



University
of Basel

BIOZENTRUM

The Center for
Molecular Life Sciences

2021

Biozentrum Highlights



Prof. Alex Schier,
Director of the Biozentrum,
University of Basel.

Dear readers

If 2020 felt like hell, 2021 looked like limbo. We got vaccinated, but SARS-CoV-2 was still with us. We worked together, but masks and online meetings limited deep connections. We promoted evidence-based thinking, but irrationality was all around us. Despite these challenges, we had a productive year and reached two important milestones: our 50th anniversary and the move to our new building.

As you read the *Highlights 2021*, you will notice that much of our progress is not just the product of one year but rests on foundations that were built over many years. Quite literally, foundation building gave us our brand-new building, as the new Biozentrum was conceptualized and constructed over many years (pages 8-11). The Basel Phage Collection is another example of progress built on foundations laid earlier (page 7). In 2019, we launched the Basel Summer Science Academy, during which high school students isolated viruses that infect bacteria from the Rhine. In 2021, this foundation resulted in a phage collection that is now available to scientists worldwide.

Several of the highlights covered in this issue lay the foundation for the future. We launched a lab course in “Experimental Molecular Biology” to teach undergraduates how to work and think like scientists (page 18). These students can now build on this foundation to become future leaders in biomedicine. With Anissa Kempf, Knut Drescher and Ben Engel, we recruited and welcomed new group leaders (pages 6 and 13). They bring fresh energy to our community. And we held our first Academia-meets-Industry Symposium. Scientists from the Biozentrum and Roche shared their research projects and strengthened the remarkable Life Sciences ecosystem in Basel (page 19).

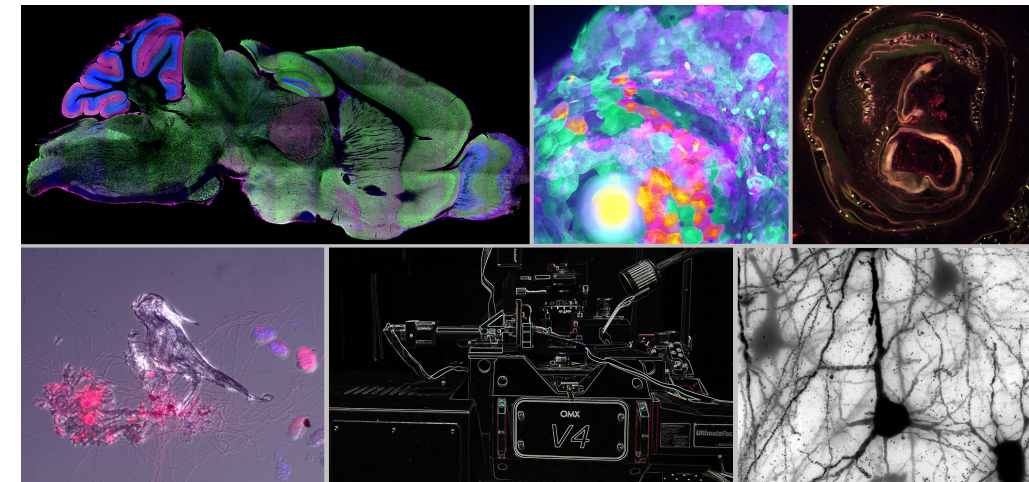
Our 50th anniversary was an opportunity to look back at our greatest foundation – the research and teaching by thousands of former colleagues (page 16-17). It is now up to us to build on this foundation, and to look forward, make fundamental discoveries and educate the next generation of scientists. Or in the words of William Shakespeare: *“Things won are done, joy’s soul lies in the doing.”*

Prof. Dr. Alex Schier
Director of the Biozentrum, University of Basel

2021 at a glance.

Silvia Arber received prestigious research grants

The European Research Council (ERC) awarded the neurobiologist Prof. Silvia Arber a highly endowed ERC Advanced Grant. In her project "InterAct" funded with 2.5 million euros, she will study how neurons in the brainstem interact in the motor system to control the generation and learning of body movements. Hers brings the total number of ERC grants received by Biozentrum scientists to 17 since the inception of the program in 2007. Furthermore, Silvia Arber is also part of a collaborative research network that has received funding from the Aligning Science Across Parkinson's (ASAP) initiative to investigate Parkinson's. The aim is to uncover how the early stages of this disease impacts the activities of neuronal circuits regulating movement and sleep.



Virtual Biozentrum Symposium 2021

The Biozentrum Symposium has been a permanent fixture in the institute's event calendar for many years. In order to provide the researchers with a platform for scientific exchange, despite the coronavirus pandemic, this year's symposium took place as a virtual event supported by new formats. Along with the classical lectures and poster presentations, there was also an "Art & Science" exhibition and, for the first time, the "Science Games @BiozentrumBasel", organized by the PhD Students and Postdoc Societies. A total of more than 300 scientists participated in this year's symposium.

Keep on moving: Sports relieve tumor-associated anemia

Many cancer patients suffer from anemia and an impaired ability to perform physical activities. Drugs only rarely alleviate this type of anemia. Prof. Christoph Handschin's team, in collaboration with researchers at the Department of Biomedicine, has now been able to clarify how cancer causes the degradation of red blood cells, and that physical exercise can reduce tumor-induced anemia. Cancer does not only trigger a systemic inflammatory reaction, but also massively changes the handling of lipids and metabolites in the body. These changes result in an enhanced destruction of red blood cells. Training restores metabolic remodeling and inflammation and is therefore a useful therapy for cancer patients to counteract anemia and in turn to improve their quality of life.



