology, and Karolien De Bosscher started her own lab at the VIB-UGent Center for Medical Biotechnology? Congratulations to them both!

- **Wetenschap Uitgedokterd** ('Science Figured Out'), a platform that gives young scientists the chance to communicate their research to the general public in video form, has been launched? The VIB Training team will organize SciComm sessions together with Wetenschap Uitgedokterd, and we are looking for enthusiastic participants who will be able to promote their own research in a video!

- **Sophie Janssens** (VIB-UGent Center for Inflammation Research) was awarded an ERC consolidator grant? Congratulations!

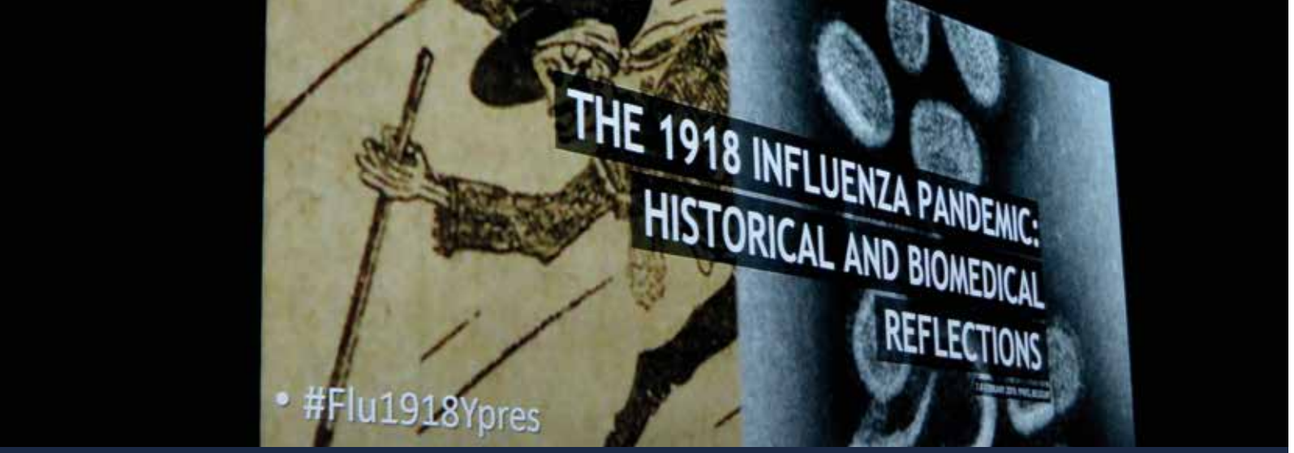
- The VIB-UGent groups of **Kris Gevaert**, **Lennart Martens** and **Francis Impens** are actively involved in the EPIC-XS project? This project, which seeks to provide researchers access to state-of-the-art proteomics technology, kicked off in January 2019 and will run for a period of four years.

- **'w[eet]enschap, middagsessies om op te eten'**, a brand-new initiative that brings research conducted by Flanders Make, imec, VIB and VITO to a wider audience during a sandwich lunch, will feature a presentation by VIB? The first VIB session about CRISPR-Cas9 was a success, it was attended by 150 people.

- **Damya Laoui** (VIB-VUB Center for Inflammation Research) together with Liesbeth Aerts and Jeroen Aerts (both Infopunt Proefdieronderzoek and also VIB) have written an opinion piece published in Knack? In their piece, they emphasize the key role of animal testing in the fight against cancer, something Damya also did in her lecture for the 'Universiteit van Vlaanderen'. Check it out!.

- The **KU-Leuven Department of Cellular and Molecular Medicine**, and VIB have organized the "Women in Science" symposium, which took place on the "Day of Women and Girls in Science 2019"? This symposium, attended by 250 people, shone a light on women in science and proposed actions that can help close the gender gap in science. And did you know that this is not the only gender-focused initiative in Flanders? The Jonge Academie (www.jongeacademie.be) has launched a gender campaign covering stereotypical problems in science. Stay tuned for more information!

