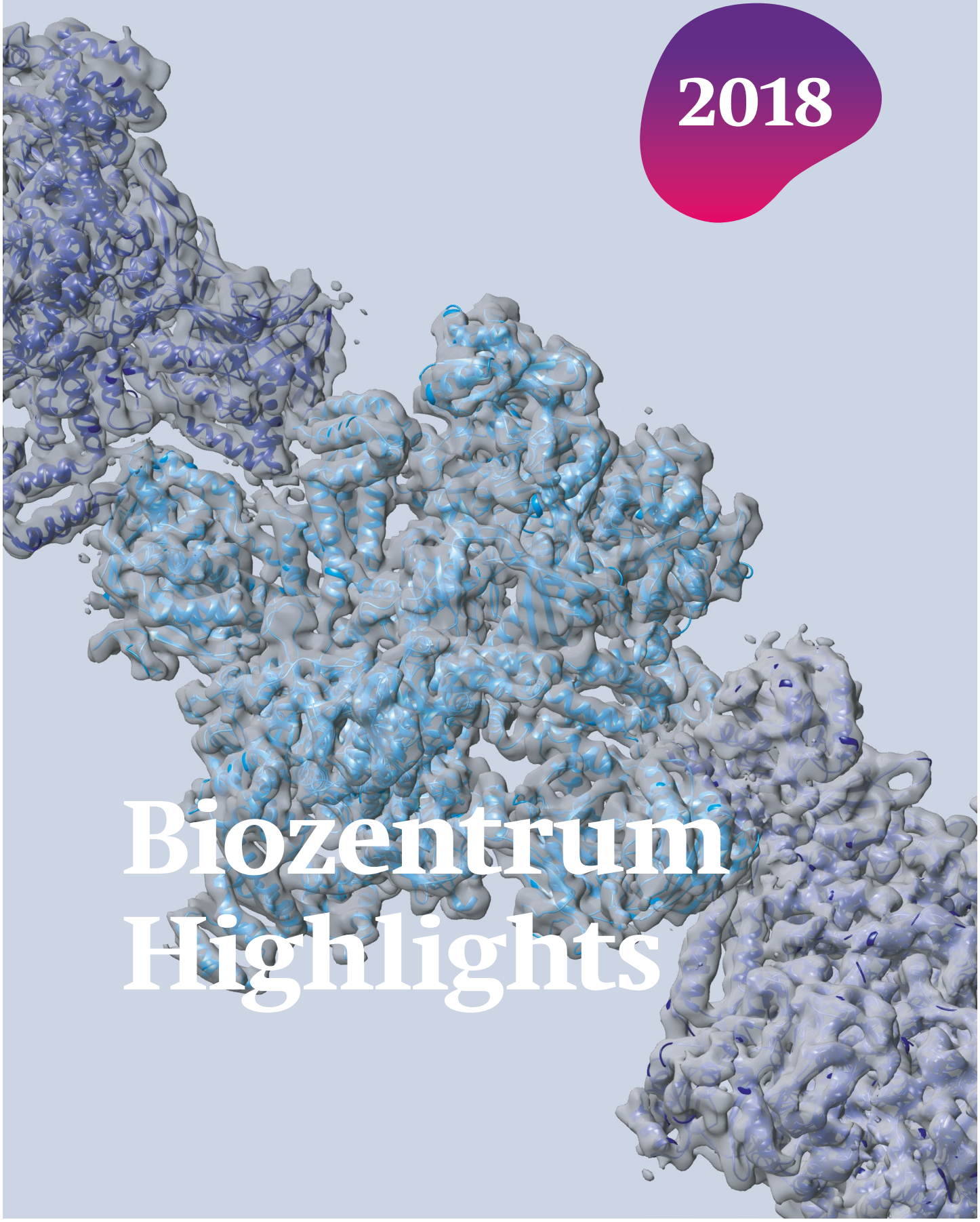
University of Basel

BIOZENTRUM
The Center for Molecular Life Sciences

2018



Biozentrum Highlights

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

Dear readers

The amazing diversity in biology rests on both constancy and change. The unalterable laws of chemistry and physics provide constancy, while mutation and selection result in evolutionary change. The same has been true for the Biozentrum since its founding in 1971: We follow unalterable principles while we evolve and change.