Furrer et al.,
Science Advances

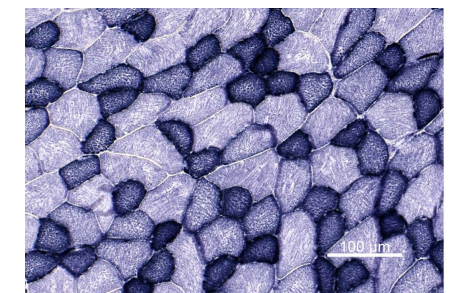


Anne Spang, Professor of Biochemistry and Cell Biology, has become a member of the German National Academy of Sciences Leopoldina. The election to the Academy is considered to be one of the highest honors for scientists awarded by a German institution. With Anne Spang, six current and former professors of the Biozentrum now belong to the Leopoldina.

Uncovering the causes of sarcopenia

Age-related muscle loss has a huge impact on autonomy and life quality of the elderly. Animal models help us to better understand the aging process and discover new treatments. The extrapolation of these findings to humans, however, has its limitations. Researchers led by Prof. Mihaela Zavolan and Prof. Markus Rüegg have demonstrated that rodents are suitable models to study muscle aging in humans. They also uncovered that clinical parameters, such as muscle mass or strength, are better indicators of muscle health than chronological age and they identified new therapeutic targets to treat sarcopenia.

Börsch et al., *Communications Biology*



The Biozentrum spin-off T3 Pharmaceuticals has been awarded the Swiss Economic Award 2021. This award is the most important young entrepreneur prize in Switzerland.

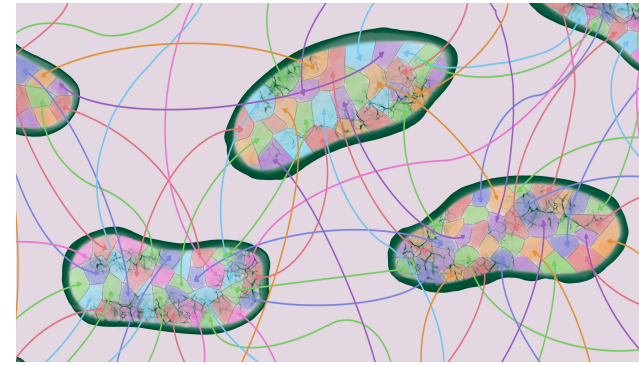
Fellowships and grants for young scientists

Despite the difficult pandemic situation, the past year was a success for many of early-stage scientists at the Biozentrum. Their dedicated work and achievements have been recognized by prestigious international fellowships and research grants. Creating a supporting and stimulating scientific environment for young researchers is one of the top priorities at the Biozentrum. In 2021, four postdocs each received a Marie Skłodowska-Curie Individual Fellowship, two scientists were awarded an EMBO Postdoctoral Fellowship, and two young researchers received a Boehringer Ingelheim and a Feodor Lynen Research Fellowship, respectively. Two PhD students have been supported by the Novartis Research Foundation. All awardees are listed at the end of the brochure.



Benjamin Engel appointed new Assistant Professor

The University Council appointed Benjamin Engel as tenure-track Assistant Professor of Structural Biology and Biophysics to the Biozentrum. The Engel group investigates the molecular architecture of cells, addressing in particular how macromolecules sculpt cellular organelles, and reciprocally, how the shape of each organelle directs the function of its resident macromolecules. Using cryo-electron tomography, the researchers visualize molecular complexes in their native environment, enabling them to map the molecular architecture of cell organelles.



Researchers crack a puzzle of bacterial genome evolution

Phylogenetic trees map the evolutionary history and ancestral relationships of organisms. At least that is the theory. However, researchers working with Prof. Erik van Nimwegen have now revealed that for many bacteria this theory is based on mistaken assumptions. These phylogenies are not a reliable indicator of common ancestry but rather reflect how extensively different bacteria have exchanged genes with each other. The finding implies that the theories of how bacterial genomes evolve need to be completely reconsidered. In another study, published in "Nature Biotechnology", the teams of Prof. Erik van Nimwegen and Prof. Mihaela Zavolan demonstrate that many of the popular tools for single-cell RNA-sequencing analysis severely distort the data and produce various artefacts. Furthermore, they present a newly developed method "Sanity" that overcomes these problems.

Sakoparnig et al., *eLife* / Breda et al., *Nature Biotechnology*

Susan Mango, Professor of Molecular and Cellular Biology, won the Teaching Excellence Award 2021 in the category Modern Scholarship.



The Hebrew University of Jerusalem awarded an honorary doctorate to Prof. Michael N. Hall. He also received the Prix Mondial Nessim Habif from the University of Geneva.

Novel antibiotic deceives bacteria through mimicry

Most antibiotics need to penetrate their target bacteria. But Darobactin, a newly discovered compound, is much too large to do so. Nonetheless, it kills many antibiotic-resistant pathogens – by exploiting a tiny weak spot on their surface. Researchers led by Prof. Sebastian Hiller and Prof. Timm Maier have revealed the amazing mechanism at play and thereby opened the door to developing completely new medicines. They discovered that Darobactin attacks a true Achilles heel of the pathogens: it binds to the bacterial outer membrane protein BamA and thus blocks the transport route for the bacteria's shell components. Identifying this mechanism of action will enable further improvement of Darobactin and its development to become an effective drug.

Kaur et al., *Nature*

Continued funding for Allen Discovery Center

Prof. Alex Schier and colleagues at the University of Washington and the California Institute of Technology launched the Allen Discovery Center for Cell Lineage Tracing in 2017. After an initial four-year funding period, the center has now received a research grant of about nine million Swiss francs for another four years. In the upcoming funding period, the scientists will use cutting-edge technologies to reconstruct developmental pathways in zebrafish and mice, and to generate lineage trees spanning from the fertilized egg cell to a wide variety of specialized cell types.



