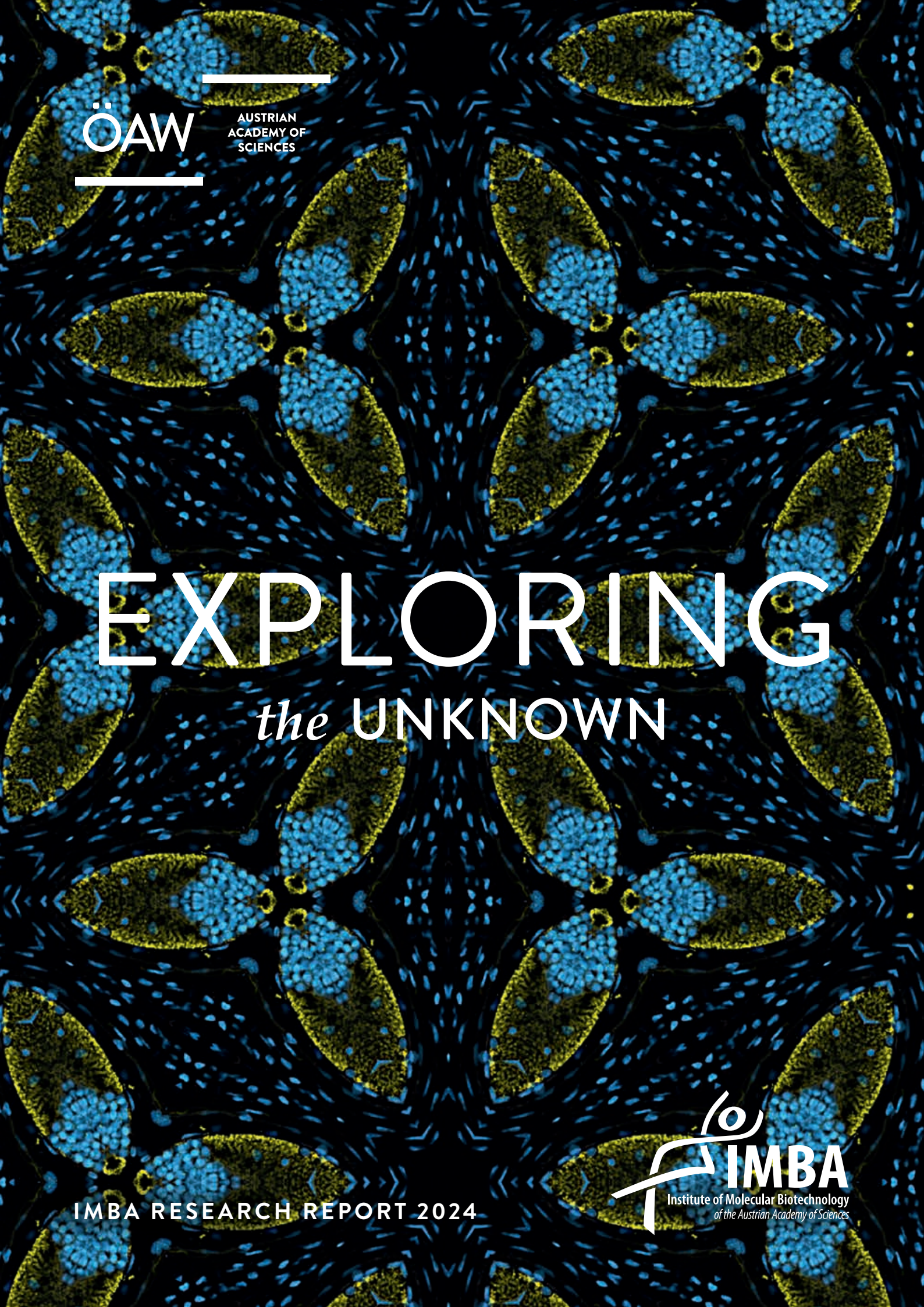
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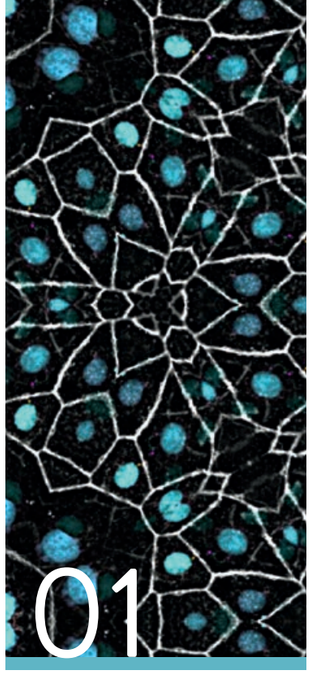
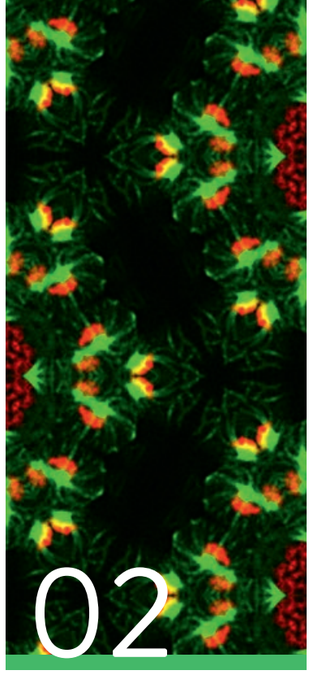
AUSTRIAN ACADEMY OF SCIENCES
EXPLORING
the UNKNOWN
IMBA RESEARCH REPORT 2024
IMBA
Institute of Molecular Biotechnology
of the Austrian Academy of Sciences

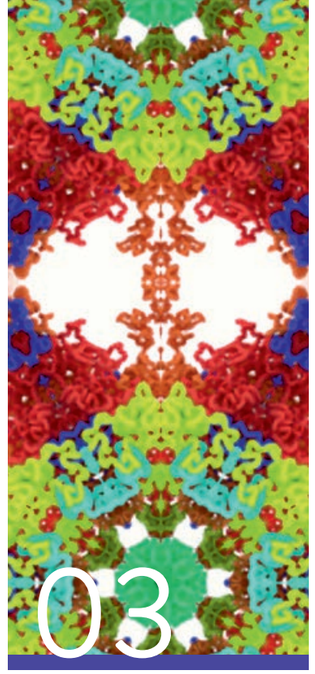
# EXPLORING *the* UNKNOWN

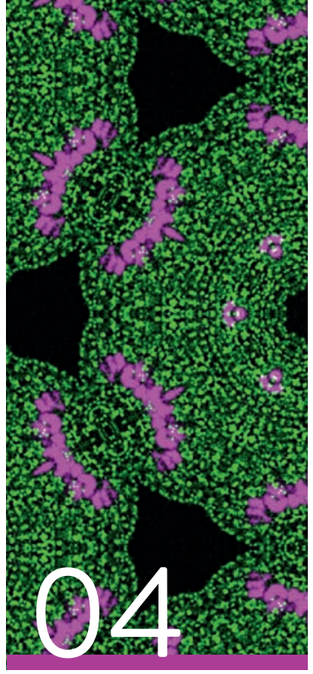
IMBA RESEARCH REPORT 2024

# Contents



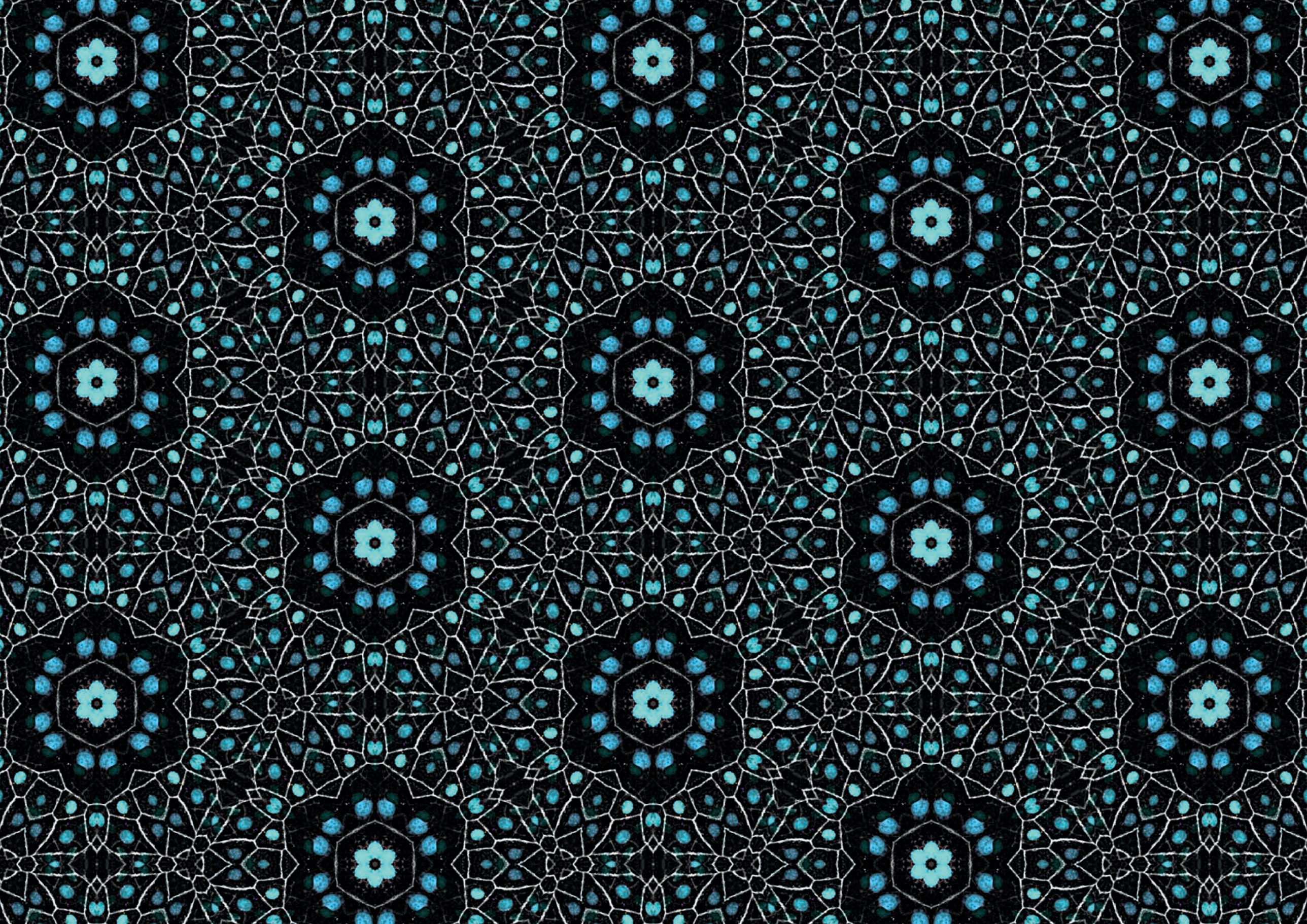



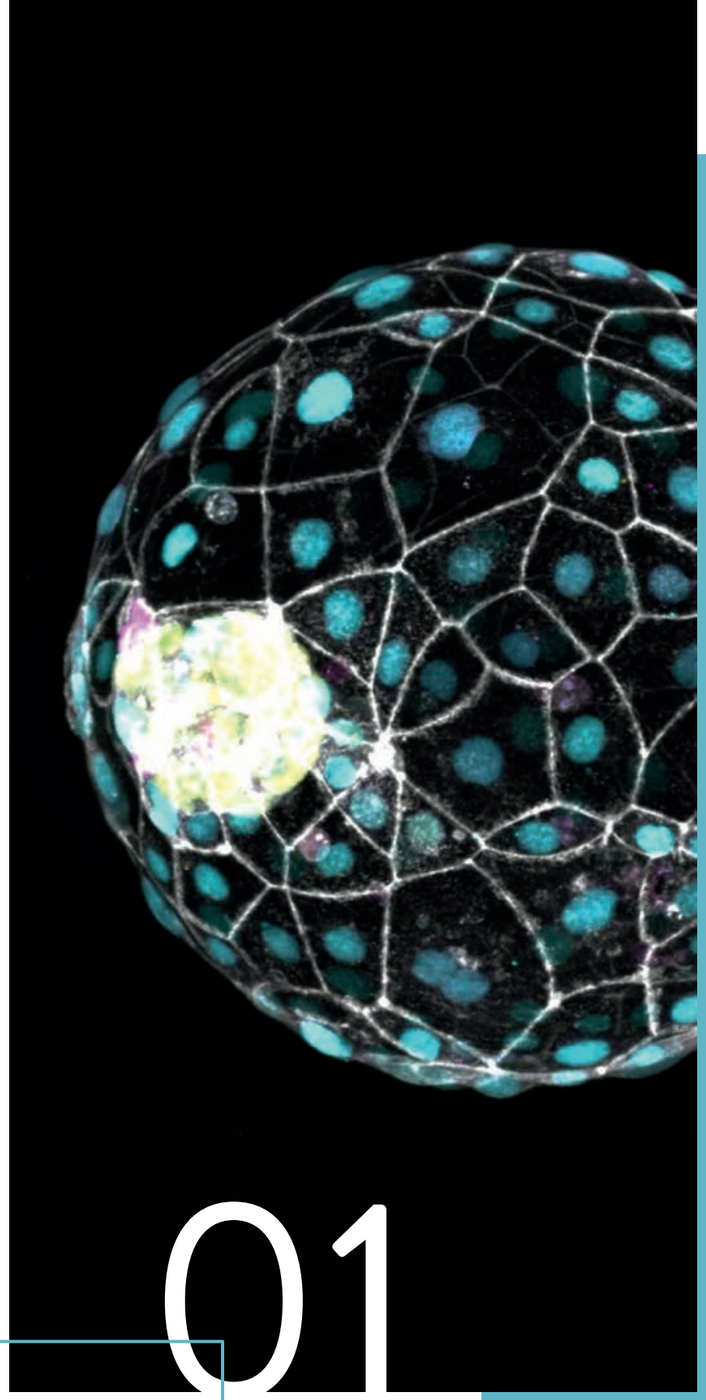






IMBA scientists are united by a curiosity to explore the unknown. This curiosity is reflected in the visual narrative of this research report, which transforms research images into kaleidoscopes. The kaleidoscopes visually represent the multifaceted nature of explorations by IMBA scientists.





