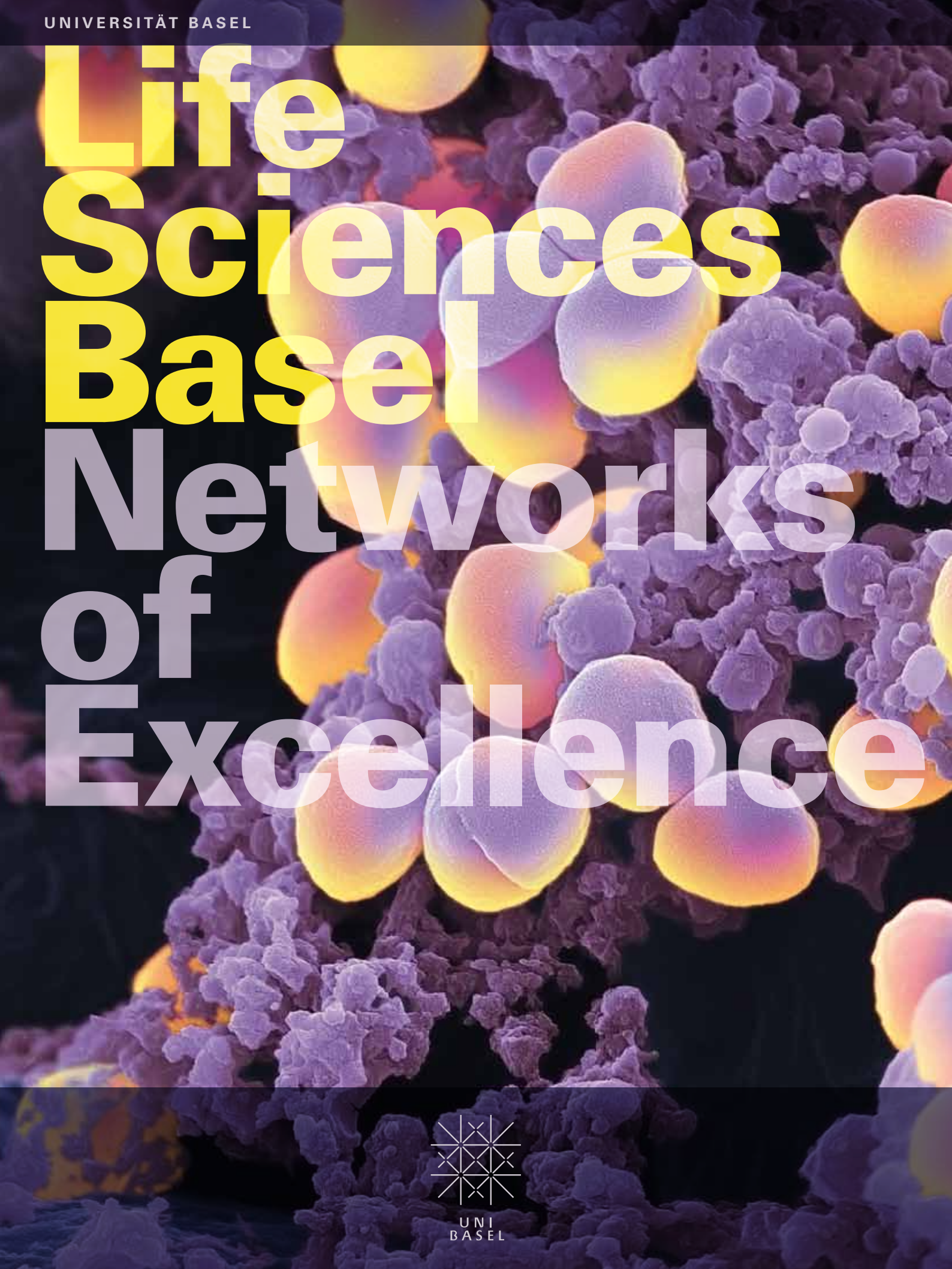
UNIVERSITÄT BASEL

Life Sciences Basel Networks of Excellence



UNI BASEL

Welcome to the Life Sciences

cluster in Basel!