Valuable virus collection for worldwide research

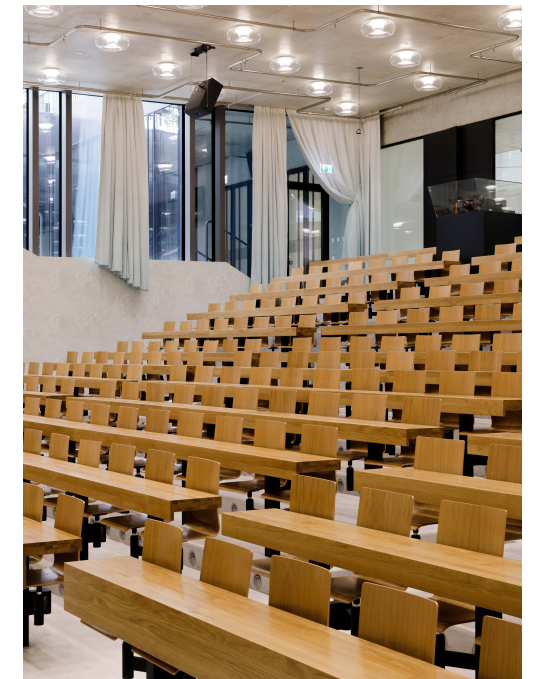
Phages are an important part of many of the Earth's ecosystems and can also play a role in the fight against antibiotic-resistant pathogens. The team led by Dr. Alexander Harms has now compiled a significant phage collection. Working together with high school students participating in the Basel Summer Science Academy at the Biozentrum, the researchers isolated and characterized a large number of bacteriophages in environmental samples and established a worldwide unique collection of 70 phage species. This BASEL phage collection is available to scientists worldwide for research purposes, as a biotech tool or to explore which phages are most suitable for therapy. The publication in PLoS Biology highlights the long-term impact of the Basel Summer Science Academy, which was launched in 2019 to offer gymnasium students the opportunity to experience research firsthand.

Maffei et al., *PLoS Biology*

The Biozentrum moved

The big long awaited moment arrived on June 28th, 2021. The Biozentrum started to move into its newly constructed state-of-the-art research building. After half a year, the more than 500 employees have completely settled in and are now busy researching and teaching in the ultra-modern laboratories, classrooms and core facilities.

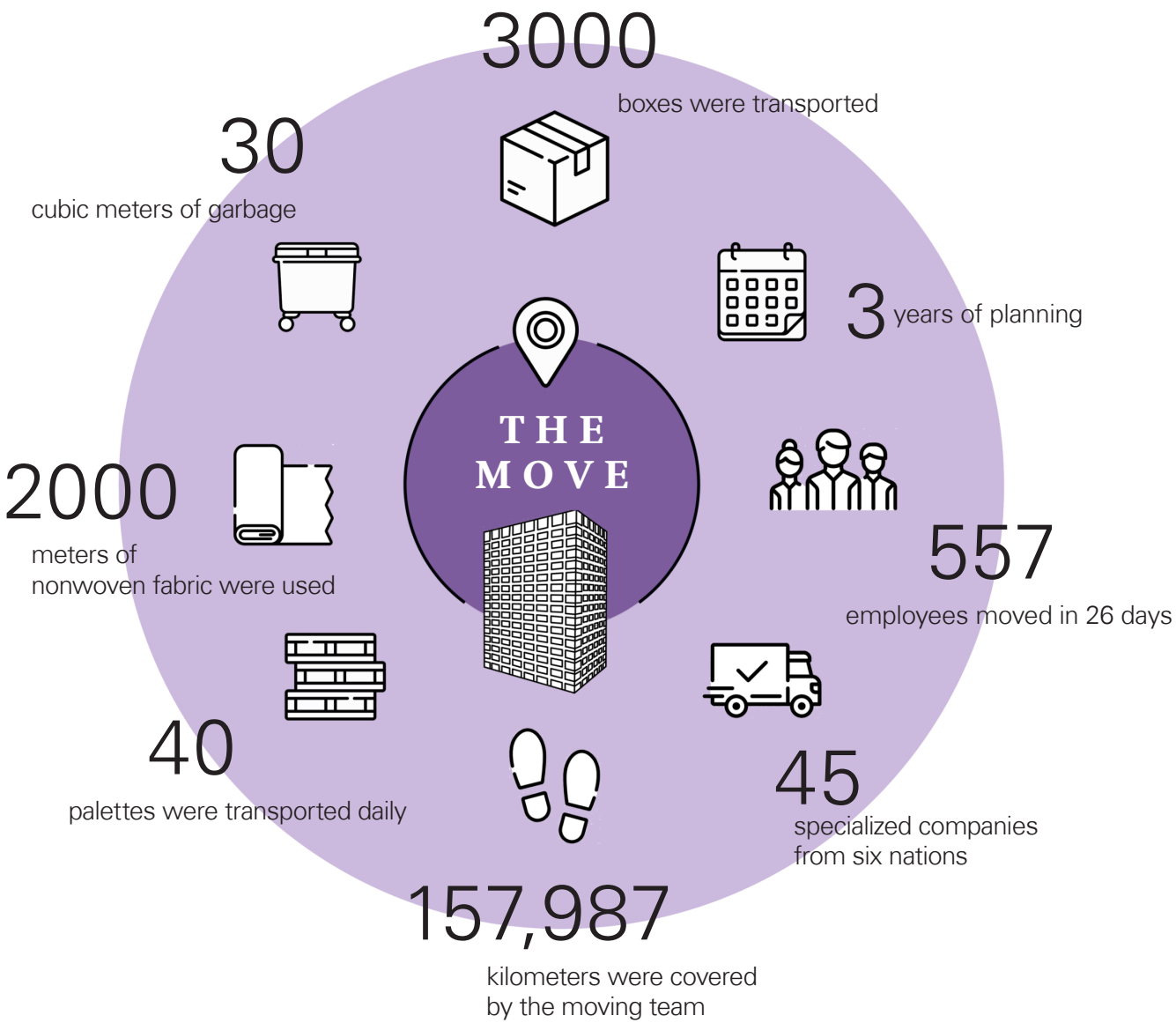
The move represents a milestone for the Biozentrum. Here, it will write the next chapter continuing its 50-year success story. Thanks to the excellent infrastructure, the Biozentrum remains competitive on the global academic stage and can attract the world's best scientists to Basel.