# 01

# INTRODUCTION

In 2024, researchers at IMBA studying human blastoids discovered a potential "pause button" in the earliest stages of human development.
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INTRODUCING IMBA

# A message from IMBA's directors

**IMBA's directors Elly Tanaka and Barbara Kraus share their vision for the institute's future, emphasizing a commitment to pioneering research, interdisciplinary collaboration, and groundbreaking discoveries that will shape the next era of molecular life sciences.**

At IMBA, we remain steadfast in our mission to explore life's fundamental principles – from the molecular scale to entire organisms. By tackling some of the most pressing questions in life sciences, we seek to expand our fundamental understanding of biology and to uncover mechanistic insights that lay the foundation for future innovations in medicine and beyond. Our research spans a broad spectrum, from RNA and genome biology to stem cells, neuroscience, and organoid research, creating countless opportunities to bridge scientific disciplines and scales. IMBA's approach is defined by the spirit of curiosity and exploration, and this year's report continues to reflect that: the visual narrative of this report captures the interconnected nature of our discoveries, illustrating how unexpected insights can reshape our understanding of biology.

IMBA scientists have once again pushed the frontiers of knowledge. In 2024, they made significant breakthroughs, including discovering a previously unknown "pause button" in human development, developing new organoid models for understanding human-specific brain development and disorders, and deepening our understanding of genomic imprinting. These achievements enhance our grasp of fundamental biology and hold the potential to influence future therapeutic strategies.

This year also marks an important transition for IMBA. In 2024, we took charge of steering IMBA's course as IMBA's new directors. We extend our gratitude to Jürgen Knoblich and Markus Kiess for their invaluable contributions and dedication to the institute's mission. As we look forward to the years ahead, we are excited to build on the foundations laid at IMBA and to continue to enable researchers at IMBA to pursue pioneering research. We are looking forward to fresh perspectives brought to our institute: In 2025, Sven Klumpe will start a cryo-Electron Tomography lab at IMBA and the IMP, in a joint research group hosted by our two neighboring institutes. And Kristina Stapornwongkul will join IMBA as Junior Group Leader, establishing her lab with a focus on exploring the environmental and metabolic factors that influence embryonic development.

In 2024, Jürgen Knoblich (R) and Markus Kiess (L) passed on the baton to IMBA's new directors, Elly Tanaka and Barbara Kraus.

IMBA's success is made possible through the continued support of the Austrian Academy of Sciences and the Federal Ministry of Education, Science and Research. We deeply appreciate their commitment to fostering scientific excellence. We also extend our gratitude to our sponsors, donors, and partners, whose support enables us to push the boundaries of knowledge.

At the heart of IMBA is its community – dedicated researchers, students, and staff whose passion and collaborative spirit drive innovation. It is through their relentless curiosity and pursuit of excellence that IMBA continues to thrive as a vibrant hub for scientific discovery.

As we step into the future, we remain inspired by the transformative potential of molecular life sciences. IMBA is poised to continue its pursuit of fundamental research, embracing new challenges and opportunities that will redefine our understanding of biology. IMBA is ready to shape the next era of scientific breakthroughs.

**Elly Tanaka,** *Scientific Director*
**Barbara Kraus,** *Administrative Director*

INTRODUCING IMBA

# Charting the institute's trajectory: IMBA's new *leadership shares their vision*

IMBA's new directors Elly Tanaka and Barbara Kraus give insights into their vision for the institute, their priorities and where they see IMBA's future.

Barbara Kraus and Elly Tanaka look back on 2024, a busy year focused on supporting the thriving community at IMBA.

**Elly, you became IMBA's new scientific director in April. How would you describe your first year at IMBA?**

**Elly Tanaka:** I have been busy! It has been exciting and gratifying to meet all the colleagues at the institute and to get to know not only the science but also the culture of the institute. IMBA is truly an amazing research institute where individuals are driven by a passion for science and a desire to excel. I feel the excitement to contribute toward the future in science by bridging outstanding molecular biology with cell and tissue-scale biology. It is at interfaces where exciting things happen, and I'm enthusiastic about the many productive interfaces at IMBA.

**What have been your priorities for 2024?**

**Elly Tanaka:** Developing a shared understanding of our goals at IMBA has been a top focus. Another has been to recruit new group leaders who bring additional dimensions to the research here, and we are already succeeding in this area. One important outlook is the arrival of the AITHYRA institute in Vienna: one focus has been to prepare IMBA so that our researchers can maximally benefit from and contribute to interactions with AI researchers to perform exciting, next-generation research.

**Barbara, you started in November as IMBA's administrative director. How would you both describe your first months together at the helm of IMBA?**

**Barbara Kraus:** For me, IMBA is a place of inspiration. I truly enjoy working with Elly. Her collaborative approach makes working together a seamless experience. During our first few months, we briefed ourselves on the Vienna BioCenter and the Academy of Sciences. We learned about the conditions and the people who work here, both of which are important for the daily running of the institute. These next months, I aim to clarify the core needs of the research groups.

**Elly Tanaka:** It has been fantastic to work together with Barbara. She brings enormous experience in management, which reinforces and is complementary to the needs at IMBA. Working alongside Barbara, I am gaining a deeper understanding of how to align business strategy with scientific goals. Together, we are focused on building a culture where all teams can thrive, supporting a collaborative environment that encourages innovation, growth, and excellence across every aspect of IMBA.

**With your knowledge of the institute, how would you describe IMBA?**

**Elly Tanaka:** IMBA is a first-rate research institute in the field of molecular and cellular biology, with strong critical mass also in stem cell biology. Excellence and discovery are the common denominators that drive decision-making in an institute that is streamlined for low bureaucracy and high flexibility. Our environment supports young researchers to help them participate in the highest level of research.

**Barbara Kraus:** IMBA is an institute embedded within the exceptional infrastructure of the Vienna BioCenter, offering a truly unique opportunity to pursue curiosity-driven research without limits. It is a place where curiosity, ambition, and excellence meet and inspire our students and researchers to make groundbreaking discoveries.

**You mention the Vienna BioCenter: How important is the campus for IMBA?**

**Elly Tanaka:** The Vienna BioCenter is vital for IMBA. IMBA alone has 14 research groups and 250 people, but with our sister institutions, we bring together more than 130 research groups and 2,000 scientists. This broadens the expertise and possibilities for collaboration on campus and also provides friendly competition to be the best we can be.

**Barbara Kraus:** The Vienna BioCenter is a place where scientific exchange, collaboration between research groups across universities and institutes, combined with a spirit of healthy competition, create an inspiring and unparalleled atmosphere that makes it truly one of a kind.

**What is IMBA's scientific strategy?**

**Elly Tanaka:** IMBA's strategy is to hire the best young minds working on exciting, forward-thinking problems in life sciences and give them a supportive environment to fulfill their potential.

**And what is your vision for the institute?**

**Elly Tanaka:** My vision of IMBA is as a place where fundamental discoveries in life sciences are made. The institute has particular strengths in understanding how the genome is regulated and how stem cells organize themselves into tissues, and what goes wrong in disease. It will be exciting to link information across disciplines – can we study DNA, RNA, and protein complexes at nanometer resolution inside tissues to understand how cells work together? Cells are remarkable living entities that, when they cluster together, can organize tissues on their own as an emergent property. How does this occur as a dynamic process, and how can we harness this for engineering living tissues? In the coming years, we will benefit from AI approaches that can integrate enormous amounts of information to bring new insights.

**AITHYRA, which exactly focuses on this use of AI in the life sciences, will soon start operating as was announced in 2024. What does this mean for IMBA?**

**Elly Tanaka:** The start of AITHYRA at the Vienna BioCenter is an important development because, in the future, AI can help us to interpret the massive amounts of data that are becoming available worldwide, and design experiments integrating information in a way that is not possible for a human brain alone.

**Where would you like IMBA to be in ten years?**

**Barbara Kraus:** I want IMBA to be as renowned for its groundbreaking research and revolutionary discoveries as the most esteemed institutes in the USA and Europe, such as MIT or the Salk Institute.

**Elly Tanaka:** IMBA should be a place where people with rigorous minds and sound experimental approaches are capitalizing on new ways of examining and integrating data about living systems to make paradigm-shifting discoveries.

INTRODUCING IMBA

# Ingenuity *and* innovation

## Scientific curiosity, a deep passion for discovery, and outstanding support infrastructure make IMBA unique.

The Institute of Molecular Biotechnology (IMBA) has established itself as one of Europe's leading research centers in molecular biology and biomedical science. As a research institute of the Austrian Academy of Sciences and a key part of the Vienna BioCenter, IMBA is embedded in a dynamic international hub for life sciences. The Vienna BioCenter brings together research institutes, universities, and biotech companies, creating a thriving environment where fundamental and applied research intersect with education to drive scientific progress.

### Research

At IMBA, scientific curiosity and a deep passion for discovery drive researchers to tackle challenging questions, pioneer new fields, and advance our understanding of life at the molecular level. Research topics pursued at IMBA span diverse areas, including RNA biology, chromosome biology, neurobiology, stem cells, organoid research, and disease modeling.

Fostering creativity is at the core of IMBA's philosophy. Scientists—ranging from early-career researchers to established experts—receive strong financial and technical support to pursue ambitious research goals. State-of-the-art core facilities, led by experts in their fields, collaborate closely with scientists, providing essential support in experimental design, instrumentation, execution, and data analysis. IMBA also encourages collaboration across research groups and institutions, bridging disciplinary boundaries and facilitating the exchange of ideas. Within this highly supportive and interactive environment, IMBA scientists conduct internationally competitive research. Our goal is to make great leaps, rather than to take incremental steps.

IMBA benefits from generous core funding provided by the Austrian Academy of Sciences. Additionally, our researchers successfully secure third-party funding from national and international funding agencies. These resources allow IMBA scientists the flexibility to explore bold new research directions, develop cutting-edge technologies, and establish innovative model systems—ultimately leading to groundbreaking discoveries.

### Education

The foundation of IMBA's success are our young scientists, who are guided towards research excellence through world-class training programs. As a top destination for researchers at all career stages—from interns to PhD students and postdocs—IMBA plays a key role in shaping the next generation of scientific leaders.

The Vienna BioCenter's internationally renowned doctoral and postdoctoral programs are integral to IMBA's educational mission. These programs provide rigorous training that fosters scientific independence and leadership skills, ensuring that researchers are equipped to tackle the challenges of the future.

IMBA's key strengths lie in its outstanding research infrastructure, a renowned community of interdisciplinary scientists, and a collaborative, vibrant environment in Vienna—one of the world's highest-ranked cities for quality of life.