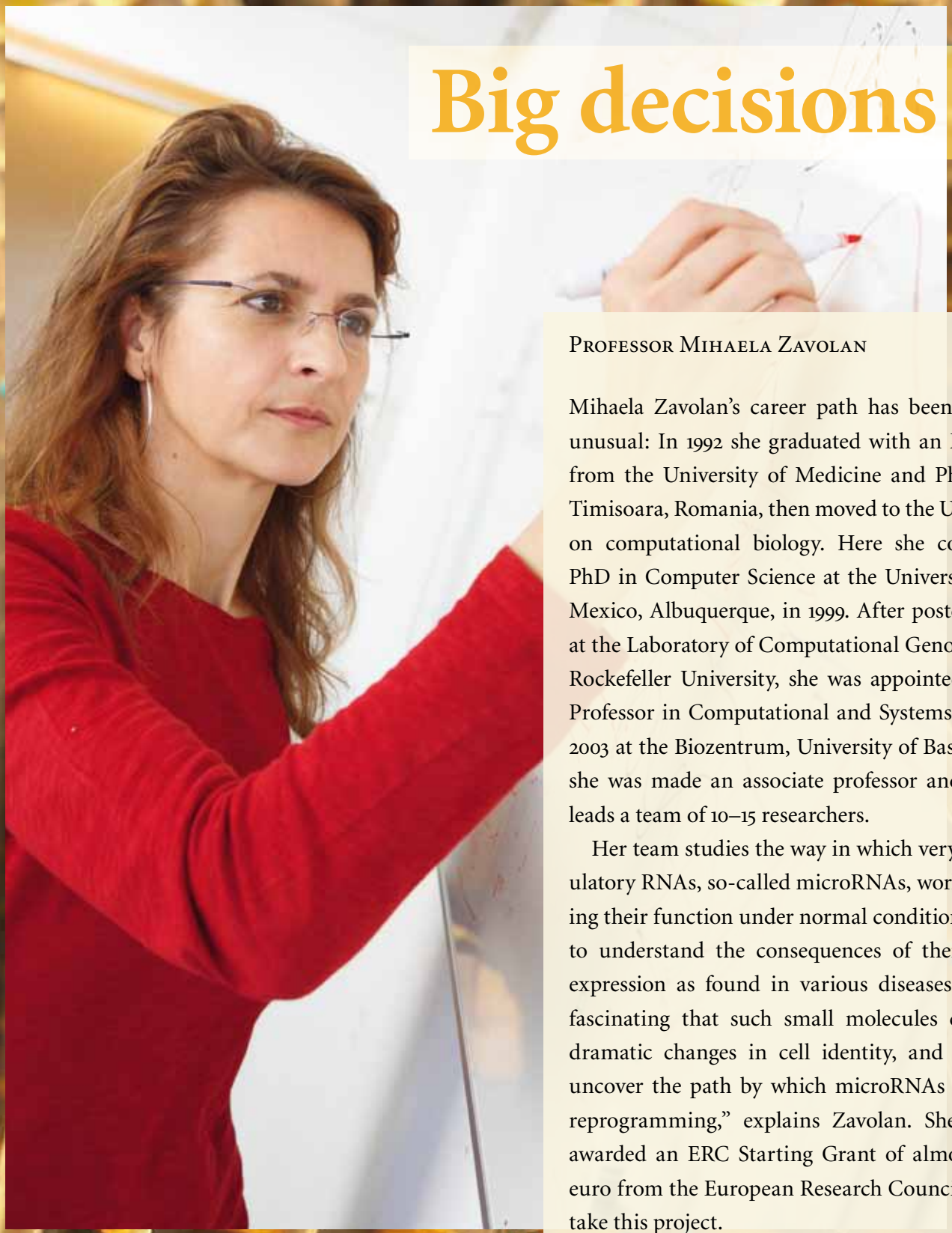
Professor Edwin Charles Constable
Vice-Rector for Research

In 2010, the University of Basel celebrated its 550th anniversary. As the oldest university in Switzerland and one of the oldest in Europe, we have a proud history in chemistry, biology and medicine. The Nobel Prize winners Paul Müller, Tadeus Reichstein, Werner Arber, Georges Köhler, Susumu Tonegawa and Rolf Zinkernagel all contributed to the University's exceptional strength today: the life sciences. According to the Shanghai Ranking, the University of Basel belongs among the top ten European and the top fifty worldwide institutions in the life sciences. Naturally, the University will continue to demonstrate strength in this discipline and will remain a crucial player in the life sciences cluster in Basel.

The life sciences have an exceptional knowledge and industrial base in Basel. In striving for consistent excellence, the University and its associated institutes are open to talented international and regional students with an interest in the natural sciences, medicine and technology. Under the flagship of "life sciences", these fields provide the necessary critical mass to engender interdisciplinary and innovative science.

Within the life sciences, the University of Basel focuses on nanosciences, computational and systems biology, stem cell and cancer research, neurosciences, immunology, infection biology and pharmaceutical science. In these fields, the translational research model ensures that pure research connects with potential applications. By maintaining these networks of excellence, the University of Basel will endeavor to secure a prominent position in international competition.

Big decisions with



Professor Mihaela Zavolan

Mihaela Zavolan's career path has been somewhat unusual: In 1992 she graduated with an MD degree from the University of Medicine and Pharmacy of Timisoara, Romania, then moved to the USA to work on computational biology. Here she completed a PhD in Computer Science at the University of New Mexico, Albuquerque, in 1999. After postdoc studies at the Laboratory of Computational Genomics at the Rockefeller University, she was appointed Assistant Professor in Computational and Systems Biology in 2003 at the Biozentrum, University of Basel. In 2008, she was made an associate professor and currently leads a team of 10–15 researchers.

Her team studies the way in which very small regulatory RNAs, so-called microRNAs, work. Examining their function under normal conditions will help to understand the consequences of their aberrant expression as found in various diseases. "I find it fascinating that such small molecules can trigger dramatic changes in cell identity, and I'd like to uncover the path by which microRNAs induce cell reprogramming," explains Zavolan. She has been awarded an ERC Starting Grant of almost 900,000 euro from the European Research Council to undertake this project.