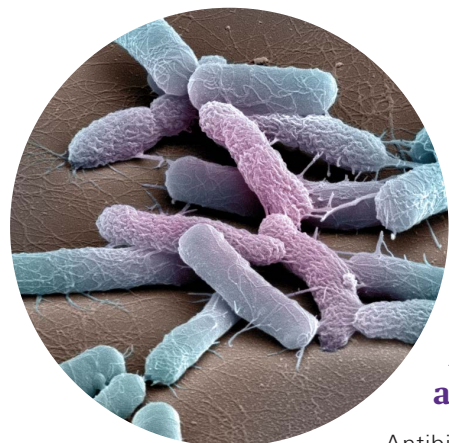
Relocation: impressive numbers

The relocation of the Biozentrum was a logistical challenge that required a perfectly functioning organization and extensive preparation. 230 labs, 4000 lab devices and over 70 pieces of equipment that require special care, had to be moved from the old to the new Biozentrum building.



Biozentrum PhD Fellowships

Twice a year, the Biozentrum encourages talented, ambitious and highly motivated young scientists from all over the world to apply for its prestigious fellowships. The “Biozentrum PhD Fellowships” are awarded on a competitive basis to a maximum of ten candidates per call. Recipients are offered a unique rotation-based selection of a research group of choice and a number of other incentives that foster the scientific excellence and the career prospects of these PhD candidates. Since its inception in 2006, 69 PhD students from 30 countries – about half of them women – have completed their doctorate. There are currently 46 PhD fellows conducting research at the Biozentrum.



A “Catch-22” vaccine against Salmonellosis

Antibiotics are still the treatment of choice in fighting bacterial infections. However, due to their extensive and sometimes improper use in medicine and livestock farming, antibiotic resistant pathogens are increasingly emerging. In collaboration with researchers from ETH Zurich, Prof. Médéric Diard has designed a vaccine cocktail that sets an evolutionary trap for the gut pathogen *Salmonella*. The oral vaccine drives the evolution of the bacteria toward virulence loss and stress sensitivity. This novel vaccination strategy could prevent the transmission of pathogens increasingly resistant to antibiotics.

Diard et al., *Nature Microbiology*

Farewell of Prof. Martin Spiess

What paths do proteins take within the cell and how do they reach their destination? These have been the central questions addressed by Prof. Martin Spiess in his work over several decades at the Biozentrum. On the occasion of his retirement, the Biozentrum honored his achievements in research and teaching with a farewell ceremony. In 1986, Martin Spiess was appointed to the Biozentrum initially as an Assistant, then as Associate Professor and since 2004 as Full Professor of Biochemistry. In addition to his research and teaching activities, he also made his mark as Dean of the Faculty of Science.



Flavio Donato, Professor of Neurobiology, was selected to be a FENS-Kavli Network of Excellence scholar. The FKNE is a network of 30 outstanding early to mid-career European neuroscientists, which aims to improve neuroscience in Europe and beyond.



More than just walking: a new role for core brain region

For decades, a key brain area called the mesencephalic locomotor region was thought to merely regulate locomotion. Now, the research group of Prof. Silvia Arber has shown that the region is involved in much more than walking, as it contains distinct populations of neurons that control different body movements. The findings could help to improve certain therapies for Parkinson’s disease. In a recently published “Nature” study, the team describe how the brain masters movements that require a high level of skill. They have been able to demonstrate that a specific region of the brainstem is responsible for various motor activities of the forelimbs. A functional map of brainstem circuits reveals which neurons control the fine motor skills of the arm and hand.

Ferreira-Pinto et al., *Cell* / Ruder et al., *Nature*

New arrivals at the Biozentrum

In August 2021, Knut Drescher started his position as Assistant Professor of Microbiology and Biophysics at the Biozentrum. His research group focuses on understanding the mechanisms that determine the dynamics of bacteria in biofilms and swarms – during their development and during environmental changes. Only two months later, Anissa Kempf moved to Basel and started her group at the Biozentrum. The Assistant Professor of Neurobiology investigates why we sleep and how neurons in the brain control sleep. Her aim is to uncover general mechanisms that the brain uses to keep track of the need to sleep, and to satisfy essential needs.

How immune cells are activated

Immune cells protect our body against invading pathogens. The chemokine receptor CCR5 on the surface of T cells plays an important role in this process. However, CCR5 is also used by the HI virus as an entrance gate into T cells. A research consortium led by Prof. Stephan Grzesiek has now deciphered the mechanism of CCR5 receptor activation. In case of CCR5, only particular chemokines fit exactly and activate the receptor. The researchers have discovered that the ability of chemokines to activate CCR5 depends on the molecular structure of the N-terminal region of the chemokine. This study provides important insights for the development of effective treatments for AIDS, cancer and inflammatory diseases.

Isaikina et al., *Science Advances*

Junior PIs working at Basel's life science institutions, including young group leaders from the Biozentrum, launched the network “J-BLISS” to support each other.