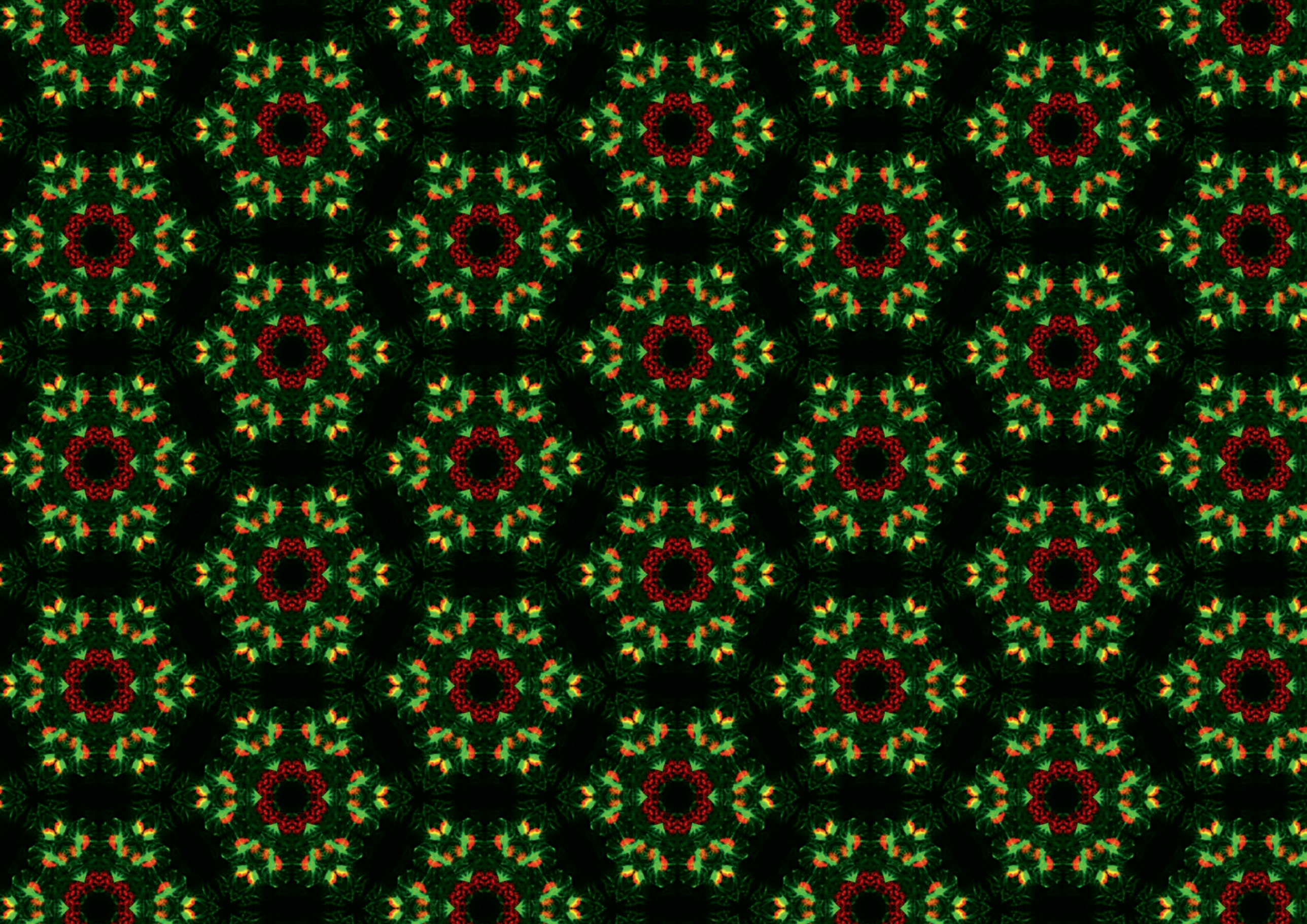
> ***"IMBA is defined by its diversity and intellectual freedom. Having spent over a decade at IMBA, I've seen first-hand how a truly collaborative environment can be transformative. It's inspiring to watch researchers from different backgrounds challenge one another, exchange ideas, and push the boundaries of what's possible. The most valuable lesson I've learned at IMBA is that scientific breakthroughs often come from unexpected places, but they are always driven by diverse minds and the contagious curiosity that defines our institute."***
>
> Julius Brennecke, Senior Scientist

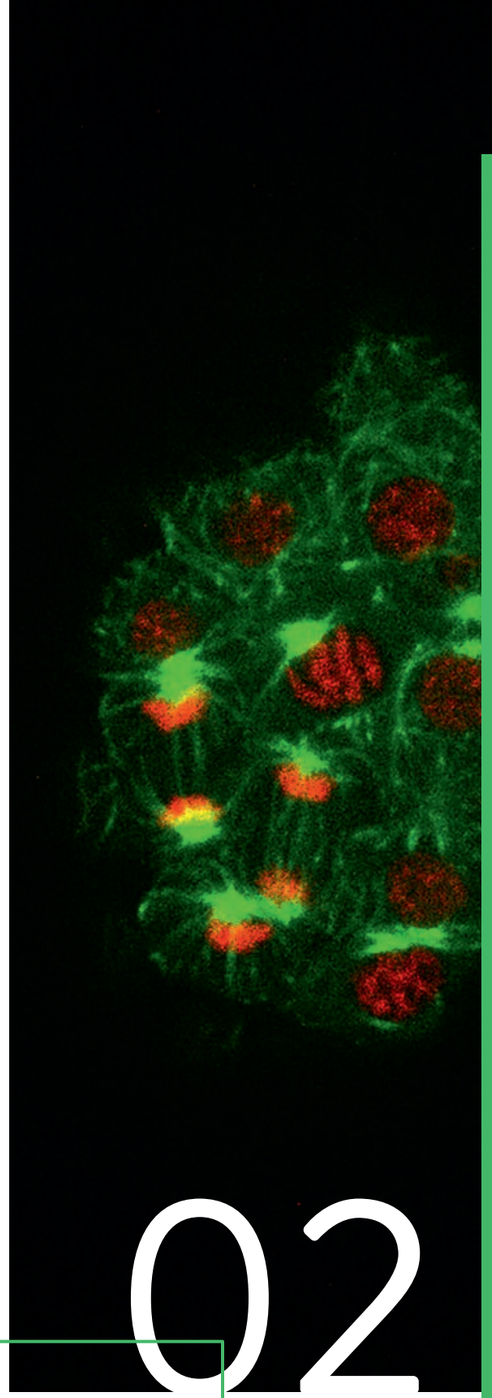
### Working at IMBA

IMBA is committed to fostering a supportive, collegial, and inclusive work environment where all employees can thrive and contribute to high-impact research. The institute prioritizes scientific excellence while ensuring a workplace culture that values collaboration, integrity, and diversity.

To maintain the highest research standards, IMBA undergoes an annual evaluation by a Scientific Advisory Board, composed of independent international experts. The Scientific Advisory Board provides guidance to the institute's leadership and the Austrian Academy of Sciences, ensuring that IMBA continues to uphold its reputation as a global leader in molecular biology and biomedical research.

> ***"Our goal is to empower curious researchers. Scientists at IMBA have access to world-class facilities, enabling them to push the boundaries of their projects and gain invaluable hands-on experience. Watching young researchers thrive and supporting them as they transform an initial idea into a groundbreaking discovery is incredibly rewarding."***
>
> Daniel Gerlich, Senior Scientist





02

Studying the model *C. elegans*, researchers at IMBA uncovered a novel gene regulation process, associated with the silencing of selfish genes, that could represent the first step in the evolution of imprinting.
© Julian Ross/IMBA

# RESEARCH *at* IMBA

# Genome organization *and* chromosome biology

## Researchers at IMBA uncovered fundamental principles of genome dynamics and RNA biology.

Genome dynamics and RNA biology are key research areas at IMBA. Scientists at IMBA explore the structural basis of the genome, and aim to understand the changes occurring during cell division as well as the genome's dynamic regulation during development. IMBA researchers also study the interplay between selfish genetic elements and the genome's defense mechanisms, and investigate the role and function of RNA molecules in a variety of cellular processes. By examining the contributions of different molecular players, scientists at IMBA aim to shed light on the dynamic organization and function of the genome, advancing our understanding of development, differentiation, and disease.

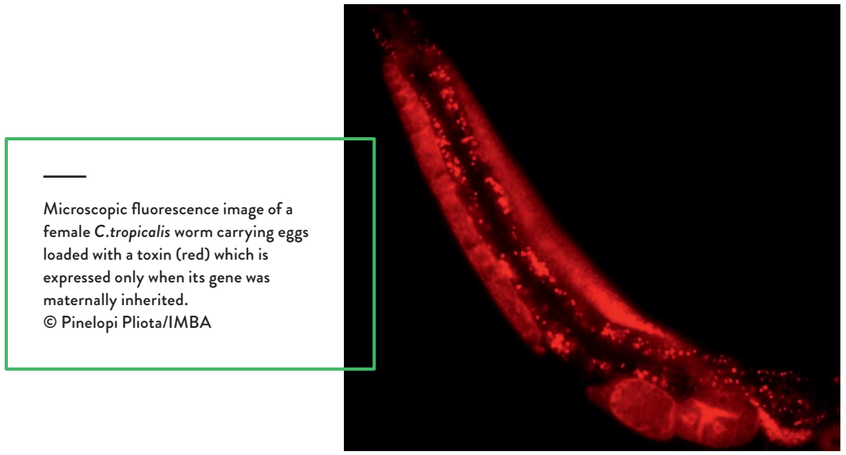
In 2024, researchers at IMBA made important advances in the fields of genome organization and RNA biology. They discovered a potential evolutionary origin of genomic imprinting, uncovered how chromatin influences the precise regeneration of limbs in the axolotl, and described how a single amino acid shapes the chromatin binding profile of a key protein for genome defense.

### Revealing the evolutionary origin of genomic imprinting

Some of our genes are expressed or silenced depending on whether we inherited them from our mother or our father. The mechanism behind this phenomenon, known as genomic imprinting, is determined by DNA modifications during egg and sperm production. In 2024, the group of Alejandro Burga uncovered a novel gene regulation process, associated with the silencing of selfish genes, that could represent the first step in the evolution of imprinting.

Studying nematodes, the Burga Lab discovered a selfish genetic element that is silenced only when inherited paternally, but not when inherited maternally. The silencing is mediated by the piRNA pathway, a defense mechanism protecting the genome from disruptions by selfish elements. This finding reveals a deep mechanistic connection between genome defense patwhays and the early evolution of genomic imprinting.

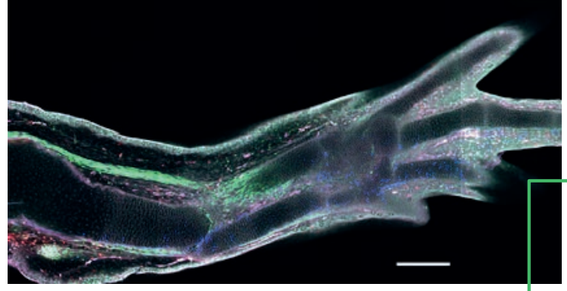
Pliota, P., Marvanova, H., Koreshova, A., Kaufman, Y., Tikanova, P., Krogull, D., Hagmüller, A., Widen, S. A., Handler, D., Gokcezade, J., Duchek, P., Brennecke, J., Ben-David, E., & Burga, A. (2024). Selfish conflict underlies RNA-mediated parent-of-origin effects. Nature, 628(8006), 122–129.



Microscopic fluorescence image of a female *C.tropicalis* worm carrying eggs loaded with a toxin (red) which is expressed only when its gene was maternally inherited.
© Pinelopi Pliota/IMBA







The Tanaka group studies the molecular mechanisms that allow the axolotl to fully regenerate its limbs after injury.
© Wouter Masselink/IMP

### Hand or arm? Chromatin holds the key

The axolotl can regenerate fully functional limbs and organs by using positional information encoded in its cells. When an axolotl loses a limb at the level of its hand, it regenerates only the hand, however, when it loses the limb at the level of its shoulder, the animal regrows the upper and lower arm as well as the hand. But how do the cells in the regenerating structures "know" their position within the axolotl body and which body parts to regrow?

In 2024, the group of Elly Tanaka showed that chromatin "stop signals" on genes act like molecular zip codes, guiding the regeneration program to regrow only the missing structures. These molecular zip codes allow cells to remember their positional information even when transplanted into a new environment, illustrating that chromatin modification acts as a memory mark determining positional information in the axolotl limb.

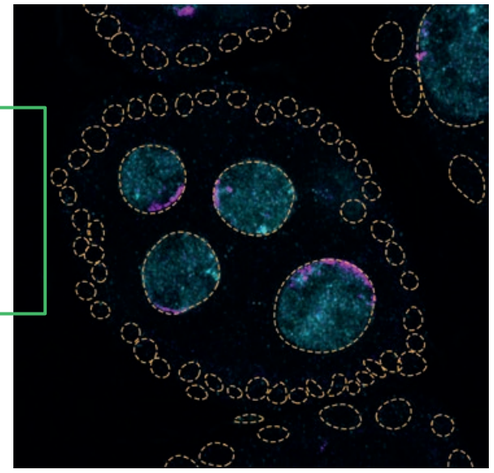
Kawaguchi, A., Wang, J., Knapp, D., Murawala, P., Nowoshilow, S., Masselink, W., Taniguchi-Sugiura, Y., Fei, J.-F., & Tanaka, E. M. (2024). A chromatin code for limb segment identity in axolotl limb regeneration. Developmental Cell, 59(16), 2239-2253.e9.