The Biozentrum offers Zavolan the best possible conditions for her work. Computational and molecular biologists in her group combine experimental results with data analyses and computational modeling. Her latest project is "Dealing with uncertainty: controlling and exploiting stochasticity in gene regulatory networks" and has received 2.5 million euro in funding from the SystemsX.ch initiative.

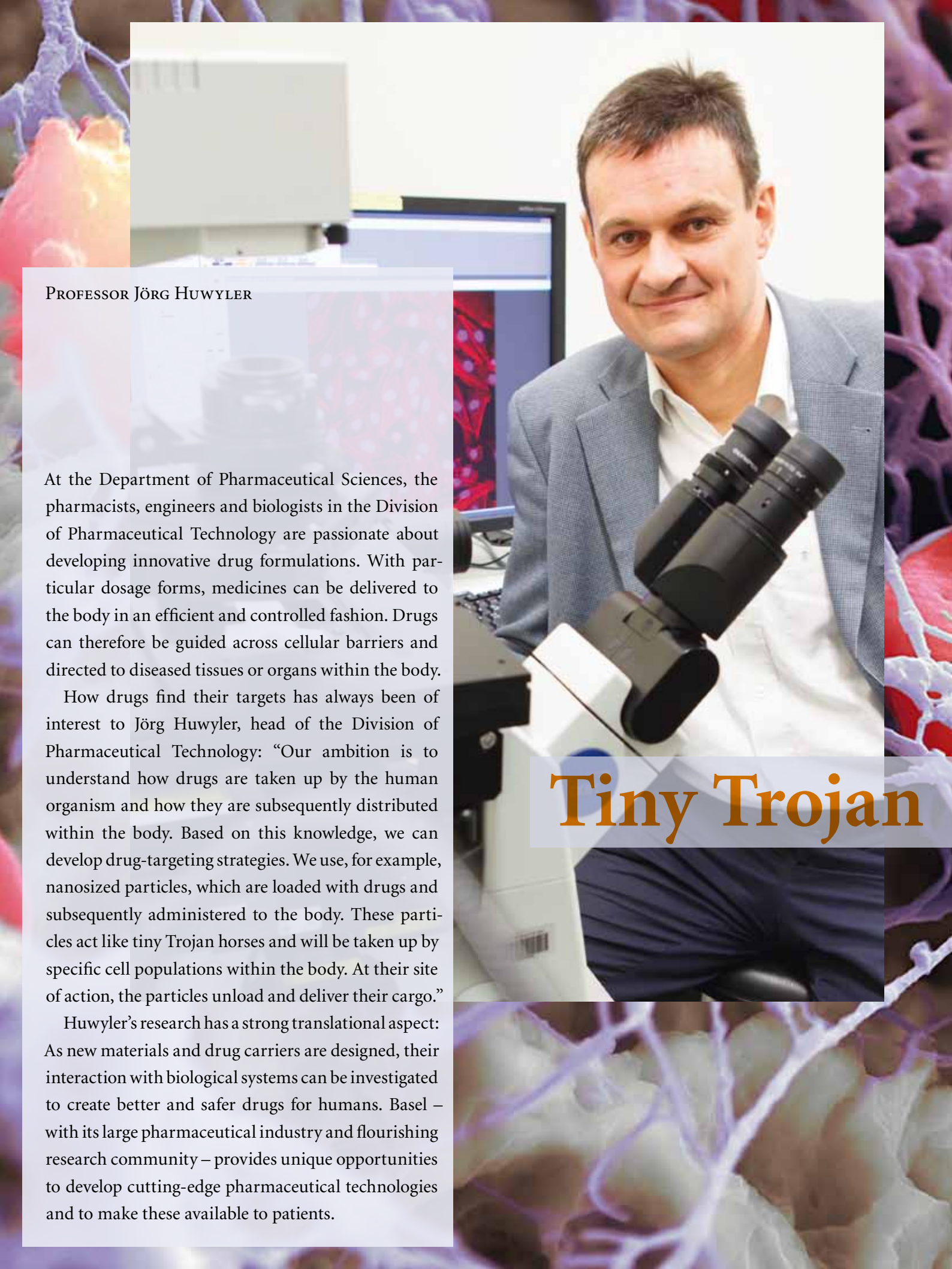
small regulators

Biozentrum

The Biozentrum is an interdisciplinary institute for teaching and basic research in molecular and biomedical sciences. Research focuses on cell growth and development, infection biology, neurobiology, structural biology and biophysics, and computational and systems biology.

Founded in 1971, the Biozentrum hosts more than 30 research groups and a staff of around 550 members from over 30 nations. With an output of approximately 200 scientific publications per year, it ranks in the top quarter of research institutes internationally.

www.biozentrum.unibas.ch



Tiny Trojan

Professor Jörg Huwyler

At the Department of Pharmaceutical Sciences, the pharmacists, engineers and biologists in the Division of Pharmaceutical Technology are passionate about developing innovative drug formulations. With particular dosage forms, medicines can be delivered to the body in an efficient and controlled fashion. Drugs can therefore be guided across cellular barriers and directed to diseased tissues or organs within the body.

