IOB Institute of Molecular and Clinical Ophthalmology Basel

A new home for visionary treatments

Your donation will enable innovative research and allow the building of bridges to clinical practice.

WELCOME

Dear readers,

Blind people who can see again? The ability to understand what causes vision loss in a growing number of people worldwide and devise effective treatments? Neither is a dream. The Institute of Molecular and Clinical Ophthalmology Basel (IOB) has recently developed breakthrough therapies and innovative solutions in ophthalmology. IOB is a pioneering project, made possible by a unique team: it was launched jointly by the University Hospital Basel, the University of Basel and Novartis at the end of 2017. This makes IOB Basel's largest cooperation project between the public sector and a private company – on an equal footing, as each contributes one half of the funding.

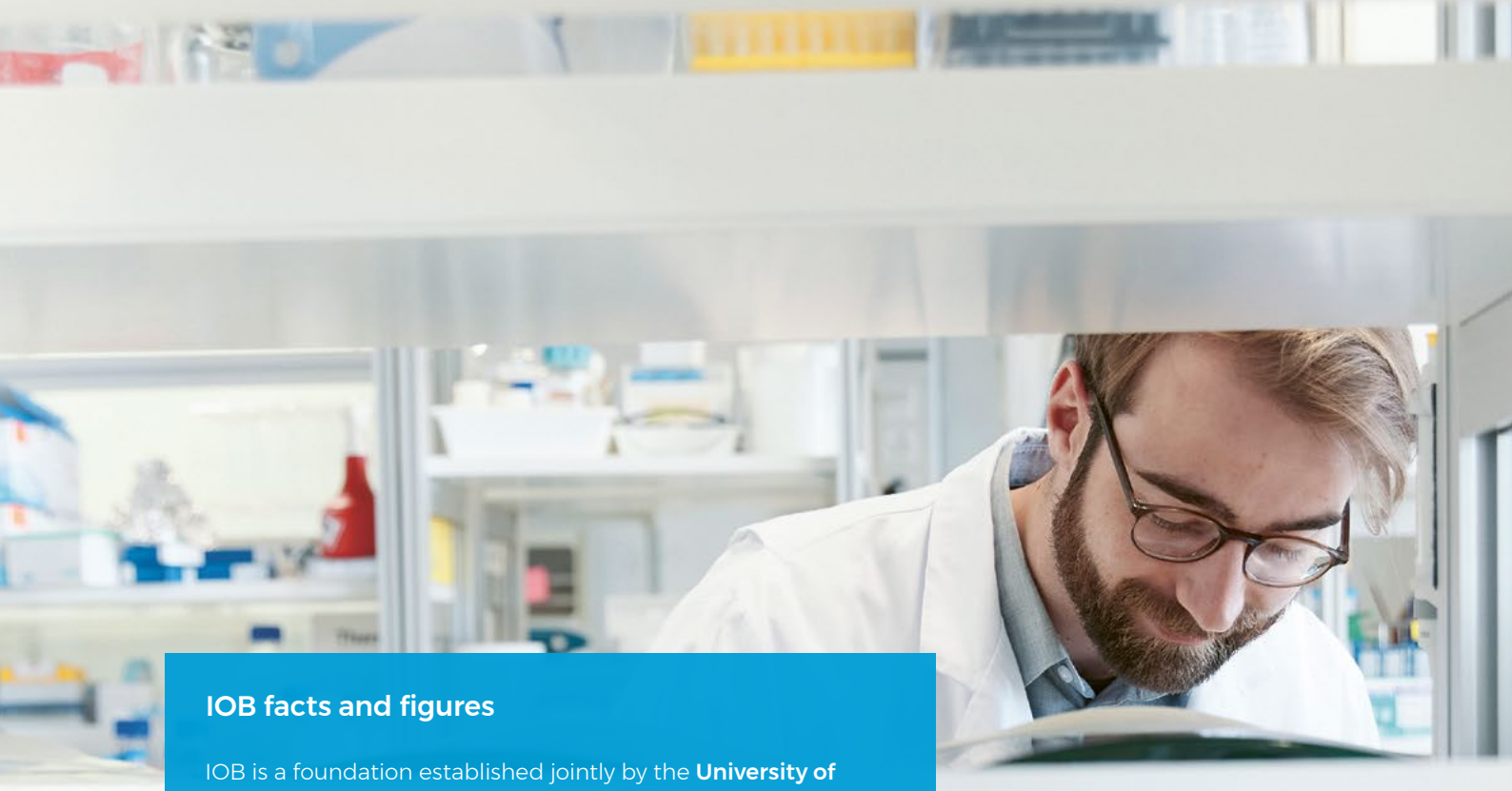
"Blind people who can see again? This is not a dream."

As one of the first institutes of its kind worldwide, IOB combines laboratory work and clinical practice. This is because medical breakthroughs are no longer achieved in a research laboratory alone. Rather, real innovation occurs at the interface between basic research in the laboratory and clinical treatment in hospitals. IOB is led by two internationally renowned experts in the field of eye research and ophthalmology: Professors Hendrik Scholl and Botond Roska. Botond Roska is regarded as a pioneer in the study of the retina and the processing of optical signals in the brain. Hendrik Scholl, who specializes in the medical and surgical treatment of retinal diseases, is Chairman of the Department of Ophthalmology at the University of Basel and Head of the Eye Clinic of the University Hospital Basel. Norbert Spirig, Director of Operations, backs the scientists with his expertise and vision, leaving them free to concentrate on their research.

As Chairman of the Novartis Board of Directors and Chairman of the IOB Board of Trustees, I am particularly pleased that IOB is able to bring together what belongs together in a meaningful way. Ophthalmology is a strategic research priority for Novartis. As well as supporting its own research departments, Novartis would like to promote independent research in Basel. IOB therefore also represents a commitment to Basel as a location. Thanks to excellent researchers who contribute complex knowledge and different perspectives, we will forge ahead and gain new insights that will create real added value for patients in Basel, in Switzerland, and far beyond the country's borders.

I am proud that IOB has given Basel a platform that combines academic freedom, patient proximity, and innovation – and I hope that you too, will be inspired by our project, as this pioneering project urgently needs a pioneering building and equipment that will enable truly innovative research to be conducted. It is only by combining everything under one roof and by providing the adequate infrastructure that IOB will be able to exploit its great potential in the future. I would like to thank you wholeheartedly for your attention.