### A single amino acid shapes Rhino's chromatin binding

Mobile transposable elements (TEs) move within host genomes and pose a significant threat to genome integrity. To counteract the deleterious effects of TEs, proteins of the heterochromatin protein 1 (HP1) family compact TE-containing genome regions, thereby silencing their activity. However, one HP1 protein, called Rhino, fulfills a completely different function: instead of repressing, Rhino facilitates the expression of PIWI-interacting RNAs (piRNAs), small RNA molecules that help silence TEs in the animal germline.

The Brennecke group investigated what makes Rhino so different from its counterparts within the conserved HP1 family, and identified a single amino acid residue that is key to Rhino's partnership with its guidance factor, Kipferl. The team discovered that changes in this amino acid disrupt the interaction between Rhino and Kipferl, affecting Rhino's function and causing profound changes in piRNA expression and TE silencing.

Baumgartner, L., Ipsaro, J. J., Hohmann, U., Handler, D., Schleiffer, A., Duchek, P., & Brennecke, J. (2024). Evolutionary adaptation of an HP1-protein chromodomain integrates chromatin and DNA sequence signals. eLife, 13, RP93194.



Mutations in the *rhino* gene disrupt the interaction and co-localization of proteins Kipferl (cyan) and Rhino (magenta) in Drosophila egg chambers.
© Lisa Baumgartner/IMBA

# Organoids *and* developmental biology

## In 2024, IMBA researchers developed organoid and blastoid models to explore key aspects of human development.

One key research area at IMBA includes organoids, three-dimensional tissue culture models of human organs that can be used to analyze development and study diseases. Scientists at IMBA study organoids that mimic the development and function of organs such as the heart, the intestine and the brain, and blastoids that replicate the initial stages of embryonic development and implantation. Another major pillar of research at IMBA is the study of how tissues such as the brain develop and form, and how tissues respond to injury and disease.

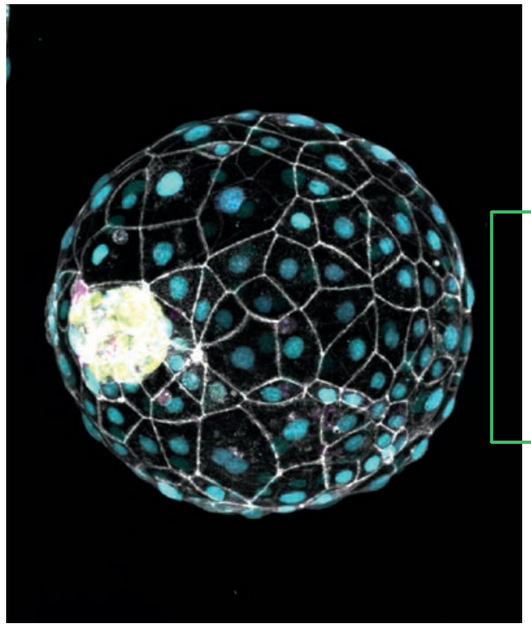
In 2024, researchers at IMBA discovered a "pause button" in human development, described the structural changes in the intestine of pregnant and nursing females, and developed a novel brain organoid model to study how the brain's information highways develop.

### "Pause button" in human development discovered

In some mammals, embryonic development can be temporarily slowed until conditions are favorable, which decouples mating time from birth. This mechanism, called embryonic diapause, allows the embryo to be tuned down and remain free-floating for weeks or months before development is resumed and the embryo implants into the uterus.

Nicolas Rivron and his team identified that the mTOR pathway, the molecular mechanism that controls embryonic diapause in other mammals, is active and actionable in human cells. The researchers discovered that modulating the mTOR signaling pathway in blastoids, three-dimensional models of early human embryos, induces a dormant state, akin to diapause, that prevents implantation. The findings provide novel insights into the processes governing our earliest development, which may open new avenues for enhancing reproductive health.

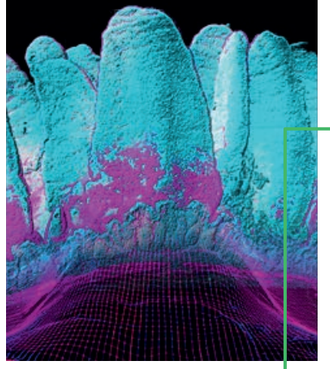
Iyer, D. P., Khoei, H. H., van der Weijden, V. A., Kagawa, H., Pradhan, S. J., Novatchkova, M., McCarthy, A., Rayon, T., Simon, C. S., Dunkel, I., Wamaitha, S. E., Elder, K., Snell, P., Christie, L., Schulz, E. G., Niakan, K. K., Rivron, N., & Bulut-Karslioğlu, A. (2024). mTOR activity paces human blastocyst stage developmental progression. Cell, 187(23), 6566-6583.



Dormant human blastoids fluorescently labeled for markers of cell wall (white), trophoblast (cyan), epiblast (yellow) and hypoblast (magenta) cells.
© Heidar Heidari Khoei/IMBA







In mothers, villi in the gut surface expand during pregnancy and lactation. This morphological alignment presumably facilitates the absorption of nutrients.
© Masahiro Onji/IMBA and Tibor Kulcsar/IMBA-IMP Graphics

### Remodeling of intestines during pregnancy and nursing uncovered

When women are pregnant and nurse their babies, their bodies change, and various organs are adapted to ensure the health of both mother and child. In 2024, the group of Josef Penninger discovered that the intestine also changes completely in pregnant and nursing females, resulting in a doubling of the intestinal surface area and a striking structural reorganization.

Mechanistically, the researchers identified the RANK receptor/RANK ligand (RANK/RANKL) system as the key to the villous enlargement of the small intestine during reproduction, which is regulated by sex and lactation hormones. These intestinal changes, which appear to be completely reversible when nursing is stopped, are important for proper feeding and nourishment of the fetus and baby.

Onji, M., Sigl, V., Lendl, T., Novatchkova, M., Ullate-Agote, A., Andersson-Rolf, A., Kozieradzki, I., Koglgruber, R., Pai, T.-P., Lichtscheidl, D., Nayak, K., Zilbauer, M., Carranza García, N. A., Sievers, L. K., Falk-Paulsen, M., Cronin, S. J. F., Hagelkruys, A., Sawa, S., Osborne, L. C., … Penninger, J. M. (2025). RANK drives structured intestinal epithelial expansion during pregnancy. Nature, 637(8044), 156–166.

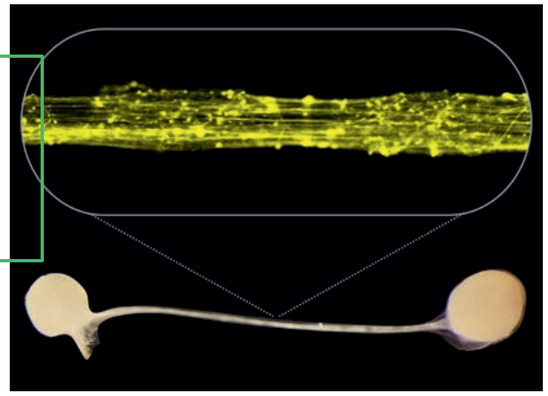
### First model of the brain's information highways developed

Our brain resembles the road network: like country roads, small connections link neighboring nerve cells, while, like highways, thick nerve bundles connect different regions of the brain. These thick, heavily used nerve bundles, which for example connect the left and right brain hemispheres, could not be investigated experimentally so far.

In 2024, the lab of Jürgen Knoblich developed a new brain organoid model that replicates the formation of long-range neuronal connections. The team used patient-derived brain organoids to model a rare neurodevelopmental disorder in which the corpus callosum, the bridge between the two brain hemispheres, does not form. The researchers showed that mutations in the ARID1B gene dysregulate the expression of genes responsible for neuronal maturation and axon generation. As a result, mutant neurons were unable to produce long-range axons for the corpus callosum. These new brain organoids are the first model in which these important neuronal connections can be studied in detail.

Martins-Costa, C., Wiegers, A., Pham, V. A., Sidhaye, J., Doleschall, B., Novatchkova, M., Lendl, T., Piber, M., Peer, A., Möseneder, P., Stuempflen, M., Chow, S. Y. A., Seidl, R., Prayer, D., Höftberger, R., Kasprian, G., Ikeuchi, Y., Corsini, N. S., & Knoblich, J. A. (2024). ARID1B controls transcriptional programs of axon projection in an organoid model of the human corpus callosum. Cell Stem Cell, 31(6), 866-885.

Microscopic image of long-range axons connecting two brain organoids. The magnification shows fluorescence labeling of single axons.
© Catarina Martins-Costa/IMBA



INTERVIEW

# Building *bridges* in science

## Noelia Urbán, group leader at IMBA, gives an insight into how research groups are supported at IMBA.

Noelia Urbán successfully established her first research group at IMBA in 2017. Her research focuses on the mechanisms that regulate and maintain neuron formation in the adult brain. In 2024, Urbán was part of a consortium that received a Cluster of Excellence Grant by the FWF. In the newly funded project, Urbán and colleagues across Austria's neuroscience community will investigate the development and function of inhibitory neurons in the brain. Noelia Urbán explains how she built her independent research group at IMBA, her philosophy for mentoring, and a new way for understanding the brain.

**Noelia, why did you choose IMBA as a place to establish your research group?**

**Noelia Urbán:** IMBA offered the right kind of support and collaboration opportunities. Young group leaders form a close-knit community, and the institute provides core funding, so I did not need to apply for grants to start my research. Additionally, I discovered early on that interactions between groups and IMBA's scientific facilities would allow my lab to explore topics at a deeper level than was previously possible. Next Generation Sequencing, Comparative Medicine, Histology, and BioOptics are crucial for supporting my lab's research goals. We are now using Proteomics and the Tech Hub to establish single-cell proteomics from tissue. And the childcare, of course.

**How have you mentored your team?**

**Noelia Urbán:** I'm there to teach my lab members and to show them how to do research. There's no blueprint you can just follow. Every person has different needs. You need to listen and set expectations, then adapt them. I'm enrolled to take part in the campus leadership program in 2025. I've heard the program is very useful and provides a framework of how to lead and how to manage a group.

The Cluster of Excellence "Neuronal Circuits in Health and Disease" coordinating team includes Francesco Ferraguti and Thomas Klausberger at the Medical University of Innsbruck, Gaia Novarino and Peter Jonas at the Institute of Science and Technology Austria, Tibor Harkany at the Medical University of Vienna, Noelia Urbán at IMBA, and Manuel Zimmer at the University of Vienna. IMBA scientists Elly Tanaka, Jürgen Knoblich and Sofia Grade are also part of the multidisciplinary project, which will foster unprecedented collaboration within the neuroscience community.


*"I discovered early on that interactions between groups and IMBA's scientific facilities would allow my lab to explore topics at a deeper level than was previously possible."*

**You and your colleagues were recently awarded a 21-million-Euro Cluster of Excellence Grant. What's the project's aim?**

**Noelia Urbán:** The new Cluster of Excellence aims to create a comprehensive understanding of how different types of inhibitory neurons – essential cellular nodes of any neural network – develop and interact to control circuit operations that underlie behavior, and how they are susceptible to diseases such as schizophrenia, autism and epilepsy. The project will extract general principles of how different types of inhibitory neurons coordinate the brain's actions.

**Why is the project focusing on inhibitory neurons?**

**Noelia Urbán:** We had the idea of using interneurons, a type of inhibitory neuron, as a new way to understand the brain. Instead of viewing the whole brain at once or focusing on a brain region in detail, we will study only interneurons, globally in the entire brain, with a little bit of focus on the cortex. From development to regeneration in adulthood and across organisms, the consortium funds fourteen task groups, and Austria has the whole range of expertise to make this type of research a reality. The results of this research could pave the way for the development of personalized drug therapies to alleviate mental illness.

**Who is part of the consortium?**

**Noelia Urbán:** One beneficial effect of this interdisciplinary project is that it will foster unprecedented collaboration within the neuroscience community in Austria. The coordinating team includes researchers from five institutions: the Medical University of Innsbruck, the Institute of Science and Technology Austria, the Medical University of Vienna, and the University of Vienna – and, of course, IMBA. As Deputy Director of Science of the consortium, my role is to align task leaders and provide strategic guidance. IMBA group leaders Elly Tanaka, Jürgen Knoblich and Sofia Grade are also part of the project.

RESEARCH GROUPS

# Research *groups* at IMBA

**At IMBA in 2024, scientists worked together in – and across – 14 research groups to advance our understanding of life in all its facets.**

Curiosity, passion for knowledge, academic freedom, and pioneer spirit drive scientists at IMBA to explore the unknown. In 2024, 14 research groups brought together scientists at all career levels, from students to principal investigators, to answer outstanding questions and make novel discoveries in the life sciences.

All principle investigators at IMBA lead their own, independent research groups and programs. While promising young researchers are supported to start their groups as junior group leaders, established excellent scientists also contribute to institute leadership as senior group leaders.