Hands-on research for Bachelor students

Early involvement of students in real-life research has always been a tradition at the Biozentrum. With its Research Summer internship program, the Biozentrum offers Bachelor students from across Europe the unique opportunity to experience scientific research at an early career stage. During the “Biozentrum Research Summer 2021”, eleven students selected from 136 applicants had the chance to gain hands-on research experience in one of the Biozentrum labs. They also learned how to think scientifically as well as how to document and present research results. The inspiring scientific and social program further supported the exchange between the participants and welded the group together.

How does a wing grow?

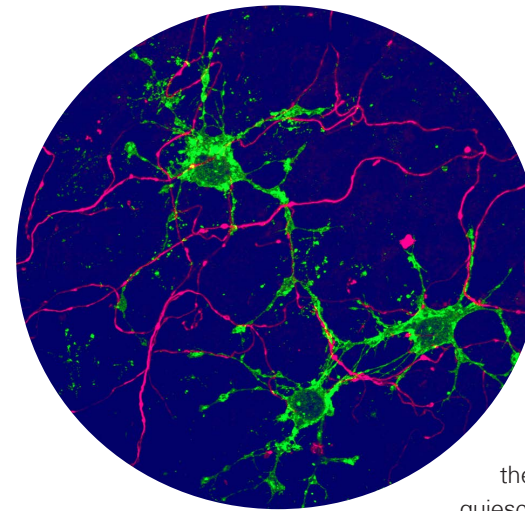
To form an organ, cells must communicate properly and develop their number, shape and size down to the smallest detail. Prof. Markus Affolter's team investigates wing growth in the fruit fly and has now refuted a long-standing dogma. Contrary to what was previously assumed, the team showed that the dispersal of the signaling molecule Dpp is not responsible for the entire wing shape and size. Also, in their choice of method, the researchers broke new ground. Using small protein scaffolds as synthetic receptors, they were able to capture proteins in the living organism and to control their spreading and signaling in the tissue. This method opens up new possibilities for the study of organ development in complex organisms.

Matsuda et al., *Nature Communications*



Farewell Symposium for Prof. Tilman Schirmer

In honor of Prof. Tilman Schirmer, the Biozentrum organized a festive Farewell Symposium which took place as a hybrid-event and was attended by many international guests and long-time companions. Renowned scientists including Prof. David Ron from the University of Cambridge, Prof. Holger Sondermann from DESY (Deutsches Elektronen-Synchrotron) in Hamburg along with the Professors Urs Jenal, Timm Maier and Christoph Dehio, colleagues from the Biozentrum, acknowledged Schirmer's scientific achievements with lectures and a laudation. With his farewell lecture entitled “All about structure?” the emeritus professor concluded the symposium. Tilman Schirmer was Professor of Structural Biology at the Biozentrum from 1992 to 2020 and studied the structure-function relationships of bacterial proteins and their communication at the molecular level.



New glial cells discovered in the brain

Neurons are central players in brain function. However, a key role for glia, long considered to be support cells, is emerging. The research group of Prof. Fiona Doetsch has now discovered two new types of glial cells in the brain by unleashing adult stem cells from their quiescent state. Doetsch's team identified a molecular switch that awakened the stem cells from their quiescent state, allowing them to uncover multiple domains that give rise to glial cells in the stem cell reservoir. These new glial cell types may be a source of cells for repair in neurodegenerative diseases, such as multiple sclerosis, or after injury.

Delgado et al., *Science*



Biozentrum Discovery Seminar series continued during pandemic

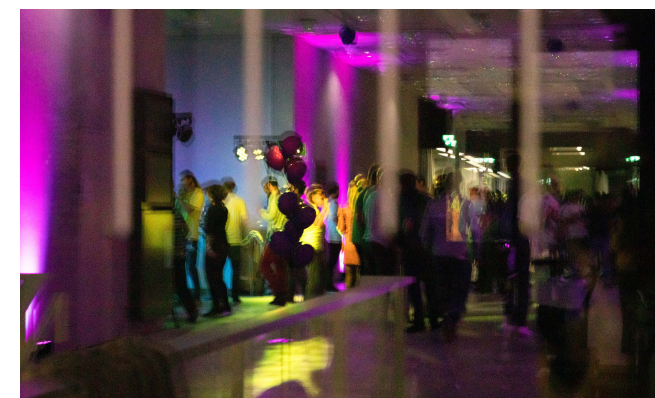
The Biozentrum Discovery Seminar series, which alternates between talks by invited speakers from institutions worldwide and seminars given by in-house PhD students and postdocs, was launched in 2018 to promote the scientific exchange and to strengthen the Biozentrum community. Also in 2021, many internationally renowned scientists provided insights into their most diverse research topics online and on-site as part of this lecture series.

This year's PhD Retreat took place as a virtual event. The organizing team of graduate students put together an exciting two-day program rich in scientific and social activities.



50 Years Jubilee of the Biozentrum

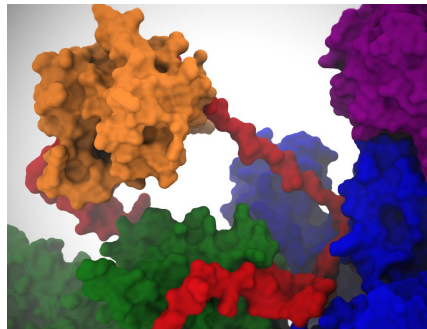
The 20th century was a time of great upheavals and ground-breaking discoveries for biology. It also marked the birth of molecular biology – and the Biozentrum. It was brought into being 50 years ago by the boundless pioneering spirit and remarkable courage of its founding fathers. Since then its researchers have embarked on a journey, following the tracks of molecules, cells and organisms, with the goal of better understanding the fundamental processes of life. During this time, the Biozentrum has lived up to its name and advanced to become a worldwide acclaimed institute for molecular biology research and teaching. On October 1st, 2021, the Biozentrum celebrated its 50th anniversary with a birthday party in its new “home”. The Vice President of Research, Prof. Thorsten Schwede, and the Director of the Biozentrum, Prof. Alex Schier, gave a birthday speech recalling the Biozentrum’s achievements, emphasizing its importance for the Life Sciences cluster in Basel and venturing a glimpse into the future. To mark this occasion, the Biozentrum also published a jubilee brochure that reviews the last 50 years – half a century of scientific endeavors and stellar accomplishments, of science wide-open to novelty and new horizons. The Biozentrum can look back to an eventful and rich history and is now looking forward to another 50 years of excellent science.