Dr. Jörg Reinhardt
Chairman of the Board of Directors, Novartis AG,
Chairman of the IOB Board of Trustees



IOB facts and figures

IOB is a foundation established jointly by the **University of Basel, the University Hospital Basel, and Novartis** in 2017. The scientists' academic independence is guaranteed in the founding documents.

Headed by the three directors, Professors Botond Roska (molecular research) and Hendrik Scholl (clinical research), and Norbert Spirig (operational management), IOB started its operations in 2018 with 25 people.
Today, **120 employees from 27 countries** work at IOB.

IOB covers the following main methodological areas:

- Gene editing and optogenetics
- Viral vectors
- Organoids
- Single-cell transcriptomics
- Data science
- Physiology of the retina, thalamus and cortex
- Theoretical and computational neuroscience
- Human genetics
- Epidemiology
- Ophthalmic imaging
- Translational ophthalmology
- Clinical trials

Until 2027, IOB will receive a start-up contribution of up to CHF 20 million per year for its day-to-day operations. Half of the funding comes from Novartis, while the University Hospital contributes 15 percent and the University 10 percent. The remaining 25 percent is provided by the Canton of Basel-Stadt.

The founding agreement sets out the rights and obligations of the founders for a period of ten years. In this document, Novartis undertook to pay half of the funding subsidies; in return, the company receives the "right of first negotiation" pertaining to the use of intellectual property. All the founders are entitled to a seat on the Board of Trustees.

Dear Madam, Dear Sir,

According to a large empirical study, the most common answer to the question of which physical condition people are most afraid was “blindness”. Today, blindness and visual impairment are increasing dramatically worldwide. There is no or only rarely a chance of a cure.

The loss of eyesight does not have to be an inevitable fate – this is the goal set by IOB, which has already achieved its first groundbreaking successes. It owes these to the excellence of the founders and the staff of IOB, and to its special way of working. As one of the first highly specialized institutes of its kind, IOB builds a direct bridge between two worlds that share the same goal but often seem out of touch and far apart: research and clinical practice. The approach is impressive: alongside their laboratory work, the scientists see firsthand in the Eye Clinic that innovation is really needed in everyday clinical practice, while the clinicians learn about the latest technologies and scientific findings from basic research.

The aim is for this division between research and clinical practice to become an interface. Direct cooperation makes it possible to translate the latest scientific findings into innovative treatments much faster. IOB is using a unique combination of technologies for its research on the visual system. Consequently, IOB promises real hope for countless sufferers of blindness or visual impairments.

Patient-oriented, effective cooperation requires physical proximity between clinical practice and research. This is currently lacking. That is why IOB urgently needs an integrated building where researchers and clinicians can work side by side and benefit from ideal opportunities for exchange. All for the benefit of the patients.

A suitable building site that is centrally located and easily accessible has been found in St. Johann.

“Basel as a top international location for basic research.”

The building shell is being financed via an investor. The cost of the infrastructure in the new building that will make innovative research possible in the first place has not yet been covered. It is with great conviction that I advocate for the raising of the necessary funds. A fully functional IOB will make Basel a top international location for basic research and the development of treatments in the field of ophthalmology. I strongly believe that, with the help of a large number of institutions and prominent figures, it will be possible to position Basel on the world map as an outstanding research location. Thanks to your support and that of other eminent individuals, we can make our vision a reality: to save millions of people from losing their sight or help them to regain it.

I hope that the project described in this brochure will spark your interest and inspire you to want to contribute to our objective. The more enthusiastic supporters we can find, the sooner the excellent team at IOB can concentrate fully on its work. The added value for society will be immeasurable.

Dr. Christoph Eymann
Former National Councillor, President of the Patronage Committee

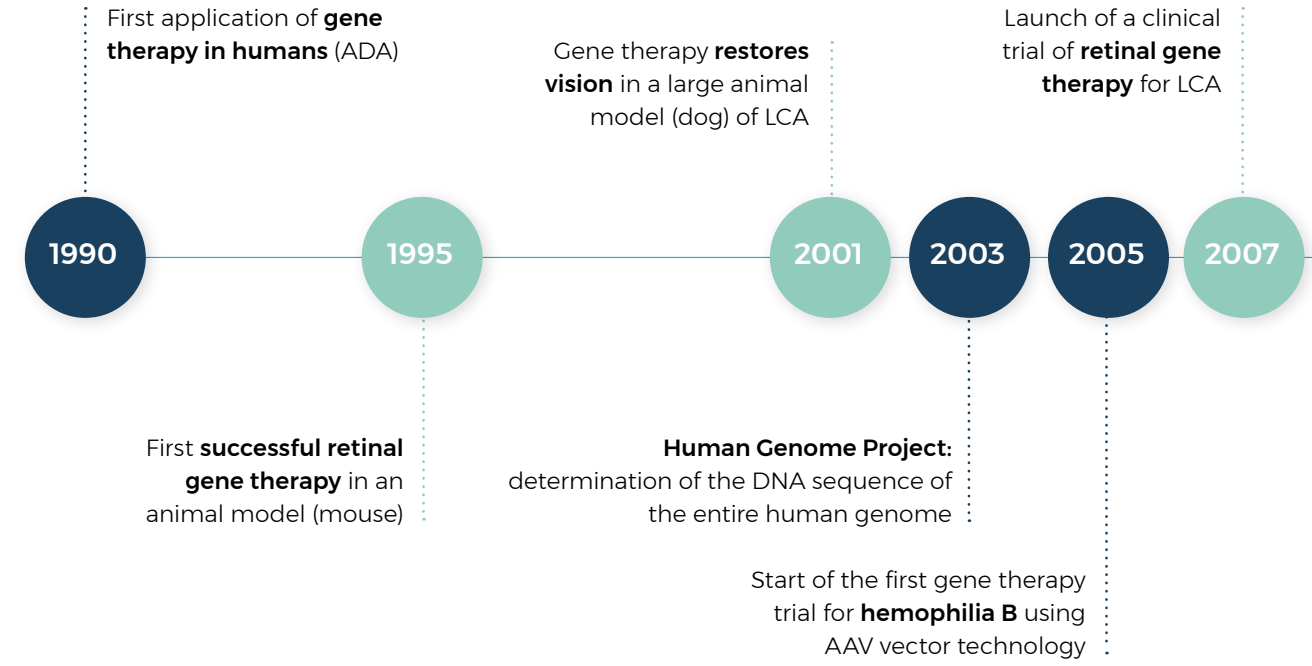
RESEARCHERS AND CLINICIANS UNITED

IOB stands for a unique innovation chain in ophthalmology – from basic research to application on patients. Scientists working hand in hand with doctors in an integrated building significantly increases the probability of obtaining groundbreaking research results. Direct interaction and proximity will ultimately benefit patients all over the world.