## Julius Brennecke: *The transposon-host molecular arms race*

Joined IMBA in 2009 | PhD: EMBL Heidelberg / Ruprecht-Karls University Heidelberg, DE

PREVIOUSLY
Postdoc (2006–2008): Gregory Hannon Lab, Cold Spring Harbor Laboratories (CSHL), New York, US
Postdoc (2005–2006): Stephen Cohen, European Molecular Biology Laboratory (EMBL), Heidelberg, DE

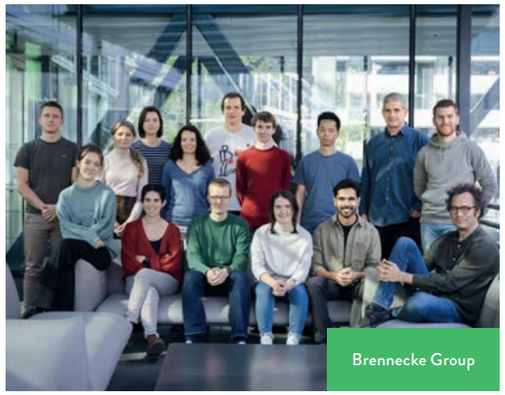
The genome of all living organisms encodes the instructions needed for the expression of every gene, a fundamental process underpinning development, homeostasis, and disease. However, rather than being perfectly organized, eukaryotic genomes are actually quite messy, largely due to transposable elements – selfish, mobile genetic sequences that spread within genomes. These elements make up roughly 50% of the human genome and as much as 80% of some plant genomes. Due to their ability to cause mutations and chromosomal instability, transposons pose a significant threat to genome stability, forcing host organisms to evolve sophisticated surveillance systems. This has fueled a classic evolutionary arms race, where hosts and transposons continually adapt and counter-adapt to each other's new tricks, leading to remarkable molecular innovations on both sides.

The Brennecke Group investigates the molecular foundations of this ongoing genetic conflict using the fruit fly, *Drosophila melanogaster*, as a primary model organism. The team's holistic approach explores both sides of this conflict to gain a deeper understanding of the coevolution between transposons and genome defense mechanisms.

### Current Projects

**The host side:** The piRNA pathway is a highly specific and effective genome defense system that, similar to the CRISPR-Cas system, uses small RNA molecules to identify foreign nucleic acids, including transposable elements, and silence their activity. By integrating genetics, biochemistry, molecular biology, cell biology and structural biology, the Brennecke Group aims to understand the molecular mechanisms underlying this remarkable silencing system.

**The transposon side:** For their survival, transposons must constantly evolve new strategies for spreading within the genome, circumventing the host's defense mechanisms. The Brennecke Group focuses on endogenous retroviruses – a group of infectious transposable elements capable of invading the *Drosophila melanogaster* germline from neighboring somatic cells. Using a combination of phylogenetic studies, fly genetics, modern imaging techniques and controlled transposon invasion experiments, the group aims to uncover how transposon traits co-evolve with the gonad ecosystem of the host.



Brennecke Group

PUBLICATIONS & PREPRINTS – HIGHLIGHTS OF THE LAST 5 YEARS


Senti KA, Handler D, Rafanel B, Kosiol C, Schloetterer C, Brennecke J (2023). **Functional Adaptations of Endogenous Retroviruses to the Drosophila Host Underlie their Evolutionary Diversification.** BioRxiv 2023.08.03.551782.

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TEAM IN 2024

**Postdocs:** Ulrich Hohmann, Maya Shinan Voichek, Changwei Yu
**PhD Students:** Roba Dawud, Svetlana Iarovenko, Ralf Jansen, Julia Portell i De Montserrat, Liudmila Protsenko, Baptiste Rafanel, Aleksandr Tsarev
**Research Assistants:** Dominik Handler, Kristen Senti, Laszlo Tirian
**Research Technician:** Anja Adelmann
**Master's Student:** Lea Katharina Lauterjung
**Trainees:** Andreas Bernhard, Giacomo Silvestri
**VBC Summer School Student:** Divine Ndeogo

# Alejandro Burga: *Genomic conflict*

Joined IMBA in 2019 | PhD: EMBL-CRG Systems Biology Unit and Pompeu Fabra University, Barcelona, ES

PREVIOUSLY
Postdoc (2013–2018): Leonid Kruglyak Lab, Department of Human Genetics, University of California, Los Angeles, US
Postdoc (2012–2013): Leonid Kruglyak Lab, Lewis-Sigler Institute, Princeton University, US

Our understanding of the natural world hinges on the concept of evolution. To survive in environments with limited resources, individuals must adapt, and those individuals best suited to their environment are more likely to pass on their genes. However, not all genes exist to benefit the organism. A significant portion of the genome contains "selfish genes" that act in their own interest to ensure they are passed on to the next generation, sometimes at the expense of the individual host.

Initially, selfish genes were viewed as genetic outlaws, to be tolerated or suppressed by the host's defense mechanisms. Recent research, however, shows that the evolutionary conflict between selfish genes and their hosts drives genetic innovation, contributing to the complexity of life. The Burga Group explores how these genetic conflicts shape biology, from molecular innovations to speciation.

## Current Projects

**The evolution of toxin-antidote selfish elements:** Toxin-antidote (TA) elements are a type of selfish genetic element which secures its inheritance by poisoning those individuals that do not inherit a copy of the TA – and thus lack the antidote. To date, TAs have been identified across diverse organisms, including fungi, insects, nematodes, and plants. However, the molecular mechanisms that drive their evolution and function remain largely unexplored.

The Burga Group uses genetic, computational, and structural biology approaches to study how TAs skew inheritance to spread in natural nematode populations, and how TAs drive evolutionary novelty. In 2024, the team revealed that genetic imprinting, a parent-of-origin gene silencing mechanism essential for mammalian development, may have evolved from TA-defense.

***Mavericks* as vectors of horizontal gene transfer:** Recently, the Burga Group discovered that *Mavericks*, a type of virus-like transposon, mediate horizontal gene transfer (HGT) between different nematode species. The team now aims to demonstrate *Maverick*-mediated HGT under controlled laboratory conditions. In parallel, the researchers are dissecting how *Mavericks* and their genetic cargos influence the evolution of genomes and catalyze molecular innovations. In addition, the team uses *in silico* approaches to systematically discover other vectors of HGT across eukaryotes, expanding our understanding of HGT and its role in evolution.

Burga Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS

Pliota P, Marvanova H, Koreshova A, Kaufman Y, Tikanova P, Krogull D, Hagmüller A, Widen SA, Handler D, Gokcezade J, Duchek P, Brennecke J, Ben-David E, Burga A (2024). **Selfish conflict underlies RNA-mediated parent-of-origin effects.** Nature 628(8006):122-129.

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TEAM IN 2024

**Postdocs:** Tianhua Liao, Sonya Angeline Widen, Sara Wighard
**PhD Students:** Daniel Ciro Krogull, Alevtina Koreshova, Hana Maranova, Florian Pühringer, James Julian Ross, Polina Tikanova
**Senior Research Assistants:** Francis Belen Pacheco Fiallos, Pinelopi Pliota
**Research Assistants:** Keroshini Guynes, Andreas Hagmüller
**Master's Student:** Anja Koller
**VBC Summer School Student:** Rachelle Daniela Fernandez Vargas



# Ulrich Elling: *Functional Genomic Screening Technologies*

Group Leader at IMBA since 2015 | PhD: Mathias Treier Lab, EMBL Heidelberg, DE

PREVIOUSLY
Postdoc (2006–2014): Josef Penninger Lab, IMBA, Vienna, AT

## Research

CRISPR-based genetic screening enables scientists to investigate hundreds or thousands of genes simultaneously, facilitating high-throughput studies of gene function. The Elling group has developed an sgRNA design algorythm to enhance the precision of CRISPR-based genetic screening. The team also develops new genetic screening technologies with increased power and applicability, such as CRISPR-Switch, an inducible system for temporarily-controlled screening of gene function. The team leverages these technologies to unravel the mechanism's driving cell identity and differentiation in both development and disease contexts.

Moreover, the Elling group has been given the task of ensuring genomic surveillance of SARS-CoV-2 in Austria by genomic sequencing of over 200,000 genomes. To this end, the team, in a collaborative project with AGES and Luisa Cochella at the IMP, developed a new technology called SARSeq.

## Current Projects

**Inducible CRISPR for *in vivo* gene function screening:** Until recently, CRISPR screening was limited to *in vitro* studies, restricting insights into more complex biological systems. In 2024, the Elling lab developed CRISPR-StAR, a novel system for *in vivo* genetic screening that produces internal controls inside the screened cell population. This new CRISPR-based technology allows precise screening of gene function in animal models, including xenografts and allografts. The team applied this technology to identify the genetic dependencies of various types of cancer cells, providing potential new therapeutic targets.

**Understanding neuronal cell differentiation:** Differences in gene expression drive cell differentiation, establishing distinct cell types in organisms. Understanding how cells determine their fate is critical for advancing regenerative medicine. Recently, the Elling lab used CRISPR-Cas9 screens to reveal that mouse embryonic stem cells differentiate into neurons via two independent signaling pathways, each regulated by closely related transcription factors.

Elling Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS

Uijttewaal ECH, Lee J, Sell AC, Botay N, Vainorius G, Novatchkova M, Baar J, Yang J, Potzler T, van der Leij S, Lowden C, Sinner J, Elewaut A, Gavrilovic M, Obenauf A, Schramek D, Elling U (2024). **CRISPR-StAR enables high-resolution genetic screening in complex *in vivo* models.** Nature Biotechnology.

Frank O, Balboa DA, Novatchkova M, Özkan E, Strobl MM, Yelagandula R, Albanese TG, Endler L, Amman F, Felsenstein V, Gavrilovic M, Acosta M, Patocka T, Vogt A, Tamir I, Klikovits J, Zoufaly A, Seitz T, Födinger M, Bergthaler A, Indra A, Schmid D, Klimek P, Stark A, Allerberger F, Benka B, Reich K, Cochella L, Elling U (2024). **Genomic surveillance of SARS-CoV-2 evolution by a centralised pipeline and weekly focused sequencing, Austria, January 2021 to March 2023.** Euro Surveillance, 29(23).

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TEAM IN 2024

**PhD Students:** Joonsun Lee, Esther Coreline Henriette Uijtewaal
**Research Assistant:** Juliane Christina Baar
**Master's Student:** Milanka Gavrilovic

# Daniel Gerlich: *Chromosome structure and dynamics*

Joined IMBA in 2012 | PhD: University of Heidelberg, DE

PREVIOUSLY
Assistant Professor (2005–2012): Swiss Federal Institute of Technology Zurich (ETHZ), CH
Postdoc (2002–2005): Jan Ellenberg Lab, EMBL Heidelberg, DE

Genetic information is stored in long DNA molecules that, if unraveled, would reach up to 10 cm in humans. These long molecules must be tightly organized within the small space of a cell to ensure that genetic information is efficiently read, replicated, and transmitted during cell division. Additionally, the three-dimensional structure of the genome must adapt to different needs, such as development, DNA damage response, or cell proliferation.

The Gerlich Group studies how genomes are organized in three-dimensional space and how this organization affects cellular processes. In recent years, the team, bringing together biologists and computer scientists, developed new methods for mapping chromosome structure and interactions. Using these techniques, the group discovered how chemical modifications compact chromosomes during cell division, ensuring the genome is accurately transmitted to daughter cells. The team showed that the same chemical modification also mediates chromosome compaction during cell death.

## Current Projects

**Organization of mitotic chromosomes through chromatin phase transitions:** The Gerlich Group studies DNA packaging to understand how the structure of mitotic chromosomes is formed. The team recently showed that the cohesin complex plays a key role in organizing replicated chromosomes through a balance of loop extrusion and topological linkages.

**Conformation of the replicated human genome:** Distant DNA regions within a cell dynamically interact with each other to regulate gene expression and DNA repair. The Gerlich Group has developed new techniques, such as Hi-C, that allow them to map the conformation within and across chromosomes. Using this technology, the team discovered that the two known functions of the cohesin protein complex – DNA loop extrusion and cohesion – have opposing effects on sister chromatid organization. This finding sheds light on cohesin's role in DNA repair and mitotic chromosome assembly.

**Chromatin structure during gene expression:** For genes to be expressed, the genome needs to be reorganized to make space for the transcription machinery. The Gerlich Group is developing new techniques to simultaneously visualize DNA, RNA and proteins in single cells, offering new insights into genome organization and its role in cell function.

Gerlich Group

### PUBLICATIONS & PREPRINTS – HIGHLIGHTS OF THE LAST 5 YEARS


Schneider MWG, Gibson BA, Otsuka S, Spicer MFD, Petrovic M, Blaukopf C, Langer CCH, Batty P, Nagaraju T, Doolittle LK, Rosen MK, Gerlich DW (2022). **A mitotic chromatin phase transition prevents perforation by microtubules.** Nature, 609(7925):183-190.