A bacterial toxin facilitating chronic infection

Some pathogens persist in the body causing chronic infections. *Bartonella* hijacks its host in a “gentle” way by employing toxins that very selectively target host cell functions and thus reducing the efficacy of the immune system. Researchers led by Prof. Christoph Dehio and Prof. Tilman Schirmer have now been able to elucidate the mechanism of this highly selective recognition of specific host proteins by the *Bartonella* toxin Bep 1. This mechanism is vital for the pathogen’s capacity to cause chronic infections.

Dietz et al., *PNAS*



How the key protein mTOR controls cell growth

The growth of cells is controlled by the protein “Target of Rapamycin”, in mammals called mTOR for short. With an adequate supply of nutrients, it stimulates the biosynthesis of proteins that are essential for growth. Recently, the teams of Prof. Sebastian Hiller and Prof. Timm Maier reported how mTOR in complex with other partners changes the conformation and function of a protein which initiates protein synthesis. Following a hierarchical order, the protein complex mTORC1 gradually changes the conformation of a specific binding partner and thus indirectly initiates protein biosynthesis. Furthermore, the scientists have been able to reveal the exact molecular mode of action of the anti-cancer drug rapamycin for the first time.

Böhm et al., *Molecular Cell*

Diversity in the brain: New genes create new cell types

Through duplication of genetic material cells can acquire new functions. This process may give rise to new cell types with unique properties. Prof. Alex Schier’s research group has now demonstrated that gene duplication has generated new cell types in fish, thus supporting a classic theory that gene duplication drives evolution. The evolution of new neurons may have helped the fish adapt to living conditions.



Shafer et al., *Nature Ecology and Evolution*

Trial run for new practical course

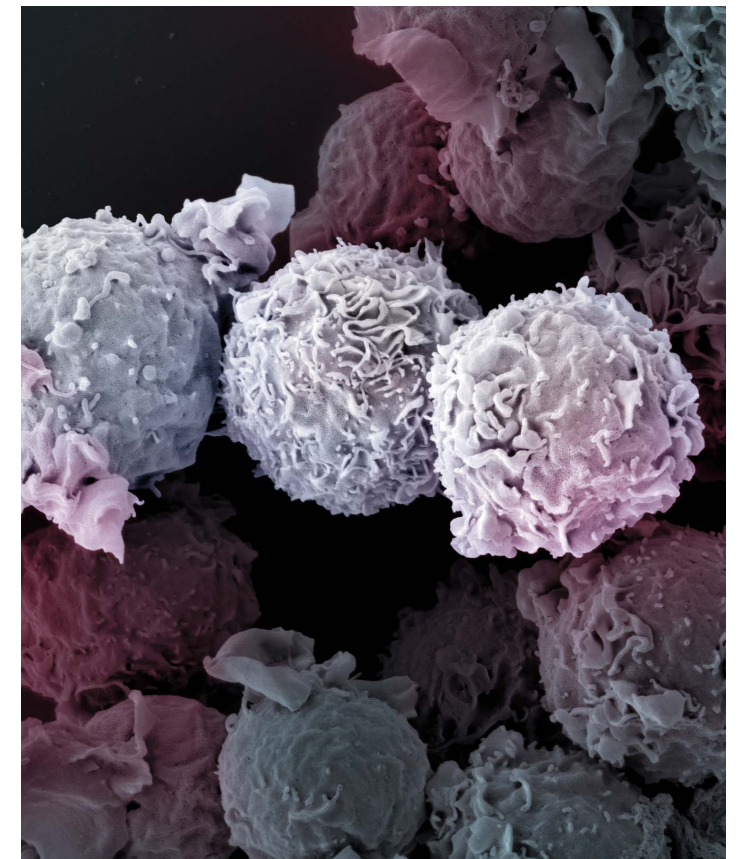
This year, a trial run for the new course “Experimental Molecular Biology” (EMB) started at the Biozentrum. In this course, Bachelor students learn what it means to work and think in a scientific way. The concept and structure was developed by Prof. Jean Pieters, Dr. David Thaler, Prof. Alex Schier and Dr. Dominik Buser. Remarkably, several of the undergraduates in the EMB course had been high school students in the Summer Science Academy. The annual course will start officially in Fall Semester 2023 and will then be mandatory for all students choosing the Bachelor of Science in Molecular Biology.



T cells: No time to die

They are at the forefront in the fight against viruses, bacteria, and malignant cells: the T cells of our immune system. But the older we get, the fewer of them our body produces. Thus, how long we remain healthy also depends on how long the T cells survive. Prof. Jean Pieters’ team has now been able to show that pathways previously thought to be implicated in T cell survival were in fact independent of the protein coronin 1, and they furthermore uncovered a hitherto unknown coronin 1-driven signaling pathway that regulates T cell survival.