How drugs find their targets has always been of interest to Jörg Huwyler, head of the Division of Pharmaceutical Technology: "Our ambition is to understand how drugs are taken up by the human organism and how they are subsequently distributed within the body. Based on this knowledge, we can develop drug-targeting strategies. We use, for example, nanosized particles, which are loaded with drugs and subsequently administered to the body. These particles act like tiny Trojan horses and will be taken up by specific cell populations within the body. At their site of action, the particles unload and deliver their cargo."

Huwyler's research has a strong translational aspect: As new materials and drug carriers are designed, their interaction with biological systems can be investigated to create better and safer drugs for humans. Basel – with its large pharmaceutical industry and flourishing research community – provides unique opportunities to develop cutting-edge pharmaceutical technologies and to make these available to patients.

Department of
Pharmaceutical Sciences

The Department of Pharmaceutical Sciences is an interdisciplinary center of excellence at the University of Basel that focuses on research and teaching in drug development, drug therapy and drug safety. Together with partners from the pharmaceutical industry, it translates our growing knowledge of the molecular basis of diseases into improved therapies.

Due to rapid progress in basic biomedical knowledge and constant changes in drug development and clinical pharmacotherapy, there is an acute need for a forum where a community of experts from academia and industry can exchange knowledge.

pharma.unibas.ch

horses as drug carriers

Basel University Hospital

Interferon efficacy

Basel University Hospital has around 5,000 staff and is thus one of the five largest health centers in Switzerland. A variety of tasks are undertaken at the Hospital, for example the examination, medical treatment, care and aftercare of patients. It has a leading reputation in the field of kidney and stem cell transplants.

The close connection between the Hospital and the University – as a center of teaching and state-of-the-art research – enables cross-fertilization. Hospital clinicians are, therefore, always up to date on the latest research and able to apply the newest and best treatment methods and equipment.