Mitter M, Gasser C, Takacs Z, Langer CCH, Tang W, Jessberger G, Beales CT, Neuner E, Ameres SL, Peters JM, Goloborodko A, Micura R, Gerlich DW (2020). **Conformation of sister chromatids in the replicated human genome.** Nature, 586(7827):139-144.

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### TEAM IN 2024

**Postdocs:** Takuya Hidaka, Thomas Steinacker, Zsuzsanna Takacs, Federico Teloni
**PhD Students:** Mohammed Mustafa Alaabo, Caelan Bell, Joseph Neos Cruz, Ines Prlesi, Maximilian Frederick Spicer
**Computational PhD Student:** Dmitry Mylarshchikov
**Senior Bioinformatician:** Christoph Langer
**Bioinformatician:** Vincent Patrick Reuter
**Senior Research Assistant:** Claudia Blaukopf
**Research Assistant:** Nikki Schütte
**Master's Student:** Sanne Wijma



# Anton Goloborodko: *Theoretical models of chromosome structure*

Joined IMBA in 2019 | PhD: Massachusetts Institute of Technology, US

PREVIOUSLY
Postdoc (2018–2019): Center for 3D Structure and Physics of the Genome, NIH 4D Nucleome Consortium, Massachusetts, US

Chromosomes pack a vast amount of information into a very limited space. A series of molecular machines constantly reshapes the architecture of chromosomes, making sure that the right DNA regions are accessible when needed for essential tasks like reading, duplication or repair. The Goloborodko Group blends methods from theoretical statistical physics, computer simulation, and computational biology to understand how the genome's three-dimensional structure is established, how it changes, and which role this structure plays in cell function. Their work seeks to reveal the hidden rules governing the genome's dynamic structure.

## Current Projects

**Homology search in DNA repair:** DNA damage can disrupt essential cellular processes and compromise genomic integrity, leading to severe consequences for the cell and the organism. To repair damaged DNA, the cell uses a mechanism called homology search, which identifies a matching sequence in the genome to serve as a template for quick and accurate repair. The Goloborodko lab is investigating how the repair machinery combs through the genome to locate the homologous template and bring it close to the damaged site to facilitate DNA repair.

**Chromosome organization and packaging during mitosis:** During cell division, DNA must be tightly compacted to ensure its correct segregation into daughter cells. The Goloborodko Group examines how interactions between molecular machines create and regulate the three-dimensional structure of chromosomes during this crucial phase, revealing insights into the structure and stability essential for successful cell division.

**Open2C: a community for the development of open-source data analysis tools:** In an era where "-omics research" – from genomics and proteomics to metabolomics and more – produces enormous quantities of information, data analysis tools are essential for visualizing data and translating it into biological observations. The Goloborodko lab is an integral part of The Open Chromosome Collective (Open2C), an international team of bioinformaticians that collaboratively develop open-source software tools to facilitate data analysis for 3D chromosome biology and genomics.

Goloborodko Group

### PUBLICATIONS & PREPRINTS – HIGHLIGHTS OF THE LAST 5 YEARS


Samejima K, Gibcus JH, Abraham S, Cisneros-Soberanis F, Samejima I, Beckett AJ, Puáčeková N, Abad MA, Spanos C, Medina-Pritchard B, Paulson JR, Xie L, Jeyaprakash AA, Prior IA, Mirny LA, Dekker J, Goloborodko A, Earnshaw WC (2025). **Rules of engagement for condensins and cohesins guide mitotic chromosome formation.** Science, 388(6743):eadq1709

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### TEAM IN 2024

**Postdoc:** Flavia Corsi
**PhD Students:** Sonja Berger, Vladimir Dimitriev, Ankit Gupta, Emma Rusch
**Trainees:** Hadiya Shamim, Olesia Slavska

## Sofia Grade: *Plasticity and repair after brain injury*

Joined IMBA in 2020 | PhD: University of Coimbra, PT, and Laval University, Québec, CA

PREVIOUSLY
Postdoc (2012–2019): Magdalena Götz Lab, Ludwig Maximilians University (LMU) and Helmholtz Center Munich, DE

Acute injuries such as stroke and progressive conditions like neurodegenerative diseases cause damage in specific brain areas. Brain damage results in a loss of function that severely impacts quality of life and is a leading cause of disability and mortality worldwide. To counterbalance these losses, the architecture of adult brain circuits can adapt by forming new connections that help maintain function. The Grade Group focuses on understanding how brain circuits rewire following injury and explores the potential of stem cell transplantation to promote regeneration in affected brain regions.

### Current Projects

**Reorganization of neuronal circuits in neurological disorders:** When a part of the brain is injured, spared brain areas can be repurposed to take over the lost function or compensate for it. The Grade Group combines advanced whole-brain imaging and circuit tracing techniques in mouse models with molecular analyses to investigate how the brain reorganizes its neural circuits and produces new neurons that integrate into preexisting circuits. The group focuses on conditions such as traumatic brain injuries and Huntington's disease, aiming to uncover the mechanisms that drive brain plasticity and adaptation in these complex disorders.

**Restoration of neuronal circuits using stem cells:** Stem cell transplantation offers a promising approach for treating tissue damage, providing new cells to help reconstruct damaged tissues. The Grade Group, in collaboration with the Knoblich Group, investigates the therapeutic potential of stem cell transplantation for brain regeneration. The team's research focuses on determining whether transplanted stem cells can differentiate into functional neurons and seamlessly integrate into the brain's existing neural circuits.

By exploring both natural brain repair mechanisms and those induced by stem cell transplantation, the Grade Group seeks to advance therapeutic strategies for restoring brain function following injury or disease.

Grade Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS

Thomas J, Martinez-Reza MF, Thorwirth M, Zarb Y, Conzelmann KK, Hauck SM, Grade S, Götz M (2022). **Excessive local host-graft connectivity in aging and amyloid-loaded brain.** Science Advances, 8(23).

Grade S, Thomas J, Zarb Y, Thorwirth M, Conzelmann KK, Hauck SM, Götz M (2022). **Brain injury environment critically influences the connectivity of transplanted neurons.** Science Advances, 8(23).

Rylander Ottosson D, Grade S, Heuer A (2021). **Editorial: Regeneration and Brain Repair.** Frontiers in Cellular Neuroscience, 15.

TEAM IN 2024

**Postdocs:** Maria Nazareth Gonzalez Alvarado, Sabrina Villar Pazos
**PhD Students:** Oisorjo Chakraborty, Niccolo De Marzo, Samuele Maturi, Petra Schaffer
**Research Assistants:** Tereza Duranova
**Master's Student:** Martina Beccari
**VBC Summer School Student:** Anna Krskova



## Joanna Jachowicz: *Dark genome in early mammalian development*

Joined IMBA in 2022 | PhD: Institute of Genetics, Molecular and Cellular Biology (IGBMC), Strasbourg, FR

PREVIOUSLY
Postdoc (2017–2022): Mitch Guttman Lab, California Institute of Technology, Pasadena, US
Postdoc (2016–2017): Maria Elena Torres-Padilla Lab, Helmholtz Zentrum Munich, DE

Transposons (TEs) are mobile genetic elements that are able to copy and paste their sequences into new genomic locations, Because of this ability, they are often seen as parasitic elements and can cause genome instability. However, recent discoveries by the Jachowicz Group suggest that these "dark genomic" elements play a beneficial role in shaping genome functions and are an important layer of genome regulation.

One striking example of functional TEs is early mammalian development. Previous research demonstrated that TE DNA sequences affect the expression of genes crucial for development. Interestingly, TEs themselves are highly expressed during early development, producing both RNAs and proteins. What role transposon-derived products play in shaping genome function and 3D genome organization remains largely unexplored.

The Jachowicz Group studies how RNAs and proteins encoded by TEs contribute to establishing gene expression and 3D genome organization during early development. The team uses cutting-edge methods to study RNA-protein and RNA-DNA interactions and to examine TE activity during early mouse development. Ultimately, the team's goal is to determine the molecular mechanisms underlying the function of TEs products in early mammalian development.

### Current Projects

**Early lineage specification by transposon-derived RNAs:** While expression of various classes of "dark genome" elements has been reported in embryonic stem cells and embryos, which specific loci produce transcripts and how they lead to lineage specification remains elusive. The Jachowicz Group uses advanced molecular biology methods and computational tools to study which TE loci are active and functional across developmental stages. The team applies CRISPR methods to perturb TE expression profiles and uses single-cell sequencing and high-resolution microscopy to monitor the consequences.

**Mapping 3D DNA and RNA organization during early developmental transitions:** After fertilization, sperm and oocyte merge their genomes to form a new embryonic genome. Within the first few cell divisions, the embryonic genome reorganizes in 3D space and begins expression from embryonic genes. Yet, how the newly emerging 3D genome organization and transcriptome are established and how they interplay is poorly understood. The Jachowicz Group aims to resolve spatial-temporal dynamics of the genome and transcriptome in a developing embryo by employing split-pool barcoding method (SPRITE).

Jachowicz Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS

Jachowicz JW, Strehle M, Banerjee AK, Blanco MR, Guttman M (2022). **Xist spatially amplifies SHARP/SPEN recruitment to balance chromosome-wide silencing and specificity to the X chromosome.** Nature Structural Molecular Biology, 29:239–249.

Arrastia MV, Jachowicz JW, Ollikainen N, Curtis MS, Quinodoz SA, Lai CA, Selck D A, Ismagilov RF, Guttman M (2022). **Single-cell measurement of higher-order 3D genome organization with scSPRITE.** Nature Biotechnology, 40(1):64-73.

Quinodoz SA, Jachowicz JW, Bhat P, Ollikainen N, Banerjee AK, Goronzy IN, Blanco MR, Chovanec P, Chow A, Markaki Y, Plath K, Guttman M (2021). **RNA promotes the formation of spatial compartments in the nucleus.** Cell,184(23):5775-5790.

TEAM IN 2024

**PhD Students:** Antonio Docavo Garcia, Agastya Singh, Ziga Vicic
**Bioinformatician:** Siegfried Schloißnig
**Senior Research Assistant:** Agnieszka Gacek-Matthews
**Research Assistant:** Julia Kernler
**Master's Students:** Melissa Poysat Sansone, Aranxa Torres Caballero
**Trainees:** Valentina Sjenicic, Francesca Botnari

# Jürgen Knoblich: *Brain development and disease*

Joined IMBA in 2004 | PhD: Friedrich Miescher Laboratory of the Max Planck Society, DE

PREVIOUSLY
Scientific Director (2018–2023): Institute of Molecular Biotechnology, Vienna, AT
Full Professor for Synthetic Biology (2021-current): Medical University of Vienna, AT
Adjunct Professor (2016–2019): Medical University of Vienna, AT
Deputy Director (2005–2018): Institute of Molecular Biotechnology, Vienna, AT
Senior Scientist (2004–2018): Institute of Molecular Biotechnology, Vienna, AT
Group Leader (1997-2004): Research Institute of Molecular Pathology, Vienna, AT
Postdoc (1994–1997): University of California, San Francisco, US

The Knoblich Group seeks to understand how the human brain develops and how its remarkable complexity arises. To study brain development in human tissue, the team pioneered the use of cerebral organoids – 3D tissue models grown from stem cells which can be derived from any patient, healthy or diseased. Cerebral organoids replicate brain development, enabling the researchers to explore development and to understand disruptions that lead to neurological disorders.

## Current Projects

**Modeling defects in neural network activity:** Brain organoids model the defects in proliferation, fate specification and morphogenesis that lead to neurological disease. In the last years, the Knoblich Group used cerebral organoids to identify the primary mechanism causing Tuberous Sclerosis Complex (TSC), a disorder that leads to severe childhood epilepsy. Pinpointing which cells are responsible for the pathology of TSC provides insights for potential treatments and highlights the importance of using human disease models.

**Genetic screening in brain organoids:** To study the genetic causes of autism spectrum disorder, the Knoblich Group developed CHOOSE, a CRISPR-based screening approach to simultaneously manipulate an entire set of high-risk autism genes at the single-cell level in organoids. This model allows the researchers to identify vulnerable cell types and gene regulatory networks that underlie autism spectrum disorders.

**Modeling of long-range neuronal connections:** Long-ranging connections transmit information between distant brain regions. In 2024, the Knoblich Group combined organoid technology and bioengineering to recreate these connections, with the aim to recapitulate neurological disorders on the circuit level to study disorders like Coffin-Siris syndrome.

Knoblich Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS

Martins-Costa C, Wiegers A, Pham VA, Sidhaye J, Doleschall B, Novatchkova M, Lendl T, Piber M, Peer A, Möseneder P, Stuempflen M, Chow SYA, Seidl R, Prayer D, Höftberger R, Kasprian G, Ikeuchi Y, Corsini NS, Knoblich JA (2024). **ARID1B controls transcriptional programs of axon projection in .an organoid model of the human corpus callosum.** Cell Stem Cell, 31(6):866-885.