The year 2018 at the Biozentrum exemplified both constancy and change. We made new discoveries, welcomed new colleagues and launched new initiatives, but our goals and values have remained the same: Research and teach how molecules and cells create life, attract and nurture the most talented and passionate colleagues, focus on important and difficult problems with cutting-edge technologies, and create synergies between the Biozentrum and the Basel Life Sciences community.

The following pages will show you some of the highpoints of 2018. Let me highlight here just two of our new initiatives. First, we launched the Biozentrum Research Summer for undergraduate students. As part of our philosophy to teach through research, we opened our labs to undergraduates and let them experience for the first time what science is all about: creating new knowledge, not just consuming or conveying knowledge in the classroom. The program was a great success, and we look forward to welcoming the next cohort of students this summer. Second, we launched the Biozentrum Discovery Seminars, a new Biozentrum-wide seminar series that alternates between external talks by invited speakers, and internal seminars given by graduate students and postdocs from the Biozentrum. The goal of this series is to celebrate exciting discoveries and strengthen interactions within the Biozentrum. The seminar series got off to an excellent start, and we hope it will help scientists in different fields inspire each other, catalyze collaborations, and strengthen our community of curious and passionate scientists.

We are looking forward to a productive year, full of creative and rigorous research, inspiring teaching and learning, and generous and deep engagement with this very special community.

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

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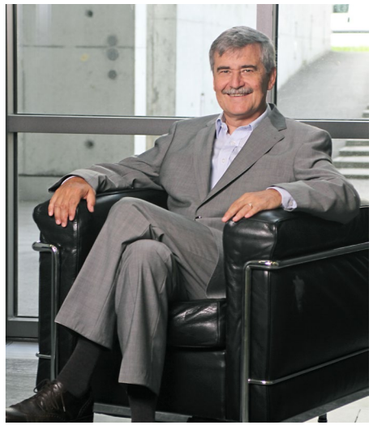
2018 at a glance.

January

Biozentrum farewells its first Director

On January 31, 2018, Erich Nigg, Director of the Biozentrum since 2009 and Professor of Cell Biology, retired. With Erich Nigg, the Biozentrum broke new ground changing from a chairman rotation system to appointing a devoted director to make long term planning easier. Among his most important contributions were the establishment of new standards of quality in the recruitment of young scientists to help the Biozentrum regain its high standing and of the new Core Facilities with their leading edge technologies and highly specialized expertise.



Prof. Silvia Arber received the Pradel Research Award 2018 by the National Academy of Sciences for her groundbreaking research on the organization and function of circuits regulating motor behavior.

Biozentrum Symposium 2018

On January 17, the annual symposium to promote scientific exchange and interdisciplinary teamwork again took place. Nearly 400 employees and students participated. The symposium offers a platform for young scientists in particular to present their research findings, be it in the form of lectures or in one of the poster sessions.

kids@science

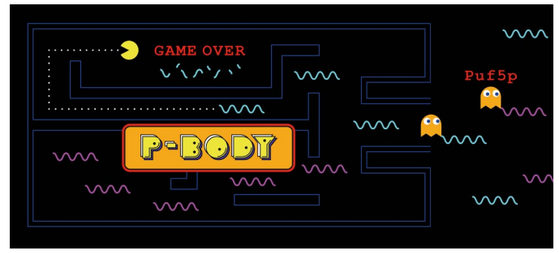
For the sixth time, nine girls and nine boys between ten to thirteen years of age participated in the study week kids@science. The program organized by the foundation “Schweizer Jugend forscht” aims to build an early awareness of science and technology.