It was clear right from the start: everyday life at IOB runs most smoothly when scientists and clinical staff can work alongside each other and with one another under one roof. Since the establishment of IOB in 2018, its laboratories have been housed in temporary facilities. Basic research and a part of the clinical research is conducted in the Klybeck district, in premises on the former BASF company site that can continue to be used until 2026 at the latest. The remaining clinical research and the treatment of patients take place in the Eye Clinic of the University Hospital Basel – on the other side of the Rhine in a building that is in serious need of renovation.

Aha moments

IOB's current procedures are elaborate. Advance planning is needed to ensure cooperation at the interface between clinical practice and laboratory research; spontaneous contacts are not possible. It is obvious that a shared building for clinical practice and research is an essential prerequisite



"Today, we have to deal with logistical challenges on a daily basis."

for the innovations emerging at IOB. "Today, we have to deal with logistical challenges on a daily basis," says Bence György. As a physician and biologist, György heads the translational ophthalmology research group at IOB and, with his team, is at the very center of the interface between laboratory research and clinical practice. Today, the joint work carried out by the two sides can only be put into practice by devising intricate coordination and covering long distances. Bence György elaborates: "It is important for the scientists to regularly spend time at hospital bedsides and for the clinicians to have frequent updates from and access to the laboratories." Sometimes a few minutes are enough to reach an "aha" moment, an insight or a new idea. For Bence György, it is "elementary" to have the chance to exchange ideas and obtain immediate insights, for both the research and clinical sides to be in direct contact with patients, and to involve them much more closely. "There is no better way to prompt real innovation."

2012 Discovery of the precise **genome editing technology** CRISPR

2017 US FDA approves **first vision-improving gene therapy (Luxturna)** for LCA

2020 **First CRISPR injection** into the eye for CEP290-LCA

2021 Partial recovery of visual function in a blind patient after **optogenetic therapy** (J.Sahel/B.Roska)

ADA Adenosine Deaminase
LCA Leber congenital amaurosis
DNA Deoxyribonucleic acid
AAV Adeno-associated virus
FDA Food and Drug Administration

CRISPR
Clustered Regularly Interspaced Short Palindromic Repeats
CEP290-LCA
Centrosomal protein 290 LCA (a subtype of LCA caused by a mutation in the CEP290 gene).

"Today, outstanding innovations emerge at the interface of science, society and business. As founding partners, we wanted to create something unique in Basel and combine cutting-edge research with high international appeal and a major impact on society. IOB is to become one of the world's leading institutes for ophthalmological research and is already well on its way to reaching this position. As home to two of the world's leading and largest pharmaceutical companies, with a university that ranks among the top 100 research universities, and with more than 600 life science and medtech companies, Basel has the ideal ecosystem for integrating IOB, offering effective support for its future development."

Prof. Dr. Dr. h. c. Andrea Schenker-Wicki
President of the University of Basel

"The medical value of innovation is measured by the burden of previously untreatable disease. In blindness, this 'unmet need' is huge. The fact that Basel's largest public-private partnership project to date is in the field of ophthalmology is a forward-looking landmark. We can consider ourselves fortunate that leading minds from science, clinical practice, and industry have pooled their expertise and visions of ophthalmology here in Basel.

What makes IOB so special is the close cooperation between science and clinical practice for the purpose of translational research. This is now to be considerably enhanced and united under one roof in a new building specifically for the Eye Clinic and IOB. This can not be done for free – or without private support. The eye clinic is self-financing. However, IOB's share of the costs is covered only partially by the operating contribution from Novartis and the public partners.

The Canton of Basel-Stadt is grateful for the traditional generosity of patronage. With IOB, Basel has once again established an institution that deserves the trust of donors. We very much appreciate your support!"

Government Councillor Dr. Lukas Engelberger
Head of the Department of Health of the Canton of Basel-Stadt

“We need names and faces, not just technical data.”

Win-win-win situation

The idea of personalized medicine is very important at IOB; in other words, therapeutic concepts that are optimally tailored to the patient, thus enabling suitable treatment to be provided more quickly and making the healthcare system more efficient. The possibilities offered by modern diagnostics, including genetic diagnostics, are therefore crucial. Both are part of everyday life at IOB. From the patients’ point of view, this means establishing a relationship not only with the doctor treating them but also with the scientists conducting research in the field of their eye disease. “This is a win-win-win situation,” says Bence György. “For the patients, the clinicians, the scientists – in other words, it is a triple-win.” Patients can participate in innovative therapies much more easily, and scientists, who often spend all day in the lab bent over microscopes and sitting at computers or specialized equipment, benefit from an emotional connection to patients.

Closer to the patients

“The new building and its interior will make our everyday life much simpler, more direct, more efficient, and more meaningful,” sums up scientist Carlo Rivolta. He heads the Ophthalmic Genetics research group at IOB and is a Professor at the University of Basel. Carlo Rivolta and his team work directly with the patients. “It is vital for our basic genetic research that we have access to people. We need names and faces, not just technical data.” He tells of scientific colleagues who conduct research in the field of ophthalmology for years without ever meeting a blind or visually impaired person. “When diseases can be experienced in the real world, they lose their abstractness.” Today, Carlo Rivolta organizes monthly exchanges between clinicians and scientists. But this always involves a huge amount of coordination and happens far, far too rarely, he explains. Being able to meet each other, interact spontaneously and exchange ideas, is “invaluable” – at

the coffee machine, at lunch together, or in the corridor. “This will all be so much easier when we are together under one roof,” says Carlo Rivolta. “If only it could happen tomorrow.”