www.unispital-basel.ch

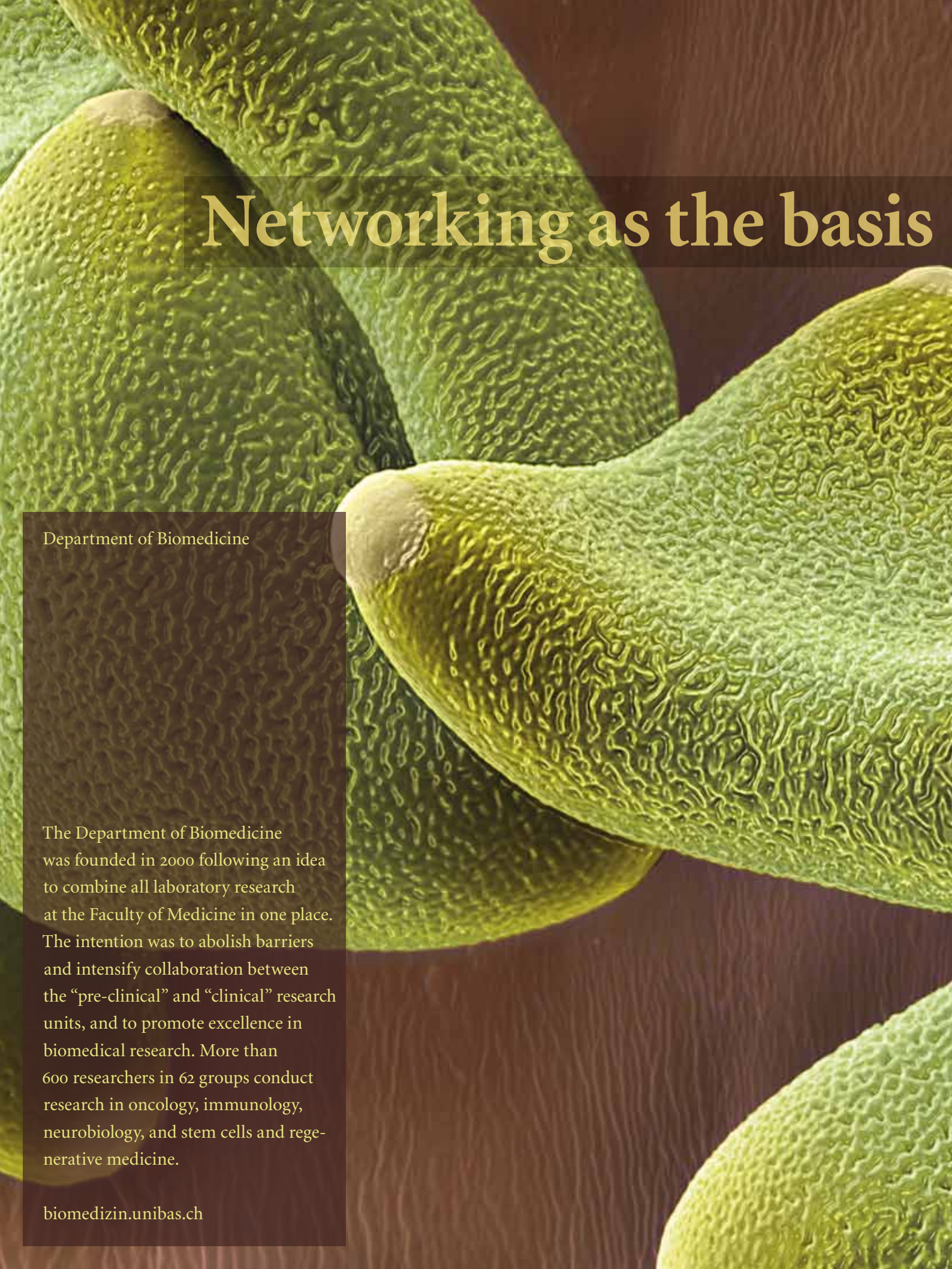
Professor Markus H. Heim

under scrutiny

Chronic infection with the hepatitis C virus is one of the most common causes of liver disease and can even lead to cirrhosis or cancer of the liver. The current treatment option – using pegylated interferons in combination with ribavirin – can take up to twelve months and often puts great stress on the patient. In terms of success rate, only about half of the sufferers are healed. A research group led by medical professor Markus Heim has been able to provide strong evidence for why the treatment is often not effective.

The study was made possible by the willingness of 16 patients to undergo a liver biopsy before and after being injected with interferon. The research team then investigated the molecular impact of interferon on the liver. It revealed that in many patients the liver's own interferon system was – unexpectedly – already active before the treatment was started. This was why the administered interferon had no impact on the liver cells.

It is not yet clear what lies behind this observation. It is equally unclear why the body's own interferon system cannot eliminate the infection with the hepatitis C virus. This is the next puzzle that Markus Heim wants to solve.



Networking as the basis

Department of Biomedicine

The Department of Biomedicine was founded in 2000 following an idea to combine all laboratory research at the Faculty of Medicine in one place. The intention was to abolish barriers and intensify collaboration between the “pre-clinical” and “clinical” research units, and to promote excellence in biomedical research. More than 600 researchers in 62 groups conduct research in oncology, immunology, neurobiology, and stem cells and regenerative medicine.

biomedizin.unibas.ch

for success

Professor Daniela Finke

Daniela Finke is a professor at the University Children's Hospital Basel (UKBB) and the Department of Biomedicine. She is an enthusiastic developmental immunologist with a commitment to the next generation of early career researchers. Together with LearnTechNet Basel, she has developed a teaching module in which students learn how to participate effectively in a scientific congress.

Professor Finke's research focuses on the molecular pathways that regulate the development of immune cells and organs from fetal to adult life. Her team has identified 'lymphoid tissue inducer cells' as the earliest innate lymphoid cells regulating lymphoid organ formation. They are used in tissue repair, mucosal immunity, and inflammation in response to the microenvironment. "This knowledge opens up new avenues for modulating immune responses in patients with chronic inflammation and autoimmune diseases. Our work is at the interface between immunology, developmental biology and biomedicine. A strong network of scientific excellence between faculties, basic research divisions and clinics makes these studies possible."

She values the BioValley Network which successfully brings together life science initiatives from industry and research in the adjoining countries of Switzerland, France and Germany in the Basel region. The University of Basel strongly supports interdisciplinary and international research activities, and in her work here Finke aims to implement platforms shared between life science researchers. "This makes knowledge and technology transfer much simpler."

Professor Wolfgang P. Meier

A vision of

At the Swiss Nanoscience Institute (SNI), physicists, biologists, chemists and engineers interact closely together. One of their long-term goals is to develop completely new methods of producing clean drinking water.

The concept behind this product is found in aquaporins – extraordinary, pipe-shaped proteins that purify water in the kidneys. Aquaporins only let water molecules pass through them and therefore make the perfect water filters. The team's goal is to develop artificial membranes into which aquaporins can be integrated. Such membranes could theoretically produce clean drinking water within just a few seconds.

The team, led by Wolfgang Meier, Professor of Physical Chemistry, has succeeded in isolating aquaporins and putting them into a sealed membrane. They have been able to prove that salts or bacteria dissolved in water cannot pass through the membrane. Now the team is working on making this technology suitable for everyday use.

"This work is highly interdisciplinary," explains Wolfgang Meier. "We need expertise in the fields of polymer chemistry, surface chemistry, structural biology and engineering. Much of this expertise can already be found right here in the Basel research hub."

clean drinking water

Swiss Nanoscience Institute

The Swiss Nanoscience Institute (SNI) combines fundamental and applied research. About 200 scientists work together in interdisciplinary groups of physicists, pharmacologists, biologists, chemists, physicians, computer scientists and engineers. They focus on nanobiology, quantum computing and quantum coherence, atomic and molecular nanosystems, molecular electronics, functional materials, nanotechnology and applications.