Mori et al., *Science Signaling*



First Edition of the Biozentrum/Roche Innovation Symposium

In December 2021, the Biozentrum/Roche Innovation Symposium was held in Basel for the first time. This event brought together researchers at all levels from the Biozentrum and the Roche Division “Pharmaceutical Research and Early Development” (pRED) and provided them with a platform for scientific exchange, to explore new collaboration opportunities and for networking. The Innovation Symposium, initiated by Roche’s pRED, aims to promote dialogue between the two institutions active in the life sciences, to provide new impulses and to strengthen the collaborations between these two neighbors. The conference generated lively interest and some 350 persons from Switzerland and abroad registered to attend.



Worms equip their offspring for the future

For many animals, the survival of their progeny depends on their parents’ care, and this can affect the survival of the species. Prof. Susan Mango’s team has reported how nematodes experience their environment and respond by preparing their offspring to face good times as well as bad. They found that substances passed from mothers to offspring vary with the living conditions, and this variability can help the progeny master environmental challenges after birth. With this study, Mango and her team have been able to show for the first time how an animal can perceive its environment and use that information to influence the biology of the next generation.

Wasson et al., *Science Advances*

Cholesterol disrupts lipid metabolism

The cell's cholesterol level is decisive for fat regulation and therefore for the lipid metabolism of the entire organism. In their current study, the researchers led by Prof. Anne Spang discovered that the receptor Patched controls the cholesterol level in the cell and thus the organismal fat metabolism. In *C. elegans* worms in which the Patched receptor is inactivated, the cholesterol export from the cell does not work properly; as a result, the animals remain small and do not accumulate body fat. The researchers demonstrated that the increased cholesterol concentration impairs the formation of fat-storing lipid droplets, thus the cells and the entire organism lack fat as an energy source. The interaction between cholesterol and fat metabolism makes clear how precisely the organism must regulate cholesterol to survive in the long term. In another project, Spang's team developed a new method to better observe transport processes in cell organelles. In their assay, the researchers chemically stressed the cells, which respond by producing larger endosomes. This procedure makes the organelles better visible, so that it is possible to observe them with a regular microscope without extra features.

Cadena del Castillo et al.,
Nature Communications /
Podinovskaia et al., *eLife*

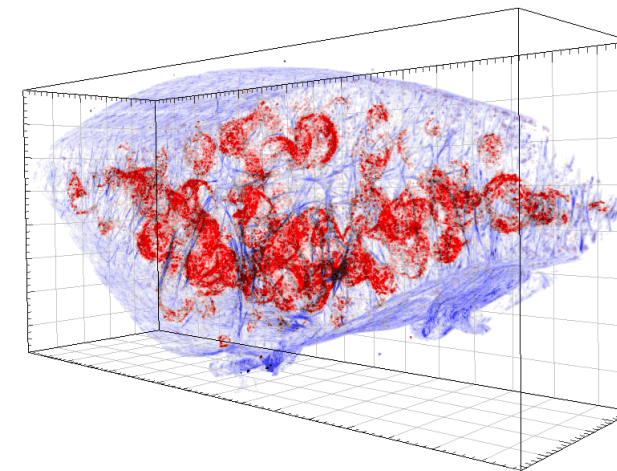


“Omicron will be dominant in Europe in about four weeks”

The data on viruses that Prof. Richard Neher receives every day, gives him a precise overview of the development of the SARS-CoV-2 virus and, lately, the variant Omicron. Indeed, it is a huge amount of data, more than he and his team has ever had about any virus before. With the online platform Nextstrain, he and his team can analyze how the genome and the molecular details of the viral proteins have changed over time, when a variant emerged, how a variant has replaced other variants over time or make inferences on how immune-evasive a certain variant could be, that is how good it can escape a preexisting immune response. His study on the spread of the SARS-CoV-2 variant

“20A.EU1”, which provides insights into the efficacy of travel policies, has recently been published in “Nature”. Since the SARS-CoV-2 outbreak in 2019, Richard Neher has been a frequently invited pandemic expert and discussion partner for the media worldwide. Additionally, he has been a member of the “Variants & Variants of Concerns” expert group of the Swiss National COVID-19 Task Force. The Task Force is committed to providing the federal and cantonal authorities with the most up to date understandings of the scientific data and information that are needed to respond to this crisis.

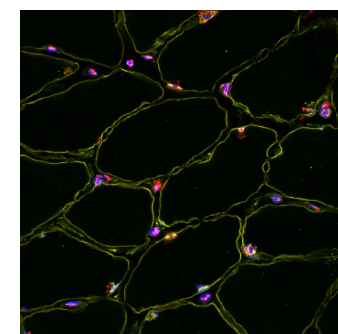
Hodcroft et al., *Nature*



Small but powerful: Tiny droplets for muscle endurance

Running a marathon requires a good training plan. Targeted endurance training accustoms the muscles to a physical workload and increases their performance. The extensive adaptations of muscles to training are mediated by the protein PGC-1 alpha. Packed in tiny droplets, it controls a complex genetic program that promotes muscle endurance. This has been reported by the teams of the Professors Christoph Handschin, Maria Hondele and Sebastian Hiller. Droplet formation is still an underappreciated but important process that enables certain key regulators such as PGC-1 alpha to control and coordinate complex biological programs.

Pérez-Schindler et al., *PNAS*



An enemy within: Pathogens hide in tissue

Antibiotics cure many bacterial infections. However, in some patients, a few bacteria survive the antibiotic therapy and can cause relapsing disease. For a long time, scientists have been trying to find out why antibiotics fail to kill all the bacteria. Prof. Dirk Bumann's group has now shown that it is not – as may be expected – due to dormant and therefore insensitive pathogens. Rather, there are certain areas in the tissue in which *Salmonella* can survive more or less unaffected by the body's immune defense. Using serial two-photon tomography, the scientists uncovered where the bacteria hide in the body and how the body's own immune system also plays an important role. They also developed an approach to boost the immune defense with the help of a simultaneously applied immune therapy. Such adjunct therapy may lead to more effective clearance of the bacteria, opening new avenues to prevent relapses.