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TEAM IN 2024

**Senior Research Associate:** Nina Stefanie Corsini
**Research Associate:** Peter-Christopher Esk
**Postdocs:** Shamsi Emtenani, Oguzhan Kaya, Hyosang Kim, Olena Kim, Laura Kracht, Lisa Lanskron, Chong Li, Jamie Blaze Littleboy, Ramsey K Najm, Mark Alan Noble, Abel Vertesy, Michael Alexander Zabolocki
**PhD Students:** Balint Doleschall, Christian Lehmann, Sakurako Nagumo Wong, Sandra Schepers, Ana Stravs, Jan Themann
**Senior Research Assistants:** Catarina Da Cunha E Silva Martins Costa, Christian Krauditsch, Angela Maria Peer
**Research Assistants:** Viktoria Leitner, Anna Pianezzola
**Master's Students:** Eva Binder, Ema Novakova, Sushant Priyam, Hanne Twenhöfel
**Medical Researcher:** Oliver Ludwig Eichmüller



# Sasha Mendjan: *Deciphering heart development and disease*

Joined IMBA in 2015 | PhD: EMBL and University of Heidelberg, DE

PREVIOUSLY
Senior Postdoc (2013–2015): Ludovic Vallier Lab, SCI, University of Cambridge, UK
Postdoc (2007–2013): Roger Pedersen Lab, LRM, University of Cambridge, UK

Heart disease claims 18 million lives worldwide each year. However, studying the causes of heart disease has been limited as, until recently, effective models for the human heart have been lacking. The Mendjan Group developed the first chamber-like and multi-chamber heart organoids, known as cardioids, which model the structure and function of the human heart at one month of embryonic development. This breakthrough model enables the team to explore human heart development at a high-throughput level and to understand the molecular mechanisms underlying heart disease and congenital heart defects.

## Current Projects

**Heart growth, vascularization and regeneration:** The heart's limited ability to regenerate poses a major challenge for regenerative medicine. While adult cardiac cells cannot regrow after myocardial infarction, and instead form scar tissue, growing fetal hearts do have the capacity to repair themselves. To understand the key differences between fetal and adult heart regeneration, the Mendjan Group is developing cardioid models that incorporate vascularization, immune cells and myocardial injury. Using these advanced cardioid models, the team aims to unravel the molecular mechanisms behind fetal heart growth and regeneration, paving the way for potential therapies.

**Pacing and septation:** Congenital malformations are caused by the defective development of key heart structures. The Mendjan Group is engineering advanced cardioid models to study how such key structures, like the septa and pacemakers, form during heart development. The team will explore how defects in signaling and morphogenesis lead to congenital malformations and arrythmias.

**Mechano-sensing and maturation:** The heart continuously contracts and expands to pump blood through the body. Defects in the cellular structures that mediate this constant movement can progressively reduce cardiac muscle function by de-maturation, leading to heart failure. The Mendjan Group uses cardioids to study how cellular structures such as the sarcomere, the cytoskeleton and mechanosensors interact with each other to sense and regulate heart contraction and maturation, and how dysfunctions in these key structures lead to cardiac failure.

Mendjan Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS

Schmidt C, Deyett A, Ilmer T, Haendeler S, Torres Caballero A, Novatchkova M, Netzer MA, Ceci Ginistrelli L, Mancheno Juncosa E, Bhattacharya T, Mujadzic A, Pimpale L, Jahnel SM, Cirigliano M, Reumann D, Tavernini K, Papai N, Hering S, Hofbauer P, Mendjan S (2023). **Multi-chamber cardioids unravel human heart development and cardiac defects.** Cell, 186(25):5587-5605.

Hofbauer P, Jahnel SM, Papai N, Giesshammer M, Deyett A, Schmidt C, Penc M, Tavernini K, Grdseloff N, Meledeth C, Ginistrelli LC, Ctortecka C, Šalic Š, Novatchkova M, Mendjan S (2021). **Cardioids reveal self-organizing principles of human cardiogenesis.** Cell, 2021, 184(12):3299-3317.

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TEAM IN 2024

**Postdoc:** Stefan Jahnel
**PhD Students:** Lavinia Ceci Ginistrelli, Alison Ann Deyett, Anna Dimitriadi, Estela Mancheno Juncosa, Amra Mujadzic, Marie-Christin Röcklinger
**Research Assistants:** Anna Bandurra, Julia Kodnar, Tobias Ilmer, Katarzyna Warczok
**Master's Students and Interns:** Maximilian Mayrhauser, Lena Plank, Lena Maria Stumbauer, Maely Victorin
**Trainees:** Doris Pfarr, Snigdha Sarthak

## Josef Penninger: *Modeling human disease*

Founded IMBA in 2002 | MD: Institute for General and Experimental Pathology, Medical School, University of Innsbruck, AT

PREVIOUSLY (selected)
Scientific Director (since 2023): Helmholtz Center for Infection Research, Brunswick, DE
Professor (since 2023): Medical University Vienna, AT
Director (2018–2023): Life Science Institute UBC, Vancouver, CA
Full Professor (since 2018): Department of Medical Genetics, University of British Columbia, CA
Group Leader (since 2018): Institute of Molecular Biotechnology, Vienna, AT
Scientific Director (2002–2018): Institute of Molecular Biotechnology, Vienna, AT
Full Professor of Immunology (since 2002): University of Toronto, CA

The Penninger Group seeks to understand the mechanisms underlying human diseases, aiming to thereby identify novel therapeutic strategies. The group develops and deploys a broad range of *in vitro* and *in vivo* tools, including genetic editing, (glyco)proteomics, haploid cells for genetic and compound screening paradigms, animal and human organoid cultures, as well as genetically engineered mice. These multidisciplinary techniques allow the Penninger group to model and study the complexity of human diseases, with a particular focus on the immune system, brain, heart, gastrointestinal tract and cardiovascular system, as well as cancer.

### Current Projects

**Next generation tissue engineering:** The Penninger Group explores the potential of human stem cell-derived vascular hematopoietic organoids to model blood and vascular diseases and to develop the next generation of human tissue engineering. The group has developed novel microfluidic devices that add flow into vascular organoids *in vitro* and a system to model atherosclerosis, has driven capillary organoids to form lymphatic organoids, and is exploring the use of bone marrow organoids to study haematopoiesis. Moreover, the Penninger Goup has pioneered the generation of bat organoid models to study host-virus interactions in natural reservoir species and uncover the molecular determinants of human viral diseases.

**Intestine remodeling during pregnancy and lactation:** During pregnancy, the female body undergoes important changes that prepare its various organs to ensure the health of both mother and child. The Penninger Group investigates these changes and the molecular mechanisms that drive them. In 2024, the researchers described the molecular mechanism that causes intestinal villi to enlarge significantly during pregnancy and lactation, increasing nutrient absorption to ensure proper nourishment of the fetus and the baby.

Penninger Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS

Onji M, Sigl V, Lendl T, Novatchkova M, Ullate-Agote A, Andersson-Rolf A, Kozieradzki I, Koglgruber R, Pai TP, Lichtscheidl D, Nayak K, Zilbauer M, Carranza García NA, Sievers LK, Falk-Paulsen M, Cronin SJF, Hagelkruys A, Sawa S, Osborne LC, Rosenstiel P, Pasparakis M, Ruland J, Takayanagi H, Clevers H, Koo BK, Penninger JM (2024). **RANK drives structured intestinal epithelial expansion during pregnancy.** Nature, 637(8044):156-166.

Orthofer M, Valsesia A, Mägi R, Wang QP, Kaczanowska J, Kozieradzki I, Leopoldi A, Cikes D, Zopf LM, Tretiakov EO, Demetz E, Hilbe R, Boehm A, Ticevic M, Nõukas M, Jais A, Spirk K, Clark T, Amann S, Lepamets M, Neumayr C, Arnold C, Dou Z, Kuhn V, Novatchkova M, Cronin SJF, Tietge UJF, Müller S, Pospisilik JA, Nagy V, Hui CC, Lazovic J, Esterbauer H, Hagelkruys A, Tancevski I, Kiefer FW, Harkany T, Haubensak W, Neely GG, Metspalu A, Hager J, Gheldof N, Penninger JM (2020). **Identification of ALK in Thinness.** Cell, 181(6):1246-1262.

Monteil V, Kwon H, Prado P, Hagelkrüys A, Wimmer RA, Stahl M, Leopoldi A, Garreta E, Hurtado Del Pozo C, Prosper F, Romero JP, Wirnsberger G, Zhang H, Slutsky AS, Conder R, Montserrat N, Mirazimi A, Penninger JM (2020). **Inhibition of SARS-CoV-2 Infections in Engineered Human Tissues Using Clinical-Grade Soluble Human ACE2.** Cell, 181(4):905-913.

TEAM IN 2024

**Postdocs:** Shane Cronin, Tiago Manuel Fontes Oliveira, Astrid Hagelkruys, Simon Licht-Mayer, Stefan Mereiter, Masahiro Onji
**PhD Students:** Gustav Jonsson, Max Kellner, Kirill Salewskij, Emanuel Isaias Tenorio Araujo
**Research Technicians:** Rubina Koglgruber, Hannah Mayr
**Master's Students:** Mariam Abramishvili, Kerstin Schmiederer



## Nicolas Rivron: *Blastoid development and implantation*

Joined IMBA in 2019 | PhD: MIRA Institute for Biomedical Technology and Technical Medicine, Twente University, NL

PREVIOUSLY
Group Leader (2013–2019): MERLN Institute for Regenerative Medicine, Maastricht University, NL
Guest Group Leader (2013–2019): The Hubrecht Institute for Developmental Biology and Stem Cell Research, NL
Researcher (2011–2013): MIRA Institute for Biomedical Technology and Technical Medicine, Twente University, NL

Humans have evolved a specific mode of reproduction characterized by prominent failures and potential selection of embryos at the time of implantation *in utero*. To study this critical phenomenon of human reproduction and its societal implications, the Rivron Group developed a stem cell-based model called the blastoid, which mimics the structure of an embryo on day 8 of pregnancy. Blastoids are combined with uterine organoids in a dish, which allows the team to study the human early pregnancy in fine detail, and to unravel how and why humans evolved such a reproductive strategy.

Leveraging the high versatility and throughput of blastoids, the Rivron Group is investigating the adaptive principles underlying embryonic self-organization and the human genetic traits that have led to our constraints and vulnerabilities in human early pregnancy as compared to other primate species.

In the long term, this work aims to uncover innovative medical approaches to enhance reproductive and adult health.

### Current Projects

**Principles of blastocyst development and implantation :** A key stage of early embryonic development is the formation of the trophoblast, which will mediate the implantation *in utero* and then give rise to the placenta. The Rivron Group studies how genetic, molecular and tissue mechanisms of trophoblast development have evolved and currently differ between humans and other closely related species, leading to specific ways to embed into the uterus.

**Engineering *in vitro* models of implantation and development:** Studying human embryo implantation is challenging due to the inaccessibility of human early pregnancy. The Rivron Group is developing advanced uterine models that, combined with blastoids, enable to model and modulate genetic and molecular aspects of the evolutionary processes of blastocyst implantation. Modelling the development of human blastocysts in a simulated uterine environment provides a unique opportunity to identify and modulate the traits of human early development and reproduction to understand our phylogenetic and ontological origins and increase our reproductive and prenatal health.

Rivron Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS

Rivron NC, Martinez Arias A, Pera MF, Moris N, M'hamdi HI (2023). **An ethical framework for human embryology with embryo models.** Cell, 186(17):3548-3557.

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TEAM IN 2024

**Postdocs:** Heidar Heidari Khoei, Harunobu Kagawa, Christos Kyprianou, Anna Osnato, Saurabh Jagdish Pradhan, Ronan Quenec'hdu, Jinwoo Seong, Emiel van Genderen
**PhD Students:** Viktoria Holzmann, Marlene Müller, Giovanni Sestini, Theresa Maria Sommer
**Senior Research Assistant:** Jana Slovakova
**Research Assistant:** Yvonne Suzanne Scholte, Op Reimer
**Trainee:** Myrto Vrentzou

# Shambaditya Saha: *Macromolecular phase separation in germ cell fate*

Joined IMBA in 2019 | PhD: Yale University, US

PREVIOUSLY
Postdoc (2013–2018): Anthony A. Hyman Lab, Max Planck Institute of Molecular Cell Biology and Genetics, DE

Cells maintain order by organizing their internal components into distinct compartments. While many of these compartments are surrounded by lipid membranes that separate them from the rest of the cell, some compartments – known as biomolecular condensates – are not enclosed within lipid membranes. One such membraneless compartment is the nuage, which is found exclusively in germline cells. The nuage contains RNA processing machinery that is crucial for gametogenesis and reproduction. The Saha group uses the model organism *C. elegans* to explore how the biophysical properties and composition of nuage influence germ cell fate and fertility.