Nature Communications: Lab-on-a-chip for tracking single bacterial cells

The research group led by Prof. Erik van Nimwegen together with researchers from the Max Planck Institute has set up a novel lab-on-a-chip with accompanying automatic analysis software, called MoMA. The integrated setup can be used to study gene regulation, growth and behavior of many generations of individual bacterial cells in response to dynamically controlled environmental changes.

eLife: Survival strategy of mRNAs during cellular sugar shortage

If a cell runs low on sugar, it stores certain messenger RNAs in order to prolong its life. Prof. Anne Spang’s research group has discovered that the protein Puf5p determines whether individual messenger RNAs will be stored or degraded when sugar levels are low. The study shows that Puf5p therefore sends the messenger RNAs to a cell organelle where their fate is sealed.



“As the new director, I look forward to writing the next chapter in the Biozentrum’s history together with my colleagues.”

February

Biozentrum welcomes new Director Alex Schier

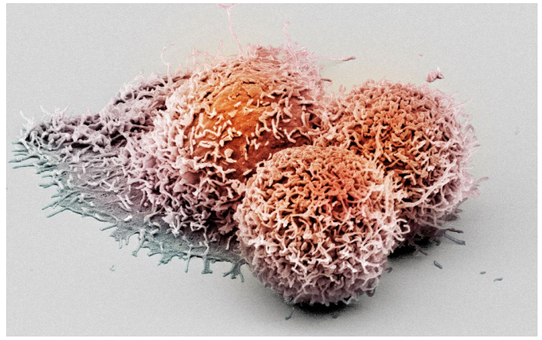
On February 1, 2018, Prof. Alexander F. Schier took over as the new Director. After 25 years, he returned from Harvard to the Biozentrum, where he was once a student and most impressed by the institute's great passion for science. “It is exciting to come back to Basel and apply the lessons I learned in Switzerland and America to helping catalyze the Life Sciences in Basel,” says the new Director. Alex Schier is internationally renowned for his pioneering research on the development of vertebrates, using zebrafish as a model organism.

Prof. Marek Basler received the renowned Friedrich Miescher Award. This prize is Switzerland's highest distinction for young scientists working in the field of biochemistry.

March

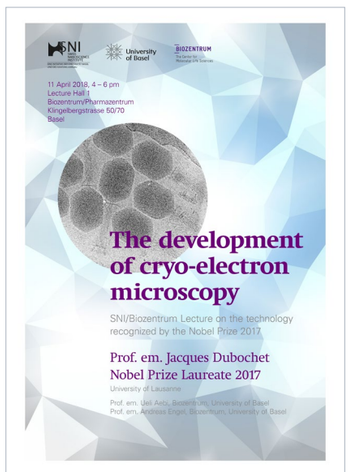
Nature:
Discovery of new anti-cancer protein

An international team of researchers led by Prof. Michael N. Hall discovered a new, so far unknown tumor suppressor, the protein LHPP. In their study, they showed that the loss of LHPP promotes tumor growth and reduces the chance of survival of cancer patients. The researchers reported in “Nature” that LHPP can also serve as a biomarker for the diagnosis and prognosis of liver cancer.



Mini-symposium with Nobel laureate Jacques Dubochet

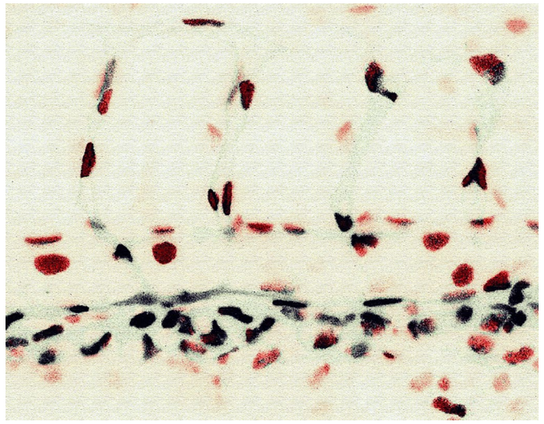
In 2017, Prof. em. Jacques Dubochet, along with two other scientists, was awarded the Nobel Prize in Chemistry for developing cryo-electron microscopy. In a symposium organized by the Swiss Nanoscience Institute (SNI) and the Biozentrum, he and two of his long-time colleagues, Prof. em. Ueli Aebi und Prof. em. Andreas Engel, provided fascinating insights into this technology. All three had earlier conducted research at the Biozentrum in the group of Eduard Kellenberger, from which Jacques Dubochet received his PhD in 1974.