Ideal location

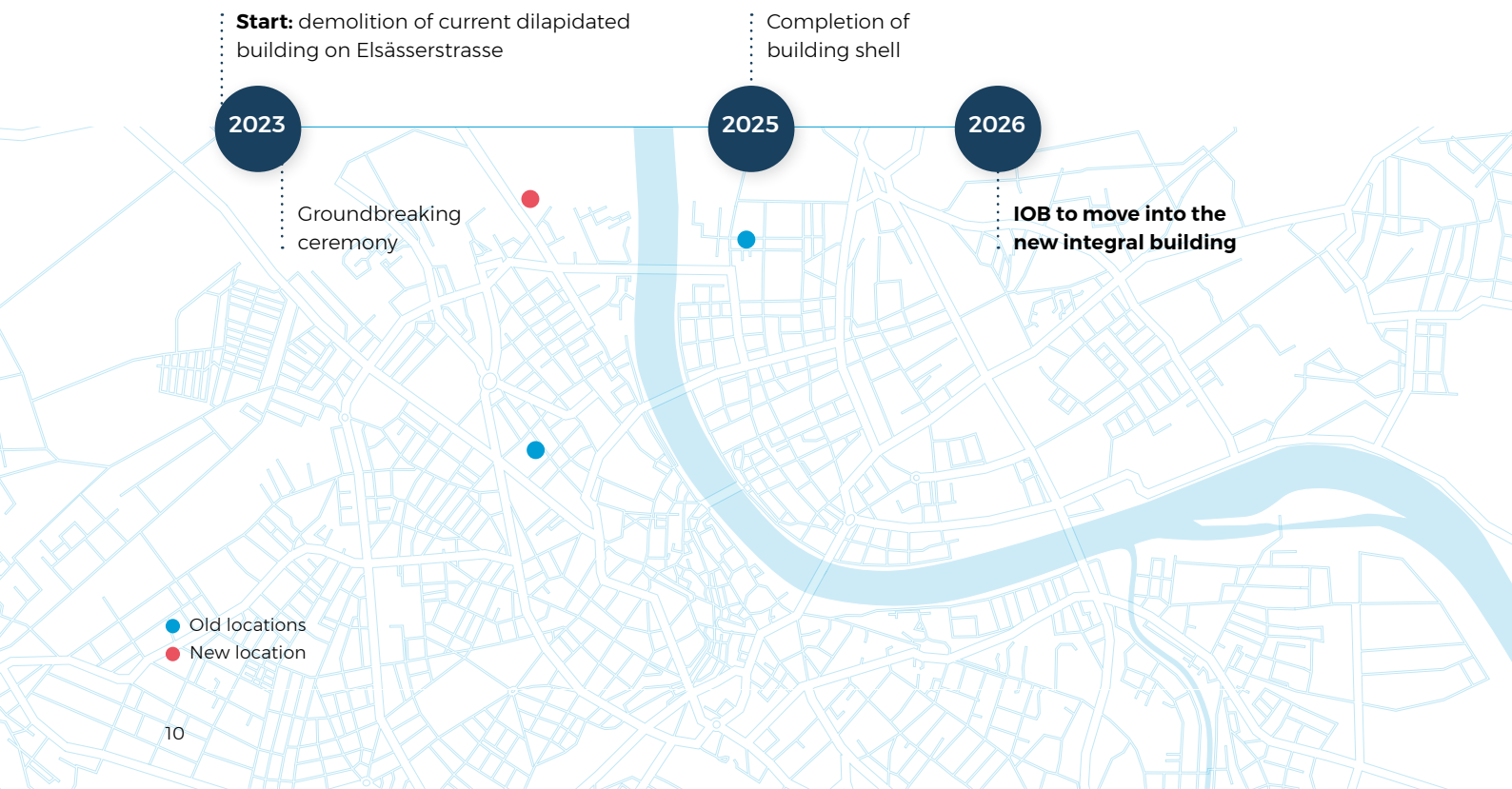
In recent months, IOB has assessed the suitability of numerous existing properties in Basel. But they would all need extensive conversion and renovation work, which in the end, would be no more cost-effective than constructing a bespoke new building from the outset. That is why, in association with the University Hospital, the Board of Trustees and the Directorate have decided to construct their own integrated building. This will allow them to coordinate the infrastructure and utilization requirements perfectly from day one. After a two-year evaluation phase involving numerous locations, they found what they were looking for at Elsässerstrasse in the St. Johann district. The plot of land is centrally located, well integrated, and easily accessible by public transport, and therefore offers the ideal conditions for research, clinical practice – and the treatment of patients.

There will be a total of 11,300 square meters available for the clinic, research laboratories, office space, interdisciplinary teamwork, and a technical area, all “packaged” in a sleek, intelligent, and flexible design.

The following requirements are essential:

- Short distances and easy access for patients
- Optimum working conditions for clinical practice and science
- Space for innovation, e.g. laboratories and flexible areas for future technologies
- Low operating costs

Timetable



"Hendrik Scholl and his team treat numerous patients who are at risk of losing their eyesight. We understand the impact that macular degeneration and glaucoma can have and strive every day to improve the lives of those suffering from these conditions.

The University Hospital Basel has a long tradition of clinical and translational research into eye diseases. We know how important ophthalmological research is for those affected. We apply research results directly at the patient's bedside.

Hendrik Scholl and Botond Roska made it clear to us that advances in ophthalmology are urgently needed. The potential of a publicly and privately funded institute in Basel as a research location became apparent in discussions with Andrea Schenker-Wicki, President of the University of Basel, and Jörg Reinhardt, Chairman of the Novartis Board of Directors.

We decided to set up a foundation, to launch IOB, and to gain the support of the Canton of Basel-Stadt. This was made possible by the involvement of Government Councillor Lukas Engelberger.

Taking stock after three years, we can see that the staff of IOB have already recorded their first significant research successes and won international prizes. The cooperation between researchers and clinicians works. It is time to take IOB to a new level. With a building specially constructed for IOB and the Eye Clinic, we can further improve our work for the benefit of our patients under one roof.

Let us tackle this great task together.
We are grateful for your support."

Dr. med. Werner Kübler
Director of the University Hospital Basel

Botond Roska
obtained his doctorate in medicine from Semmelweis Medical School, a Ph.D. in neurobiology from the University of California, Berkeley, and studied genetics and virology as a Harvard Society Fellow at Harvard University and Harvard Medical School. From 2005 to 2018, he led a research group at the Friedrich Miescher Institute for Biomedical Research in Basel. He has been a Professor at the Faculty of Medicine since 2010 and a Professor at the Faculty of Science at the University of Basel since 2019. At IOB, he leads a research group that focuses on understanding vision and its diseases, and on developing gene therapies to restore vision. Botond Roska has received several awards, including the Viva Award, the Alcon Award, the Alfred Vogt Prize, the Cogan Award, the Bressler Prize and the W. Alden Spencer Award, the Louis Jeantet Prize for Medicine, the Cloëtta Prize, the Semmelweis Budapest Award, the Körber Prize for European Science, and the Sanford and Susan Greenberg End Blindness Visionary Prize.