A major objective of the SNI is to facilitate the transfer of scientific results to other research institutions and companies and to support the commercial use of their own scientific findings. The establishment of the SNI further consolidates the position of the University of Basel as an internationally acknowledged center of excellence in nanoscale sciences.

www.nanoscience.ch

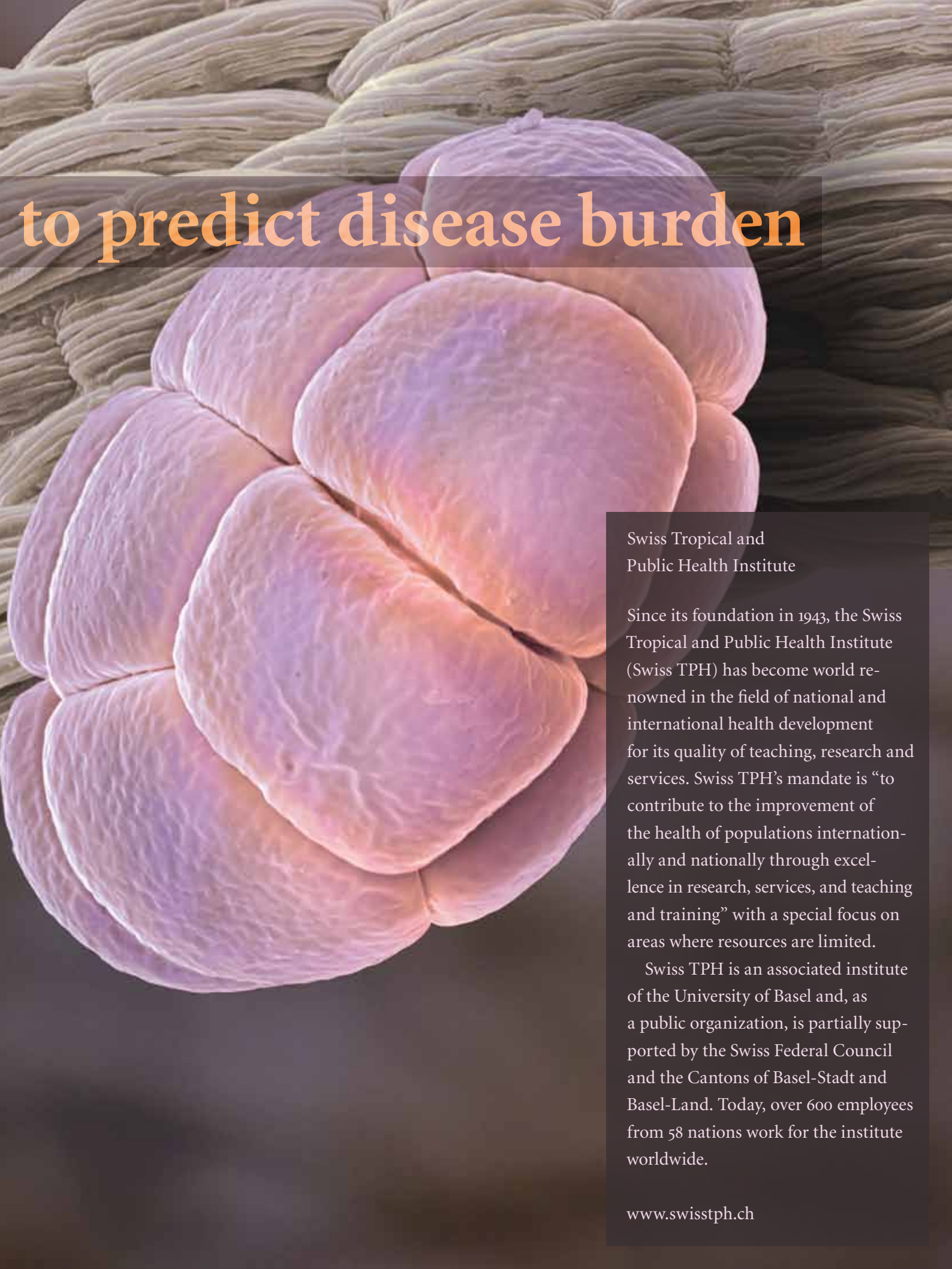
Modeling

Professor Penelope Vounatsou

Penelope Vounatsou analyzes space-time data related to malaria, schistosomiasis and other neglected tropical diseases, mortality and cancer epidemiology. Born in 1966 in Mytilini, Greece, Penelope Vounatsou graduated with a degree in mathematics from the University of Ioannina in 1987. Subsequently, she studied environmental sciences at the Aegean University (GR), statistics at the University of Sheffield (UK) and obtained a PhD in statistics from Imperial College London.

After joining the Swiss TPH as a postdoctoral research fellow in 1994, she started a successful career at the institute and made Basel her hometown. Currently, she is an assistant professor and leads a group researching advanced statistical modeling and Bayesian computation. In November 2012, Vounatsou's project "Innovative Modeling to Optimize Control of Childhood Anemia across Africa" was awarded a European Research Council Advanced Grant to the value of 2.5 million euro over five years.