April

Fiona Doetsch receives prestigious ERC research grant

The European Research Council (ERC) awarded the neuroscientist and stem cell biologist Prof. Fiona Doetsch a highly endowed “ERC Advanced Grant”. In the project, funded with around 2.5 million euros over five years, Doetsch will investigate how physiological conditions modulate the maturation and the behavior of stem cells in the adult brain.



SNSF Scientific Image Competition

Maria Kotini, postdoc in the Affolter group, is one of the four winners of the SNSF Scientific Image Competition. She has been awarded for her image “Portrait of a cell population” – revealing the beauty of a zebrafish.

May

Torsten Schwede appointed new Vice President for Research of the University of Basel

Prof. Torsten Schwede became the elected Vice President for Research at the University of Basel. Torsten Schwede joined the Biozentrum as Assistant Professor of Structural Bioinformatics in 2001. In 2007 he was promoted to Associate Professor and in 2018 to Full Professor. Torsten Schwede is also a group leader at the Swiss Institute of Bioinformatics (SIB) and Director of sciCORE, where he is responsible for the central infrastructure for scientific computing at the University of Basel. As Chairman of the Scientific Expert Board and Director of the Data Coordination Centre of the Swiss Personalized Health Network (SPHN), Schwede is committed to the development of research in the field of personalized health and medicine in Switzerland.

Prof. Marek Basler was awarded the EMBO Gold Medal for his outstanding scientific achievements in the field of infection biology.

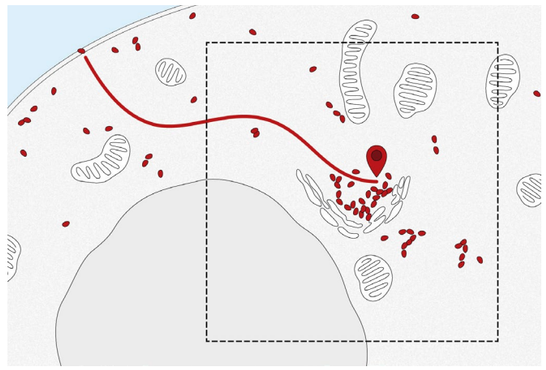
Biozentrum Retreat

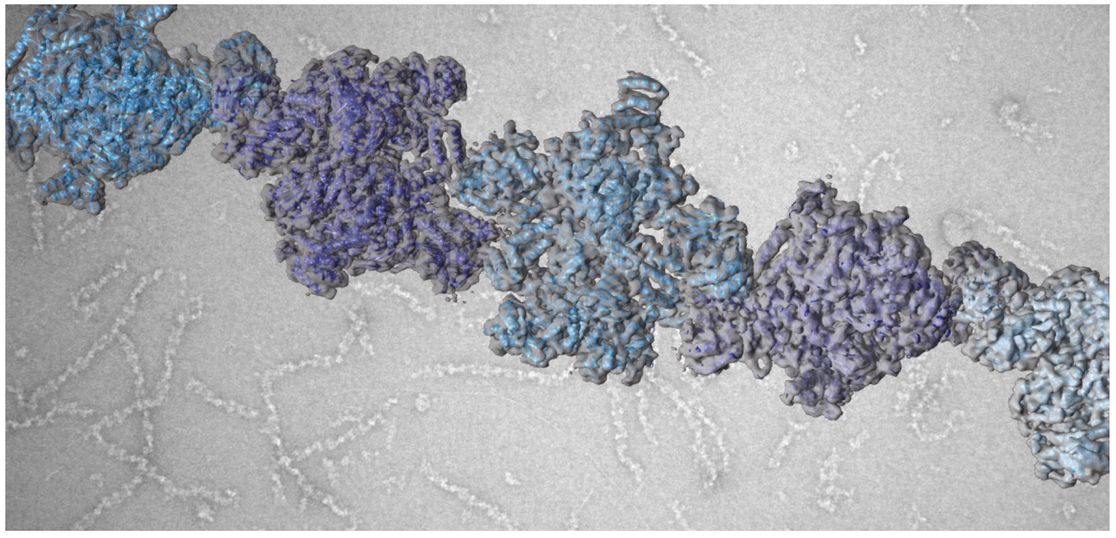
On May 19th to 20th, the Biozentrum Group Leaders gathered for their yearly retreat. The focus lay on the development of new strategies in teaching, ranging from spurring more hands-on and original research at an early stage, to teaching students to become scientists, how to optimize seminars and what a leading Bachelor program in the Life Sciences would look like if it were designed from scratch.