Hendrik Scholl
is an ophthalmologist and retinal researcher. He is the Head of the Eye Clinic of the University Hospital Basel and Professor of ophthalmology at the University of Basel. He specializes in the treatment of retinal diseases such as age-related macular degeneration and diabetic retinopathy. His research interests are mainly neurodegenerative diseases of the retina and the development of therapies for retinal diseases with the aim of halting vision loss by means of pharmacotherapy or gene therapy, or restoring vision by means of gene therapy methods. Professor Scholl has received numerous prizes and awards, including the European Vision Award, the Visionary Award of the Foundation Fighting Blindness, the W. Richard Green Award of the Macula Society, the President's Award of the American Society of Retina Specialists, and the Alfred Vogt Award for Research in Ophthalmology.

TWO PIONEERS WHO ARE REVOLUTIONIZING OPHTHALMOLOGY

Working hand in hand to better understand eye diseases and develop new therapies: basic researcher Botond Roska (BR) and clinician Hendrik Scholl (HS). An interview with the two founding directors of IOB.

What drives you the most in the type of projects carried out at IOB?

HS: The fact that we are really devising treatments. As an ophthalmologist, I have therapeutic options for many eye conditions. For example, I can remove a lens and put in an artificial one. If I were not also a researcher, I might accept this as "normal". But if you consider the path from the idea to the application, it is always a small miracle that you can actually help the patients at the end of the day. And at IOB we really are developing completely new treatments – in model systems, in stem cells in petri dishes, or on donor retinas. We work translationally along the entire development chain: from molecular and cellular biology to human genetics and clinical trials. That way, we are very close to it all, you can not get any closer in the academic environment before you start a therapy trial on humans for the first time. The fact that ideas, knowledge, and implementation are so close together is simply fantastic!

BR: The coming together of two cultures that have been kept apart for decades. If you put two butterflies on two continents and separate them, two species will develop over time. If science and clinical practice are separated, no real innovation is possible. But we have the same problems, we have the same goals, and we speak the same language. The secret is in the detail, it is hidden between the lines, so to speak. That's why direct human interaction is so important.

IOB will therefore bring together what belongs together in the future.

BR: At IOB, we will develop treatments that can be used in the clinic. What happens when a patient suddenly reports back to us that they can see something? How do we test it? We need to learn what our patients can see, we need instruments, we need to be able to work hand in hand. For a long time, therapeutic development took place outside of academic research. IOB is adopting a different approach. We are developing gene therapies for previously untreatable eye conditions. This is very concrete, it is visionary, and the patients are involved from the very beginning. For example, the new generation of scientists and doctors we are working with spend time with the patients in the morning, then go to the lab in the afternoon. An integrated building is a must.

HS: We want to make seeing tangible. We need a lot of creativity and we need the right infrastructure. We want to be able to show how vision works and can be tested. To do this, we also need our own street lab, for example; mobility in a real environment that can answer questions for us such as: what can the patient do that they could not do before? Can they move around adequately? Can they cook again, for instance?

What are you most looking forward to when you think about the new building and its infrastructure?

HS: The idea that the building being entered by patients with, at the time, no existing treatment for their condition, will be the very same building in which the therapies are being developed for them. And the social interaction: research is also all about free association, it is about combining things. People meet, they bump into each other, often exactly without having meant to do so. We will come up with insights that we could not otherwise have gained. Some things can not be planned. They come about when you create a framework in which they can become possible.

"We want people to think of Basel when they talk about ophthalmology."

20 years ago, you started dreaming about blind people being able to recognize objects and distinguish light from dark again. That dream came true. What is your next dream?

BR: We want to further advance gene therapy so that it truly becomes applicable for a wide range of people. We are talking about 2.5 billion people around the world who are suffering from vision problems. These include age-related macular degeneration (in the people affected, the cells in the retina in the region of sharpest vision become atrophied), glaucoma (where the cells leading to the optic nerve are impaired) and finally, high myopia (nearsightedness), where macular and retinal damage can occur due to an elongated eyeball. We have not even begun to fully understand the diseases in any of these areas. We must find new ways to solve these problems. We need model systems and are reliant on organ donations from people with macular degeneration. Mice, for example, have no macula, so we can not test everything on mice. This new path we are taking must therefore be based on new model systems and technologies.

You mentioned organ donations from visionary people who offer their support to science during their lifetime. This allows IOB to conduct significantly fewer and only very targeted animal experiments.

BR: Exactly, but this requires appropriate tools that allow us to start work as soon as the organs have been donated to carry out examinations that can only be done for a few hours. All this requires highly specialized logistics. It is very difficult to find organ donors suffering from the diseases we are studying. We need new ways to collect and analyze important data. In the coming years, we would like to understand why important cells are dying in an increasing number of people. Research on human donor organs and organoids not only facilitates the transfer of our results to clinical practice, but also helps to reduce animal testing. It is our wish that people think of Basel when they talk about ophthalmology, and that they think of ophthalmology when they talk about Basel.

Three breakthrough technologies from IOB, that have been awarded the prestigious Körber Prize for European Science:

1. Transforming defective human skin cells in the laboratory to form mini-organs similar to the retina. These organs carry the genetic defect so that scientists can test therapies on them.
2. Nerve signals created by light were recorded from the retina of deceased organ donors. This gives the scientists a human model system to work with.
3. Duplicating retinas in the laboratory allows for some of the cells to be stimulated to recognize light signals thanks to gene therapy.

The winner of many awards at a young age: IOB junior researcher Dasha Nelidova

After Dasha Nelidova had received her fourth major award in 2020, her doctoral supervisor Botond Roska jokingly said that if this continued, she would receive an award a month in the future. And so it was. The young physician and scientist from New Zealand has achieved great things at IOB and has been awarded 13 major prizes to date, including the most important global research award for young scientists: the Science & SciLifeLab Prize for Young Scientists, which recognizes the four most internationally relevant doctoral theses in the life sciences.