Li et al., *PNAS*

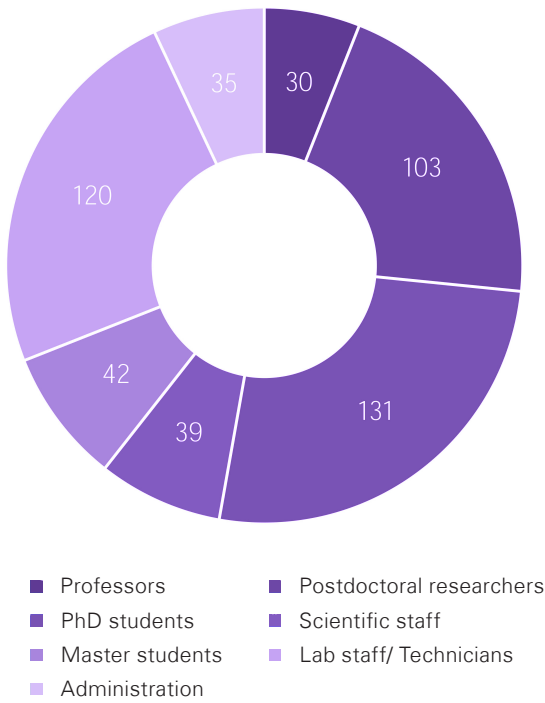


Prof. Markus Rüegg has been awarded the Lelio Orci Award 2021 for his contributions to the molecular principles that are essential for the development and maintenance of the neuromuscular system. His work has led to a better understanding of fundamental processes in biology and has paved the way for treatment options for severe human diseases of the neuromuscular system.

Facts & Figures.

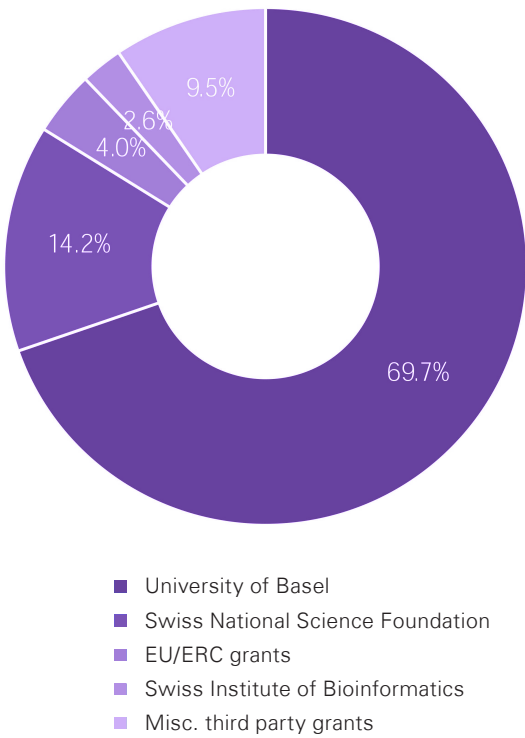
Members of staff

Total members of staff: 500
Scientists from over 60 countries



Annual financial statement

Sources of funding of the budget of 66.3 million Swiss francs:



Research groups 2021

Prof. Jan Pieter Abrahams
Prof. Markus Affolter
Prof. Silvia Arber
Prof. Marek Basler
Prof. Attila Becskei
Prof. Dirk Bumann
Prof. Christoph Dehio
Prof. Médéric Diard
Prof. Fiona Doetsch
Prof. Flavio Donato
Prof. Knut Drescher
Prof. Stephan Grzesiek
Prof. Michael N. Hall
Prof. Christoph Handschin
Prof. Sebastian Hiller
Prof. Maria Hondele

Prof. Urs Jenal
Prof. Anissa Kempf
Prof. Roderick Lim
Prof. Timm Maier
Prof. Susan Mango
Prof. Richard Neher
Prof. Camilo Perez
Prof. Jean Pieters
Prof. Markus Rüegg
Prof. Peter Scheiffele
Prof. Alex Schier
Prof. Torsten Schwede
Prof. Anne Spang
Prof. Kelly Tan
Prof. Erik van Nimwegen
Prof. Mihaela Zavolan

Awards, Grants & Fellowships for PhD students and Postdocs 2021

- Minia Antelo Varela**, EMBO Postdoctoral Fellowship
- Jérémie Breda**, Gottfried Schatz PhD Student Prize of the Biozentrum
- Hoi Ching Cheung**, Boehringer Ingelheim Fellowship
- Colin Delaney**, Novartis Foundation for Medical-Biological Research
- Jessica Eira**, EMBO Postdoctoral Fellowship
- Özgür Genç**, Translational fellowship NCCR RNA & Disease
- Gytis Jankevicius**, SNSF Propelling Grant
- Maxim Kolesnikov**, Novartis FreeNovation Grant
- Maria Kotini**, Excellent Junior Researcher, University of Basel
- Madalena Madeira Reimão Pinto**, Marie Skłodowska-Curie Individual Fellowship (MSCA)
- Debdatto Mookherjee**, Marie Skłodowska-Curie Individual Fellowship (MSCA)
- Christoph Müller**, Feodor Lynen Research Fellowship
- Anna Sueki**, Marie Skłodowska-Curie Individual Fellowship (MSCA)
- Yinan Wan**, Marie Skłodowska-Curie Individual Fellowship (MSCA)
- Bing Zhang**, J.C.W. Shepherd PhD Student Prize of the Biozentrum