June

PNAS:
How to track and trace a protein: Nanosensors monitor intracellular deliveries

Membrane proteins ensure that many substances, such as hormones and other proteins, are transported from the cell surface into the cell or carried out again. The research group led by Prof. Martin Spiess has developed a method for tracing the movement of proteins within the cell. They tagged proteins with tiny nanosensors, so-called nanobodies, which enable the scientists to live track and trace the proteins' pathway through the cell. In the future, this quantitative method can also be applied to elucidate the molecular transport mechanisms inside the cells.





Nature:
Enigma of fatty acid metabolism solved

The core component of all fats are fatty acids. Their production is initiated by the enzyme ACC. Researchers led by Prof. Timm Maier demonstrated how ACC assembles into distinct filaments. As they reported in "Nature", the type of filament formed controls the activity of the enzyme and thus fatty acid production. Metabolites signaling an excess of carbohydrates drive the enzyme to form a filament, which efficiently catalyzes chemical reactions and stimulates fatty acid production. ACC can also be switched off by filament formation. This versatile mode of regulation by changing the overall shape of the enzyme is unique and was previously unknown.

Marek Basler, Assistant Professor for Infection Biology since 2013, was promoted to Associate Professor.

Biozentrum again part of the largest EU-funded research project on autism

Prof. Peter Scheiffele has received a grant of 1.2 million euros to study autism. He is a partner in the EU research grant "Autism Innovative Medicine Studies-2-Trials", awarded by the Innovative Medicines Initiative (IMI) and supported with a total of 115 million euros.

New SNSF Professor

On June 1st, Médéric Diard started as a new SNSF Professor at the Biozentrum. Diard obtained his PhD from the Institut National de la Santé et de la Recherche Médicale (INSERM). He then worked as a teaching assistant at the Université Paris Descartes and, since 2009, as a research assistant and lecturer at the ETH Zurich. The team of Médéric Diard focuses on the ecology and evolution of enteropathogenic bacteria.

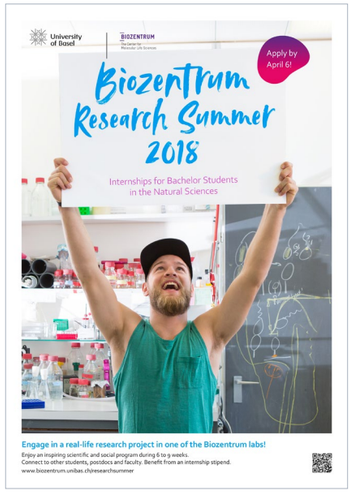
July

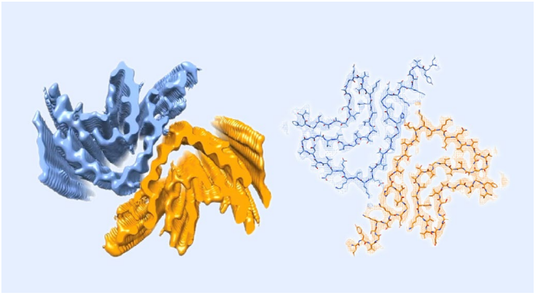
From Harvard to Basel

Susan Mango's group moved from Harvard, where she was a Professor of Molecular and Cellular Biology, to the Biozentrum. The renowned scientist investigates one of the fundamental questions in biology, dealing with how complex organs develop from stem cells and which factors coordinate this process.