Intensive cooperation

Dasha Nelidova was selected as the winner of the molecular medicine category for developing an optogenetic technology. The procedure may enable people with severe vision problems to perceive things in the near infra-red range much better again. To achieve this, the young researcher inserted gold nanoparticles into no longer functional photoreceptors of mice. With the help of antibodies, the nanoparticles were bound to certain proteins. As a result, the blind mice were able to carry out visual tasks again. In the next step, Dasha Nelidova applied the procedure to human blind retinas from eye donors. The results are extremely promising.

“We are now undertaking further experiments to help us to transfer the procedure to clinical practice as soon as possible,” explains the young doctor. IOB provides the ideal setting. “Developing new treatments for vision loss requires multidisciplinary teams. At IOB, there are outstanding scientists and clinicians who are highly committed to the development of innovative therapies. We are working intensively together on powerful new technologies that have the potential to represent real therapeutic breakthroughs.”

“AS IF THERE WERE LAYERS OF LETTUCE LEAVES IN FRONT OF MY EYES”

Daniel Fernandes suffers from a congenital functional disorder of the retina. He still has three percent vision in one eye, less in the other. A newly developed gene therapy can bring back some of his vision.

Something was wrong. Daniel’s parents noticed this when he was just a few months old. Their son was always turning his head toward the light and looked at things differently than other one-year-old children. He underwent one examination after another before the diagnosis was made. Daniel Fernandes, now 31, suffers from leber congenital amaurosis, a congenital functional disorder and progressive degeneration of the retina.

At first, Daniel attended regular school, but in addition to his pronounced night blindness, his vision deteriorated increasingly in the first years of his life. “When I was nine, I was still able to ride my bike with my sister,” he recalls. But it became more and more difficult. Since he needed increasingly larger letters to decipher any writing, Daniel moved to a day school for people with disabilities, where he was initially able to read with special reading devices. At the age of 15, he started attending the boarding school of the School for the Blind in Zollikofen and learned Braille. “The constant changes were exhausting,” he says. He had to keep readjusting.

Member of the national blind soccer team

To this day, Daniel Fernandes tries to use his eyes. “But above all hearing and intuition,” he adds. He compares his current vision to having several layers of lettuce leaves in front of his eyes. “In between there are little dots I have to squint at to see them better.” He can just about make out the outline of a car, a tree, or women wearing skirts.

Daniel’s older sister was always a great help. “She told me point blank: ‘You may be blind, but you are not stupid. You can do anything’.” She took her younger brother with her everywhere. “That was a gift.” Daniel Fernandes didn’t lose heart. To this day, he loves playing soccer. “When I was little, my friends and I used to practice in a courtyard. We made up our own rules, they would call out to me when the ball was coming and from which direction.” Today he plays for the Swiss national blind soccer team. There is a rattle in the ball, and the games are full of non-stop shouting and calling.

Daniel Fernandes likes going to the movies, where, with the help of an app, he can download a soundtrack with audio-description that lets him “watch-listen” to the film. He often goes out with friends and enjoys dancing in clubs. “When you want to get to know someone, it is often not easy. If there’s loud music playing, I can not go by a person’s facial expressions. Those are tough moments.”

Promising therapeutic option

Two years ago, Daniel Fernandes came across the name Hendrik Scholl. “I wanted to go and see him right away and made an appointment.” After examining him, Hendrik Scholl suspected that Daniel Fernandes’ retinal degeneration could be caused by mutations in the RPE65 gene. A genetic diagnosis at IOB confirmed this. The Eye Clinic is now the exclusive gene therapy center in Switzerland for precisely this type of damage: healthy copies of the gene are injected under the retina, where they are absorbed by the underlying retinal layer and introduced into the cell nucleus. One of Botond Roska’s IOB labs is working intensively on these “viral carriers”, viruses that function as a means of transport. The copies of the gene initiate the production of the missing enzyme in the cell nucleus. The aim of the treatment is to restore the missing

activity of the enzyme RPE65 in the filter of the retina, enabling the retina to convert light stimuli again that can then be processed in the rest of the visual process.

"It felt like winning the lottery."

"It felt like winning the lottery," says Daniel Fernandes. "I have precisely the defect that can be treated at the Eye Clinic." The treatment – an injection into each eye – has recently been approved in Switzerland; Daniel Fernandes has the manual for the treatment in the form of an audio book, which he listens to again and again. Now it is a matter of making the decision – a decision with far-reaching consequences. Unless Daniel Fernandes goes ahead, there is a risk that he will soon go completely blind. Saying yes to the treatment can bring back some of the lost sight.

Unmet medical need in ophthalmology

Presbyopia

1.1 billion
2015

1.8 billion
by 2050[3]

Age-related macular degeneration

196 million
2020

288 million
by 2040[4,5]

Visual impairment or blindness

At least
2.2 billion[1]

Hereditary retinal diseases

> 5 million[2]

Glaucoma

79.6 million
2020[6]

Breakthrough innovations and their implementation are needed for clinical application.

(1) World Health Organization (WHO), www.who.int/health-topics/blindness-and-vision-loss (2) Hanany et al. Proc Natl Acad Sci U S A. 2020; 117(5): 2710-2716. (3) Berdahl JP, Bala C, Virtual Annual Meeting 2020 of the American Society of Cataract and Refractive Surgery, ascrs.org/clinical-education/presbyopia/2020-pod-sps-107-64522-global-prevalence-patient-and-economic-burden-of-presbyopia-a-sys (4) Jonas JB. Lancet Glob Health. 2014;2:e65-6 (5) Wong WL, Su X, Li X, et al. Lancet Glob Health 2014; 2: e106–16 (6) Quigley HA, Broman AT, Br J Ophthalmol 2006; 90(3): 262-267

WHERE THE FOCUS IS ON THE EYE

The success of IOB depends on interlocking fields of research. Together they form a jigsaw puzzle that allows IOB not only to improve the basic understanding of the function of the eye, but also to transform this knowledge into patient treatments. An overview of the main elements of the new building:

Laboratory for the development of retinas in cell culture dishes (organoids)
IOB has developed methods for producing artificial organs (retinas) from human skin cells. These are used as models to experimentally study eye diseases in vitro, thereby avoiding animal experiments. It is conceivable that these organoids could also be used as cell replacements for damaged areas of the retina in the distant future.

Laboratory for viral vectors
Gene therapy agents must be delivered to the right place in the eye via cell type-specific transporters. To do this, experts use what are known as viral vectors, which IOB itself develops and optimizes for each application, so that other areas of the eye are affected as little as possible.