- **Bart De Strooper** (VIB-KU Leuven Center for Brain & Disease Research) gave the Brain Prize Lecture (https://cbd.vib.be/nl/lezing/) at Maria Theresia College in Leuven on February 12, 2019 to provide more info about Alzheimer's disease and scientists' research on a way to cure and possibly prevent the disease? Last year, Bart took home the renowned Brain Prize, together with three fellow researchers. The award is considered the 'Nobel Prize for brain research'.



WHEN SCIENCE MEETS HISTORY: A UNIQUE VIB SCIENCE EVENT

"THE 1918 INFLUENZA PANDEMIC: HISTORICAL AND BIOMEDICAL REFLECTIONS"

Two years ago, Marnix Beyen (University of Antwerp, History) and Xavier Saelens (VIB-UGent Center for Medical Biotechnology) decided to organize an international conference on the 1918 influenza pandemic.

There was, however, one thing that would set it apart from other conferences: both historians and biomedical scientists would be invited to contribute. Such an interdisciplinary perspective might help in answering questions that remained elusive this far. After all, many mysteries still plague our understanding of the 1918 influenza pandemic (where did it originate? Was there a biological reason for the high mortality rate? Why did it so strongly affect young adults?). But, these questions have a strong social component as well (how did the movement of army troops contribute to the flu's spread? Did the toll of the war exacerbate the flu's already strong punch?). Answers, then, will have to come from a strongly interdisciplinary approach that combines the latest biomedical knowledge with historical and social insights.

With this goal in mind, over 100 academics, students, and industry members met in Ieper, the city in West Flanders renowned for its World War I museum. On February 7th and 8th 2019, historians and biologists both presented their work.

Some of the highlights included the talk by Peter Piot (London School of Hygiene and Tropical Medicine, United Kingdom) in which he addressed the preparedness of the modern world for a future epidemic. He warned that vector-borne diseases such as Dengue and malaria are increasingly spreading into the moderate climate zones of the world. Drawing on the South Korean MERS outbreak in 2015, he further cautioned that the interconnectedness of the modern world can amplify the spread of viruses.

Debby van Riel (Erasmus MC, Rotterdam, the Netherlands) provided compelling evidence, based on studies in ferrets, that the 1918 influenza virus can replicate in the central nervous system. This observation fits well with reports that severe influenza can result in neurological complications.

Howard Phillips (University of Cape Town, South Africa) presented the thought-provoking thesis that the onset of the influenza pandemic in the spring of 1918 had weakened the German army more severely than the allied troops. His suggestion that the flu may have contributed to the eventual defeat of Germany elicited a vibrant discussion.

As part of the social program, the attendees visited the nearby Lijssenthoek military cemetery, a hospital site during WWI. The conference participants also visited the In Flanders Fields Museum in Ieper, which was followed by a closing drink in the cloth hall, offered by the city of Ieper. Bringing together historians and biomedical scientists on the topic of influenza was a small adventure and a big success.

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2019 will focus on type 2 immunity research, emerging applications of microbes, and the hottest topic will be single cell technologies during 3 of our conferences: Revolutionizing Next-Generation Sequencing 3, The Brain Mosaic: Cellular heterogeneity in the CNS 2 & Next-Generation Protein Analysis and Detection 3.

Will we see you at one of our conferences?

MARK YOUR CALENDAR

Regulatory Oxylipins
April 1-4, 2019 – Ghent

Emerging Applications of Microbes
June 3-4, 2019 – Leuven

International Conference on Polyploidy
June 11-14, 2019 – Ghent

Biotech day
October 20, 2019 – Leuven

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BELGIUM

Chief Editor

Sooike Stoops

Coordinator

Tiny Sterck

Freyja Vermeire

Photography

Ine Dehandschutter

Maxime Taillez

Sofie Van Gassen

Bart Ghesquière

All Enquiries

VIB HQ

Rijvisschestraat 120

9052 GHENT

BELGIUM

Tiny Sterck

E-mail: tiny.sterck@vib.be

Tel.: +32 9 244 66 11

Fax: +32 9 244 66 10

www.vib.be