A new springboard into research for bachelor students

The early involvement of students in real-life research has always been an exceptional quality feature of the Biozentrum. Now a further opportunity has opened with the new "Biozentrum Research Summer" an internship for bachelor students in the sciences to immerse themselves in cutting-edge research projects for up to nine weeks. Nineteen bachelor students from Switzerland and abroad were selected by the research group leaders from over 100 applicants.





eLife:
How does Parkinson's disease develop? Study raises doubts on theory of Parkinson's disease

The exact causes of Parkinson's disease are still unknown. In a recent study, the team of researchers led by Prof. Henning Stahlberg has questioned the previous understanding of this disease. So far, it was assumed that mutations in the alpha-synuclein protein cause the formation of dangerous fibrils, which accumulate in the nerve cells and damage the affected brain cells. The researchers artificially generated alpha-synuclein fibrils and visualized the 3D structure with atomic resolution. Surprisingly, the structure reveals that mutated alpha-synuclein proteins should not be able to form these type of fibrils, as the location of the mutations would rather hinder fibril formation.

August

W. Alden Spencer Award goes to Silvia Arber

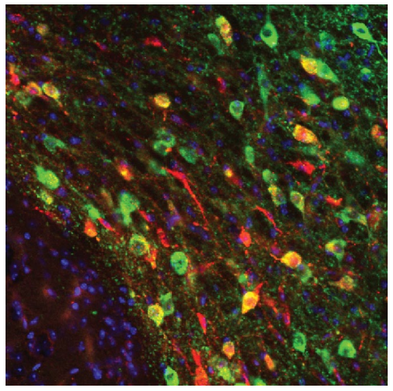
Prof. Silvia Arber and Prof. Botond Roska were selected as co-recipients of the 2018 W. Alden Spencer Award. The award is presented annually by the Department of Neuroscience and the Kavli Institute for Brain Science at the College of Physicians and Surgeons of Columbia University.

Prof. Sebastian Hiller was awarded the Founder's Medal of the International Council on Magnetic Resonance in Biological Systems. The prize is one of the most important awards in the field of nuclear magnetic resonance spectroscopy (NMR).

Neuron: Movement control: How our brain responds to unexpected situations

The team led by Prof. Silvia Arber has demonstrated that the motor cortex is only necessary for the execution of corrective movements in response to unexpected changes of sensory input but not when the same movements are executed spontaneously. Signatures of differential neuronal usage in the cortex accompany these two phenomena. The findings change the way we think about how motor cortex functions.

Fiona Doetsch, the internationally acclaimed scientist in the field of neural stem cells and the development of the nervous system, was promoted to Full Professor.



Nature Communications: Synapses of the reward system at stake in autistic disorders

One of the main characteristics of autism spectrum disorders is the impaired social communication. But what happens in patients' brains that disrupts their social skills? According to scientists from Prof. Peter Scheiffele's group and from the University of Geneva, a malfunction of the synaptic activity of neurons present in the reward system seems to be at stake. Therefore, the scientists developed a mice model that imitates mutations identified in autistic people. Unlike their normal counterparts, these mice had a lack of interest in novelty and less motivation to interact socially, behavioral traits frequently found in some autistic individuals.

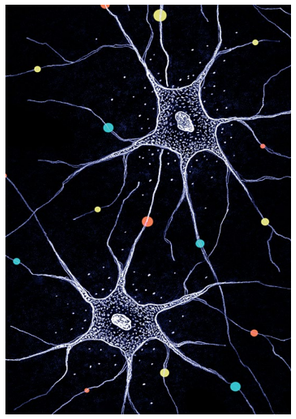
September

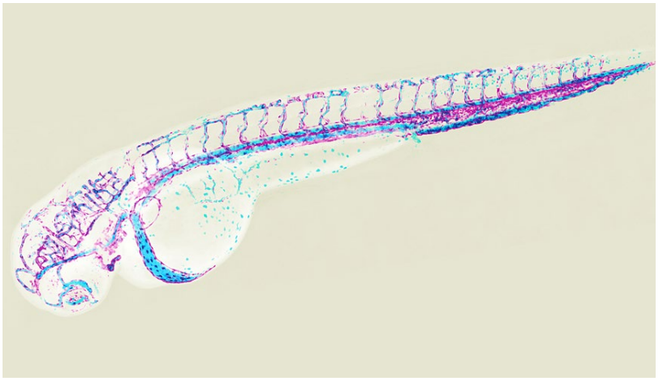
New winter call for Biozentrum PhD Fellowships