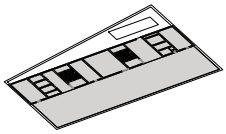
Space for the epidemiology of eye diseases / myopia labs
This is where regional, demographic or ethnic clustering of eye diseases is studied. Not only genetic but also environmental influences are taken into account.

Clinical study center
The selection and professional handling of patients in a clinical trial are just as crucial for new treatments as the scientific analysis of the results. The study center also ensures that proper information is given to participants and that an ethically correct framework is observed.

Street lab
After treatment, patients who had no or hardly any vision have to relearn how to deal with the signals of the eye correctly. In the street lab, they practice encountering everyday situations – for example, using handles in the home or finding their way through traffic.

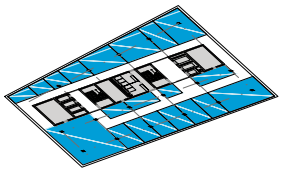
Meeting areas
Research is teamwork. IOB relies on close interdisciplinary cooperation and transparent communication. Common rooms and open offices are important conditions for this. The best exchanges take place in areas where people feel comfortable.

3rd–5th floors, 1st loft level	Offices, meeting rooms
1st basement	Auditorium
1st loft level	Cafeteria



2nd loft level

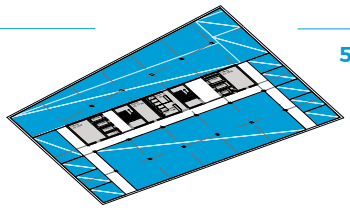
- IOB
- Eye Clinic
- Entrance area, public space



1st loft level

Infrastructure for bioinformatics

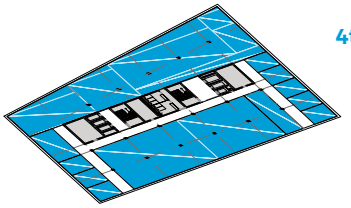
Modern biology at a genetic level requires the ability to analyze huge amounts of data with mathematical algorithms and to make creative use of artificial intelligence to understand genetic patterns or imaging techniques.



5th floor

Microscopy laboratory

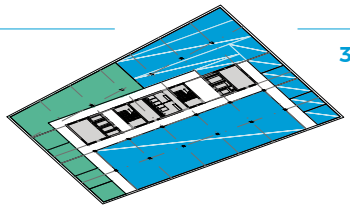
Microscopes with sufficiently high resolution are needed to analyze cellular processes and assess the effect of therapeutic approaches. This equipment will be available for every field of research in the microscopy laboratory.



4th floor

Single-cell transcriptomics laboratory

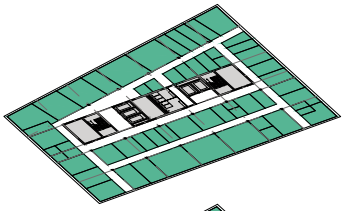
The laboratory examines genomic and molecular components of the human eye in healthy and diseased states at individual cell level. This in-depth knowledge of cell biochemistry forms the basis for the development of new treatments.



3rd floor

Laboratory for special diagnostics and ophthalmological imaging

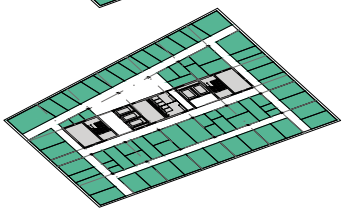
The physical examination of the patient forms the basis for every ophthalmological diagnosis. This is also particularly important when assessing the effectiveness of a new treatment. The laboratory also conducts evaluations based on artificial intelligence that sharpen the perception of the eye.



2nd floor

Laboratory for gene editing and optogenetics

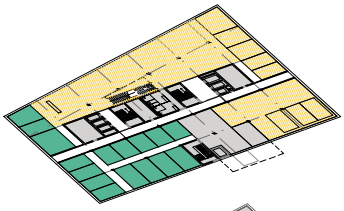
This laboratory develops treatments at cellular level based on the results of genetics. This involves repairing errors in genes or in cell biochemistry to maintain or restore functionality.



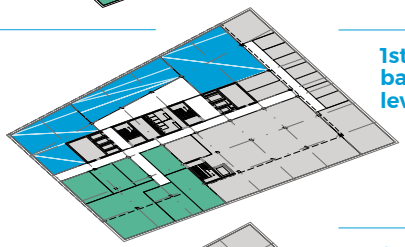
1st floor

Laboratory for genetics and genetic epidemiology

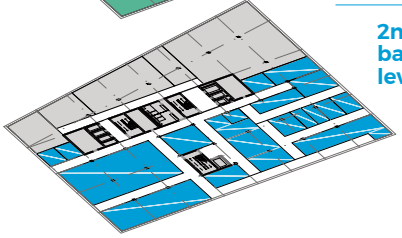
In ophthalmology, a large number of relatively rare genetic diseases are recognized, especially in the retina. This laboratory investigates the relationship between genetic defects and patterns of disease to understand if and how treatments can be developed.