Professor Vounatsou's aim is to develop and apply Bayesian geostatistical and mathematical disease transmission models that can be applied to determine the relative impacts of malaria, helminth infections and malnutrition on anemia in pre-school children in Africa. Such models also help to estimate child mortality attributed to severe anemia across the continent. Data from her project will lead to improved anemia management and to programs that integrate disease control and anemia prevention.



to predict disease burden

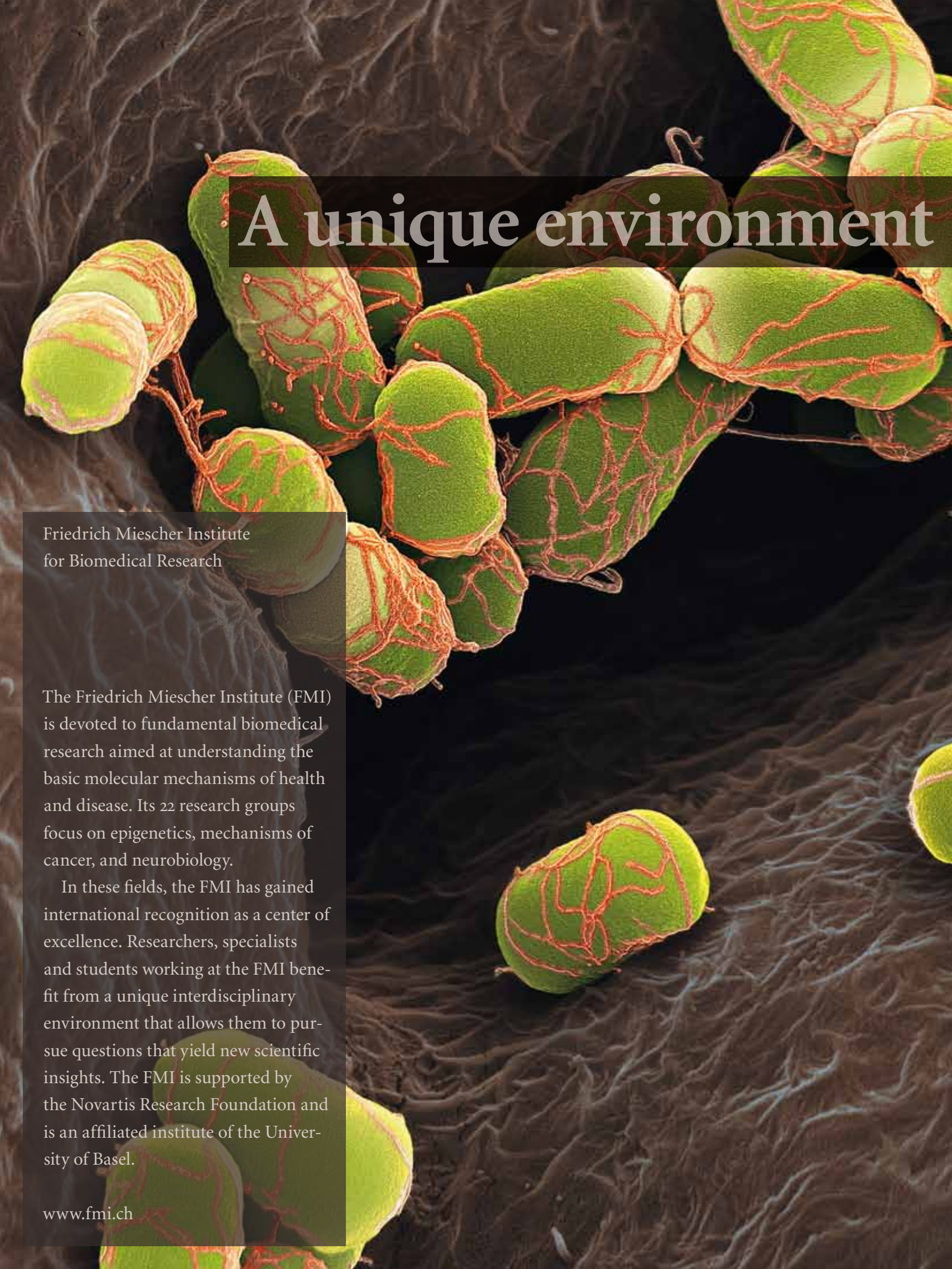
Swiss Tropical and
Public Health Institute

Since its foundation in 1943, the Swiss Tropical and Public Health Institute (Swiss TPH) has become world renowned in the field of national and international health development for its quality of teaching, research and services. Swiss TPH's mandate is "to contribute to the improvement of the health of populations internationally and nationally through excellence in research, services, and teaching and training" with a special focus on areas where resources are limited.

Swiss TPH is an associated institute of the University of Basel and, as a public organization, is partially supported by the Swiss Federal Council and the Cantons of Basel-Stadt and Basel-Land. Today, over 600 employees from 58 nations work for the institute worldwide.

www.swisstph.ch

A unique environment



Friedrich Miescher Institute
for Biomedical Research

The Friedrich Miescher Institute (FMI) is devoted to fundamental biomedical research aimed at understanding the basic molecular mechanisms of health and disease. Its 22 research groups focus on epigenetics, mechanisms of cancer, and neurobiology.