To give outstanding master's graduates from around the world the same opportunity, despite differences in study schedules, the Biozentrum has launched an additional winter call for its prestigious and much sought after PhD fellowships.

Cell Reports: How millions of neurons become unique

A mathematical model developed by Prof. Attila Becskei's team demonstrates that the random combination of different gene isoforms enables the generation of diverse populations of neurons.





Nature Communications: Like a zipper – How cells form new blood vessels

Blood vessel formation relies on the ability of vascular cells to move while remaining firmly connected to each other. This enables the vessels to grow and sprout without leaking any blood. The scientists led by Prof. Markus Affolter have elucidated how this works. In this process, the cytoskeleton pushes the cell forward, while an adhesion protein subsequently closes the gap to the neighboring cell, like a zipper. If the cells were unable to remain attached, bleeding into the surrounding tissue would occur during vascularization.

October

Two SNSF Ambizione Fellowships for the Biozentrum

Two young scientists from the Biozentrum received a much coveted SNSF Ambizione Grant. Alexander Harms is investigating how bacterial viruses can be applied to fight chronic infections caused by antibiotic-tolerant pathogens. Shinya Matsuda is pursuing the question of how cells get their identity during development. The two projects will each receive more than 900,000 Swiss francs over four years. Alexander Harms and Shinya Matsuda are two of a total of 90 scientists in Switzerland receiving an SNSF Ambizione Grant this year. In total, 288 Ambizione applications were submitted to the SNSF.

November

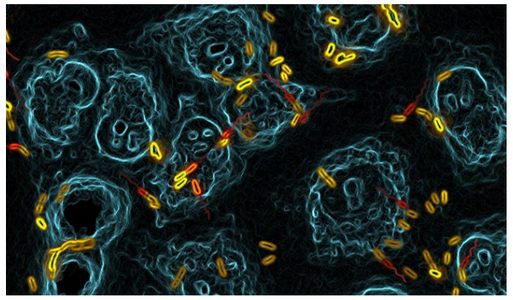
T3 Pharmaceuticals wins Falling Walls Venture Award 2018

T3 Pharmaceuticals, a biotech start-up company of the Biozentrum with a focus on immuno-oncology, was named “2018 Science Start-Up of the Year” by Falling Walls Venture. The award honors the scientist-entrepreneurs for their breakthrough business model in bacterial cancer therapy.

December

Cell Host & Microbe: Pathogen's twin-track strategy

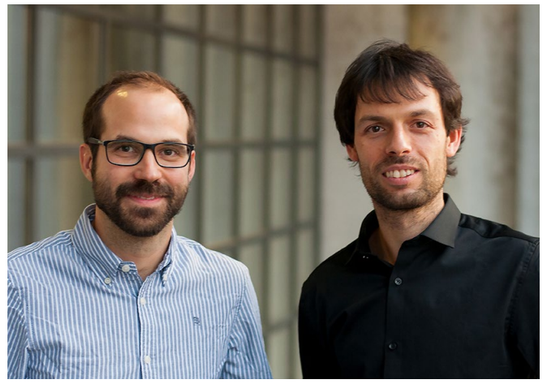
The pneumonia causing pathogen *Pseudomonas aeruginosa* has developed a twin-track strategy to colonize its host. It generates two different cells – motile spreaders and virulent stickers. The team led by Prof. Urs Jenal has now elucidated how the pathogen attaches to tissue within seconds and consecutively spreads. Just like the business model: settling - growing - expanding.