Ground floor



1st basement level



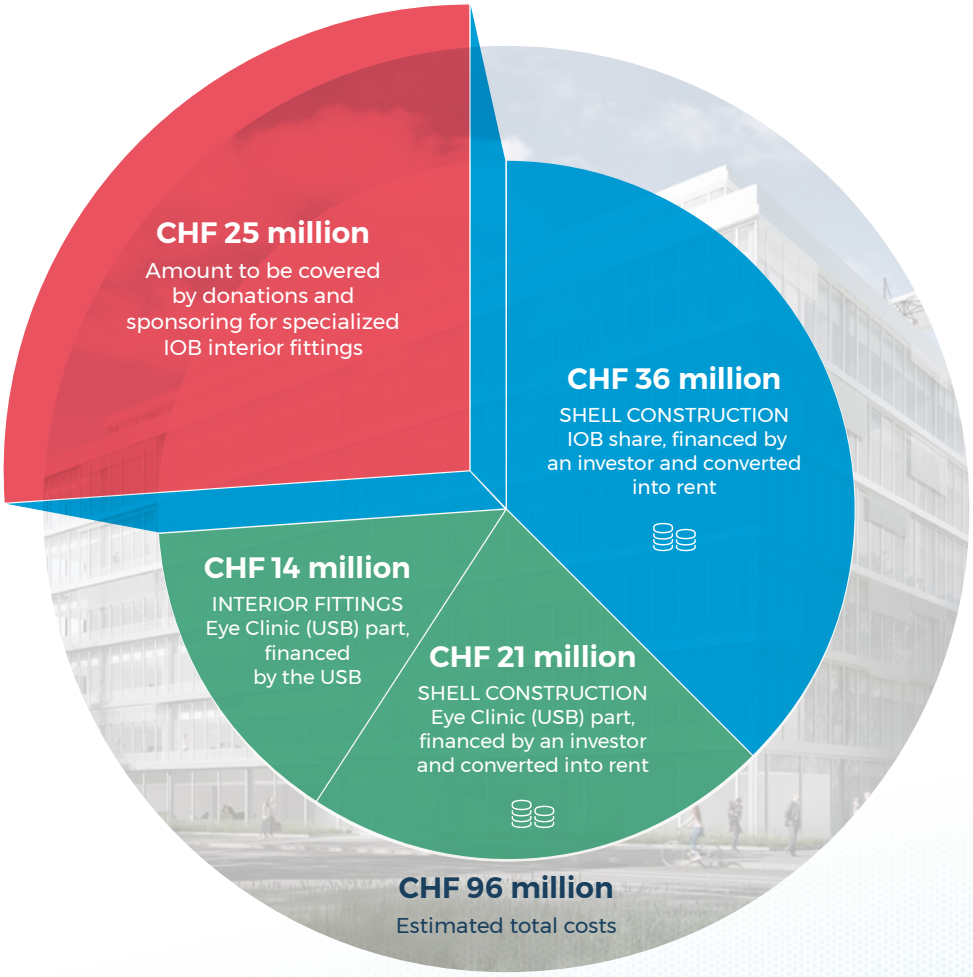
2nd basement level

Laboratory for the physiology of the retina, thalamus and cortex

The physiology laboratory uses high-precision optical structures and specific high-resolution microscopes to investigate the signal pathway of visual perception from the retina to the cerebral cortex. The aim is to improve understanding of the complex visual process.

COSTS

IOB is relying on donations totaling CHF 25 million for the specialized interior fittings of the integrated building. The new infrastructure will enable innovative research to be conducted and, at the same time, facilitate proximity and direct exchanges.



- IOB building part
- Eye Clinic (USB) building part
- Financed via donations
- Financed via investors

THE PATRONAGE COMMITTEE

As members of the Patronage Committee, the following individuals are committed to IOB's visionary project:

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Raphael Wyniger
Founder / Managing Director of the Wyniger Group

A FLAGSHIP PROJECT

"They are two completely different worlds: the world of the researcher, who sometimes spends a lifetime generating new knowledge about a group of diseases and thus opening doors to innovative treatment options. And the world of the clinical practician, who has patients with a wide range of diseases waiting outside the door, hoping for fast, effective treatment. I know from my own experience: real innovation only comes from the interaction between these two worlds. Diverse skills and different ways of thinking and working have to be brought together, both in the laboratory and in clinical trials. How is that possible? Under one roof with the opportunity to sit down together over a pizza or a coffee, to listen, to learn from each other – ultimately to understand each other's language and approach, and then to work together successfully on projects. IOB is pursuing this extremely promising path."

Prof. Dr. med. Dr. h. c. mult. Eberhart Zrenner
Senior Professor and Founding Director of the Institute for Ophthalmic Research at the Center for Ophthalmology of the University of Tübingen

"In 2020, we awarded Botond Roska the Körber Prize for European Science, one of the most highly endowed European research prizes. Even during the selection process, I was fascinated by the way in which this co-founder of IOB brings together absolutely cutting-edge research and consistent implementation in clinical practice. IOB is an outstanding example of how basic research is not only geared toward medical challenges, but how its breakthroughs can also directly benefit patients. IOB's work gives hope worldwide for the successful treatment of previously incurable eye diseases."

Matthias Mayer
Head of the Science Department of the Körber Foundation

"Nowadays, neuroscience is highly interdisciplinary. The vision at IOB is a dynamic interplay between different disciplines with the aim of transferring the knowledge acquired in high-risk and profitable basic research directly into clinical practice. This places particularly high demands on the cooperation between the disciplines. The directors and scientists at IOB are working hard to achieve this goal for the benefit of humanity. I am impressed by their achievements, follow their work with great interest, and wish them much success!"

Prof. May-Britt Moser
Center for Neural Computation, Kavli Institute for Systems Neuroscience, The Faculty of Medicine and Health Sciences, Norwegian University of Science and Technology, Nobel Prize in Physiology or Medicine 2014

"IOB is revolutionizing ophthalmology by consistently evolving from chemical-pharmaceutical treatments to gene therapies, and successfully progressing from innovation to implementation. Since its establishment in 2017, it is clear to see how partnerships between different private and public stakeholders can successfully generate great benefits for society. Thanks to IOB, Basel has thus become the scientific and clinical hub for millions of people around the world who suffer from blindness and previously incurable visual impairments."

Prof. Dr Marcel Tanner
Epidemiologist and public health expert, President of the Swiss Academy of Arts and Sciences, Director Emeritus Swiss TPH

"Interdisciplinary bridge-building for the benefit of patients is at the heart of IOB. At the same time, the institute is an ideal training ground for future generations of excellent eye researchers and ophthalmologists. Basel is a major hub for innovative biomedical science, and IOB is an integral part of its innovative translational research, with novel, breakthrough treatments."

Prof. Aleksandra Wodnar-Filipowicz
Coordinator Basel Stem Cell Network of the University of Basel

"IOB is a unique and extremely exciting project. Its ambition is to bring together world-class researchers, clinicians and start-ups under one roof to develop innovative treatments for eye diseases. Having a world-leading pharmaceutical company in ophthalmology like Novartis on board is very valuable."

Prof. Dr Patrick Aebischer
Neuroscientist, former President of the École polytechnique fédérale de Lausanne

"IOB is a hotspot that brings together clinical and basic research. The two disciplines, which have completely different perspectives on eye diseases, will be able to interact closely under one roof in the future. This is the only way to accelerate and sustainably advance science. Already now, IOB is a flagship project. I am convinced we will hear a lot more about this research institute."

Franz Badura
Chair of the Board of Directors of Retina International;
Franz Badura is himself affected by retinal degeneration.

Dear patrons,
Please get in touch with us! We look forward to hearing from you.

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