In these fields, the FMI has gained international recognition as a center of excellence. Researchers, specialists and students working at the FMI benefit from a unique interdisciplinary environment that allows them to pursue questions that yield new scientific insights. The FMI is supported by the Novartis Research Foundation and is an affiliated institute of the University of Basel.

www.fmi.ch

for cancer research

Professor Nancy Hynes

Nancy Hynes is the "grande dame" of research into breast cancer in Switzerland. For more than 25 years she has committed her research efforts to a better understanding of the molecular processes that cause breast cancer, in particular the signaling proteins that contribute to cancer development. In 1987, her laboratory – then at the Ludwig Institute for Cancer Research in Bern – was one of the first to discover amplification of the gene for the receptor tyrosine kinase ErbB2/HER2 and to describe its important and deleterious role in every fourth breast cancer patient. Shortly thereafter, she moved to the Friedrich Miescher Institute for Biomedical Research in Basel where her laboratory was among the first to develop an antibody-toxin approach to treat sub-types of breast cancer overexpressing ErbB2. Her research has further contributed to our understanding of the mechanisms underlying the activity of the standard treatment for this type of breast cancer. Today, this therapy is viewed as one of the very first examples of personalized medicine.

In recent years, Nancy Hynes has extended her studies to other signaling pathways and has explored how the formation of metastases can be prevented in solid breast tumors.

"For me, linking fundamental basic research and medical application has always been a great motivation," comments Hynes. "With the University of Basel and the pharmaceutical industry, Basel offers a unique environment for my multi-disciplinary projects in biomedical research."

Department
of Biosystems Science and Engineering

The Department of Biosystems Science and Engineering (D-BSSE) is a new department at the ETH Zurich and the only one located outside Zurich, at the Biopark Rosental in Basel. More than 200 people from over 40 nations currently work here.

Research at the D-BSSE focuses on systems biology and the emerging field of synthetic biology. It offers an important opportunity for highly productive intellectual and collaborative exchange between the renowned faculties of natural sciences and engineering at the ETH Zurich and the vibrant community of life scientists working in the Basel area. In the mid term, the ETH Zurich plans to increase the number of professorships at the D-BSSE from 13 (at present) to 17. This investment should make it possible to create a center of excellence in synthetic biology in Basel with worldwide impact.

www.bsse.ethz.ch

University
of Applied Sciences and Arts Northwestern
(FHNW) Switzerland, School of Life Sciences

The School of Life Sciences FHNW provides market-oriented applications for the fascinating field of life sciences. With a network of industry and research partners, it represents a unique place to be – working on technology development at the interface of natural, medical, environmental and engineering sciences. Cutting-edge research can be put into practice thanks to the state-of-the-art infrastructure. The success of technology transfer is illustrated by the many projects directly funded by industry or co-funded with public research money. Our ultimate goal is to develop benefits for patients, innovative products, therapeutic solutions and environmentally-friendly technologies. At the heart of our life sciences study programs is scientific knowledge for research and development, coupled with practical experience.

www.fhnw.ch/lifesciences

The Life Science Industry: The Best Conditions for Success

Did you know that DNA was discovered in Basel? Friedrich Miescher extracted nucleic acids, the chemical substrate of the genetic code, from white blood cells in 1871. Since then, the Basel area has grown to become one of the most successful life science clusters in the world today with about 700 companies and an annual turnover of 100 billion dollars. Two of the ten largest pharmaceutical companies in the world, Roche and Novartis, have their headquarters in Basel within walking distance of each other.

The area is home to many other leading life science companies and related branches. These include the agribusiness world leader Syngenta and the chemical companies Clariant, Lonza and Ciba (now part of BASF) as well as the medical technology companies Straumann and Synthes.

Basel is also attractive to start-up companies. In the last ten years, over 100 young companies have emerged. Several of these firms, such as Actelion, Basilea and Speedel (now Novartis), have succeeded within a short time in going public on the stock market. Actelion, founded in 1997, today has nearly 2,600 employees. Martine Clozel, co-founder of Actelion, says: "Switzerland, and Basel in particular, offer an excellent environment in which to found life science firms because here we find the necessary experts and there is a good network too".

BioValley – A Life Science Network in the Heart of Europe

BioValley was one of the first European initiatives for the promotion and development of life sciences. It has grown to become one of the leading life science regions in the world.

The BioValley is a cross-border enterprise. Besides the Basel region, it also encompasses Alsace in France and Southern Baden in Germany. It is a network of competence and know-how that includes 40 scientific institutions, 100,000 students, 50,000 jobs devoted to the sector and 11 life science parks.

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University of Basel

The city of Basel is home to the oldest university in Switzerland. Founded upon the initiative of local citizens in 1460, the University of Basel is a modern and attractive center of teaching, learning and research situated in the heart of the historic old town.

It is home to 5,000 staff as well as over 10,000 undergraduate and 2,400 postgraduate and doctoral students. Its annual budget is approximately 650 million Swiss francs, of which one quarter each is borne by the two sponsoring cantons of Basel. The remaining costs are covered by federal contributions, third-party funding, students coming from other cantons, and tuition fees. One of the distinctive strengths of the University is the focus on Life Sciences.

www.unibas.ch

In the heart of Europe

Basel is situated in the heart of Europe. EuroAirport Basel-Mulhouse-Freiburg connects the region with over 50 European destinations, while major US and Asian cities are served via connecting flights to Zurich, Frankfurt or Munich, situated an hour's journey away from Basel.