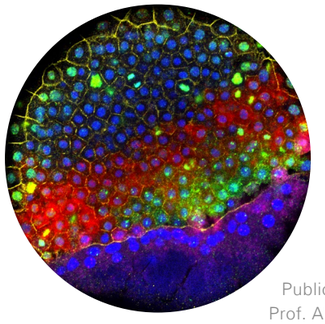


For his achievements in cancer research, the cell biologist Prof. Michael Hall was awarded the Charles Rodolphe Brupbacher Prize 2019.

First Innosuisse Project

Stefan Imseng and Asier González have ventured into entrepreneurship. The Swiss Innovation Agency Innosuisse is funding their project “Development of a lead compound for specific mTORC1 inhibition” with a grant of 350,000 Swiss francs. This is the first project from the University of Basel supported by Innosuisse. In the feasibility study, the scientists are searching for suitable active substances, which could provide a novel approach for inhibiting mTORC1, the key factor controlling cell growth.





Publications of Prof. Alex Schier from the Biozentrum and Harvard University were selected as the “Breakthrough of the Year 2018” by the magazine “Science”. In their studies, his research team was able to reconstruct the developmental trajectories of individual embryonic cells for the first time.

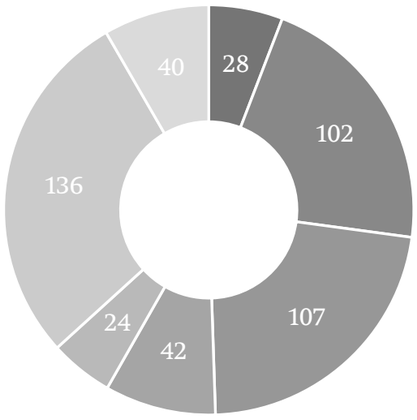
Launch of new Biozentrum Discovery Seminar series

The Biozentrum Discovery Seminar series, which alternates between talks by invited group leaders from other institutions and seminars given by graduate students and postdocs from the Biozentrum, was launched. The first presentations by the Biozentrum scientists Hanna Hörnberg, Scheiffele lab, and Benoit Laventie, Jenal lab, dissected fascinating cellular recognition and decision processes.

Facts & Figures.

Members of staff

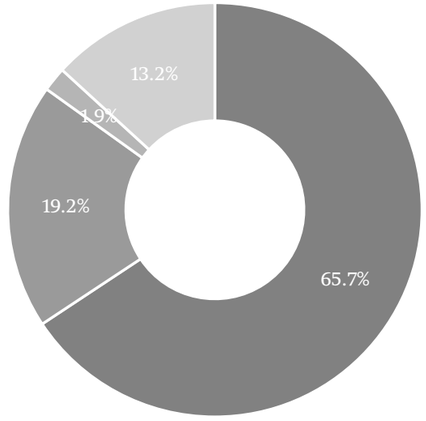
Total members of staff: 479
Scientists from more than 50 countries



- Professors
- PhD students
- Master students
- Administration
- Postdoctoral researchers
- Scientific staff
- Lab staff/ Technicians

Annual financial statement

Funding of the 61.4 million Swiss francs budget:



- University of Basel
- Swiss National Science Foundation
- Swiss Institute of Bioinformatics
- Misc. third party grants

Research groups 2018

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 (as of June 1)
Prof. Fiona Doetsch
Prof. Stephan Grzesiek
Prof. Michael N. Hall
Prof. Christoph Handschin
Prof. Sebastian Hiller
Prof. Sonja Hofer (until January 31)
Prof. Urs Jenal
Prof. Roderick Lim
Prof. Timm Maier
Prof. Susan Mango (as of July 1)
Prof. Thomas Mrsic-Flogel (until January 31)
Prof. Richard Neher
Prof. Erich A. Nigg (until January 31)
Prof. Camilo Perez
Prof. Jean Pieters
Prof. Markus Rüegg
Prof. Peter Scheiffele
Prof. Tilman Schirmer
Prof. Torsten Schwede
Prof. Anne Spang
Prof. Martin Spiess
Prof. Henning Stahlberg
Prof. Kelly Tan
Prof. Erik van Nimwegen
Prof. Mihaela Zavolan