## Current Projects

**Role of protein composition in nuage function:** The Saha group explores the importance of condensate formation in nuage function. Specifically, they address the hypothesis that nuage composition is optimized for its function.

**Role of LOTUS domain proteins in nuage:** The Saha group is examining the role of proteins that contain LOTUS domains in the assembly and function of nuage.

**Regulation of macromolecular diffusion within nuage:** Since the efficiency of biochemical reactions within nuage depends on the diffusion rate of its constitutents, the Saha group strives to identify the factors that regulate diffusion rates of macromolecules in the nuage – and how these mechanisms could support robust functinality in germ cells.

Saha Group

TEAM IN 2024

**Group Leader:** Shambaditya Saha

**PhD Students:** Stela Jelenic, Balashankar Radhakrishna Pillai



# Elly Tanaka: *Molecular mechanisms of vertebrate regeneration*

Joined IMBA in 2024 | PhD: University of California San Francisco (UCSF), US

PREVIOUSLY
Senior Group Leader (2016–2024): Research Institute of Molecular Pathology (IMP), Vienna, AT
Director (2014–2016): DFG Center for Regenerative Therapies, TU Dresden, DE
Professor (2008–2016): DFG Center for Regenerative Therapies, TU Dresden, DE
Group Leader (1999-2008): Max Planck Institute of Molecular Cell Biology and Genetics, Dresden, DE

Humans only have a very limited ability to regenerate damaged tissues after injury. The axolotl (*Ambystoma mexicanum*), by contrast, possesses an extraordinary ability to regenerate lost limbs, its tail and even part of its heart and brain.

The Tanaka Group studies the molecular mechanisms underlying this remarkable regenerative capability, seeking to discover principles of regeneration that can provide fundamental insights for regenerative medicine.

## Current Projects

**Generating and directing cells for limb regeneration:** In 2024, the Tanaka Group discovered how regenerating cells in the axolotl arm "know" which part of the body they stem from. The team decoded the molecular "zip codes" along the genome that instruct cells whether they are part of the upper arm, lower arm, hand or finger, thereby ensuring regeneration of only the lost parts of a limb. A fascinating future question is whether such information exists in mammals.

The Tanaka Group is currently studying how cells in the uninjured limb are triggered by injury to "dedifferentiate" into stem cells that can execute the limb regeneration program.

**Nervous system regeneration – from stem cells to circuits:** Regeneration in the nervous system is a momentous challenge. A key feature of successful regeneration is the formation of tissue that can place all the cell types in the correct location in three dimensions. Based on this concept, the Tanaka lab has engineered fully patterned three-dimensional spinal cord tissue from mouse embryonic stem cells. In 2024, they described how vitamin A causes stem cells to coalesce into a key signaling center to direct spinal cord formation. The team is now investigating how vitamin A signals some stem cells to produce the floorplate signaling center.

The axolotl spinal cord and brain show remarkable regenerative capacities. The Tanaka lab studies how neural circuits are built from stem cells during axolotl spinal cord regeneration and how the newly regenerated neurons find their targets in the limb and body muscle.

Tanaka Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS

Kawaguchi A, Wang J, Knapp D, Murawala P, Nowoshilow S, Masselink W, Taniguchi-Sugiura Y, Fei JF, Tanaka EM (2024). **A chromatin code for limb segment identity in axolotl limb regeneration.** Developmental Cell, 5807(24):300-9.

Lust K, Maynard A, Gomes T, Fleck JS, Camp JG, Tanaka EM, Treutlein B (2022). **Single-cell analyses of axolotl telencephalon organization, neurogenesis, and regeneration.** Science, 377(6610).

Lin TY, Gerber T, Taniguchi-Sugiura Y, Murawala P, Hermann S, Grosser L, Shibata E, Treutlein B, Tanaka EM (2021). **Fibroblast dedifferentiation as a determinant of successful regeneration.** Developmental Cell, 56(10):1541-1551.

TEAM IN 2024

**Postdocs:** Elad Bassat, Katharina Judith Lust, Wouter Masselink, Leo Otsuki, Anastasia Polikarpova, Stephan Alexander Raiders, Diego Rodriguez Terrones, Carina Seidl, Hannah Taylor Stuart, Takuji Sugiura
**PhD Students:** Fernando Becerril Perez, Miray Naz Bozkurt Ay, Elena Constantini, Francisco Falcon Chavez, Andre Fischer, Lucrezia Galli, Simone Horenkamp, Mattias Enar Jonasson, Teresa Kramer, Pietro Tardivo
**Senior Bioinformatician:** Jingkui Wang
**Senior Research Assistants:** Helena Okulski, Yuka Sugiura
**Research Assistant:** Jiaye Yang
**Master's Students:** Martin Nuamah Asare, Onur Bayram, Deniz Leonard Demirkesenler, Salvador Gonzalez Juarez, Viktoria Paller, Anja Pelzl
**Trainee:** Julian Jakob Zimmermann

## Noelia Urbán: *Regulation of neural stem cell quiescence*

Joined IMBA in 2017 | PhD: University of Barcelona, ES

PREVIOUSLY
Investigator Scientist (2014–2017): Francois Guillemot Lab, The Francis Crick Institute, London, UK
Postdoc (2009–2014): Francois Guillemot Lab, National Institute for Medical Research, London, UK

Stem cells play a crucial role in maintaining homeostasis and enabling repair in adult tissues. In the mammalian brain, specialized neural stem cell niches generate new neurons throughout adulthood that integrate into existing neuronal circuits, supporting essential functions such as olfaction and memory.

The Urbán Group investigates how new neurons are formed in the adult brain, focusing on the mechanisms that regulate and maintain neuron formation. The researchers use the mouse as a model to explore how adult neural stem cells decide when to produce more neurons. Their research examines how external stimuli influence the decision to generate neurons.

In particular, the Urbán Group studies how neural stem cells remain in a quiescent, "frozen-in-time" state, allowing stem cells to survive long-term and form a reserve. The heterogeneity of neural stem cells may play a crucial role in maintaining quiescence throughout life. The Urbán Group studies how the delicate balance between activation and quiescence of neuronal stem cells is regulated by both internal and external factors, to prevent exhaustion of adult neural stem cells during aging.

### Current Projects

**Identifying signals that control adult neuronal stem cell quiescence:** Adult neurogenesis is regulated by local signals and systemic stimuli that guide stem cells to either proliferate or remain quiescent. The Urbán Group investigates how external factors influence the decision to generate neurons. Recently, the team disproved the theory that intermittent fasting impacts adult neurogenesis, demonstrating that intermittent fasting has no impact on the generation of neural stem cells or new neurons.

**Studying the role of proteostasis in adult neuronal stem cell quiescence:** To transition from a quiescent to an active state, adult neural stem cells undergo a profound interior remodeling, which includes the elimination of quiescence-related proteins. The Urbán Group studies how this shift in protein balance is regulated and which molecular mechanisms drive this remodeling process.

Urbán Group

PUBLICATIONS & PREPRINTS –
HIGHLIGHTS OF THE LAST 5 YEARS


Gabarró-Solanas R, Davaatseren A, Kleifeld J, Kepčija T, Köcher T, Giralt A, Crespo-Enríquez I, Urbán N (2023). **Adult neural stem cells and neurogenesis are resilient to intermittent fasting.** EMBO Reports, 24(12).

Urbán N (2022). **Could a Different View of Quiescence Help Us Understand How Neurogenesis Is Regulated?** Frontiers in Neuroscience, 16, 878875.

Austin SHL, Gabarró-Solanas R, Rigo P, Paun O, Harris L, Guillemot F, Urbán N (2021). **Wnt/β-catenin signalling is dispensable for adult neural stem cell homeostasis and activation.** Development, 148(20).


TEAM IN 2024

**Postdocs:** Gabriele Colozza, Ivan Crespo Enriquez, Ana Paula Zen Petisco Fiore
**PhD Students:** Alejandro Alarcon del Carmen, Justus Kleifeld, Rut Gabarro Solanas, Lidija Milojkovic, Greeshma Pushpa Bose, Katherina Tavernini
**Senior Research Assistant:** Lilian Kirwan
**Research Assistants:** Amarbayasgalan Davaatseren, Tatjana Kepcija
**Master's Students:** Ninetta Molnar, Lucia Ruiz-Salinas Rivas
**Trainee:** Leonie Drakos





# New group leaders in *2025*

## Kristina Stapornwongkul

Developmental biologist Kristina Stapornwongkul will start her research group at IMBA as junior group leader. The Stapornwongkul Group will study how the nutritional environment and metabolic processes influence embryonic development.

The environment plays a critical role in regulating embryonic development: External factors, such as oxygen levels and nutrient availability, are essential for the survival of embryonic cells. In addition, these factors also influence the cells' metabolic state, which regulates cell proliferation, growth, signaling and epigenetics. However, how cells' metabolic state is integrated with developmental processes, and whether it serves a regulatory function, remains largely unknown.

The Stapornwongkul Group at IMBA will investigate how metabolism is integrated into developmental processes, tackling fundamental questions such as: How does metabolism influence cell fate decisions? How robust are developmental processes, such as patterning and morphogenesis, to changes in the nutritional environment? And what is the energetic cost of morphogenesis? To answer these questions, the Stapornwongkul Group will develop new tools to map the spatial and temporal dynamics of metabolism and use human stem cell-derived models to study gastrulation and neural tube development.

*Kristina Stapornwongkul joins IMBA in autumn of 2025.*

The Stapornwongkul lab will study how the nutritional environment and metabolic processes influence embryonic development.

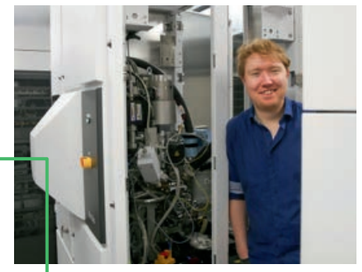
## Sven Klumpe

Structural biologist Sven Klumpe will join the Vienna BioCenter institutes IMBA and IMP as Joint Fellow, heading a research group to add cryo-electron tomography research on transposons to the campus.

The Klumpe Group will develop and apply technologies for *in situ* structural biology to address questions in germline biology with a special interest in transposable elements. Specifically, the group will use focused ion beam-scanning electron microscopes (FIB-SEM) to produce cellular thin sections at cryogenic temperatures. In conjunction with high-end transmission electron microscopy (TEM), the researchers generate three dimensional reconstructions of the cellular interior from these thin sections. This will allow them to study biological macromolecules in their native environment, the inside of a cell, and resolve them in the most favorable cases down to secondary structure elements and potentially sidechains.

Klumpe is particularly interested in the replication cycle of transposons, the mobile genetic elements also nicknamed "jumping genes", which are in a constant arm's race with the host's defense mechanisms. To understand the cell biological mechanisms that drive the replication cycle of transposons and, thus, their evolutionary success, the Klumpe Group will use the model system *Drosophila melanogaster* to study transposons in their respective niches during gametogenesis.

*Sven Klumpe joins IMBA and IMP in April 2025.*



Sven Klumpe will join IMBA and IMP to add cryo-electron tomography research on transposons to the campus.

INTERVIEW

# A PhD at IMBA – An opportunity for *immense growth*

## Two IMBA alumni share their insights on pursuing a PhD at IMBA.

Completing a PhD is more than a step in a scientific career – it's a transformative personal journey that combines intellectual growth with exploration of research. IMBA's collaborative environment, cutting-edge research facilities, and dedicated mentorship platform provide an ideal foundation for pursuing a PhD. In 2024, Alison Deyett and Viktoria Holzmann completed their doctoral work at IMBA and embarked on new career stages at other institutes. In this interview, they reflect on their experiences at IMBA, which helped shape their careers and their personal development.

Alison Deyett earned a Bachelor of Science in Chemical Engineering at the University of New Hampshire, which was followed by a research project at Vertex Pharmaceuticals, where she worked on disease modeling. In 2019, Alison joined the group of Sasha Mendjan at IMBA. In 2024, Alison received the Vienna BioCenter PhD Award for her doctoral thesis. After leaving IMBA, Alison joined Michael Laflamme's lab at the University of Toronto, in Canada, as a postdoctoral fellow.

Viktoria Holzmann studied biomedical sciences at FH Joanneum, in Graz and Tissue Engineering at FH Technikum in Vienna. In 2019, Viktoria joined the lab of Nicolas Rivron at IMBA as a PhD student. Viktoria successfully defended her PhD thesis in 2024, after which she joined the Moris lab at The Francis Crick Institute, in the United Kingdom.

### Why did you decide to do a PhD at IMBA and the Vienna BioCenter?

**Alison Deyett:** I wanted to elevate my career and have more responsibilities as a scientist. I decided to pursue a PhD degree at IMBA because it was an established institution in the field of organoid research, a topic I had become passionate about while working at Vertex.

**Viktoria Holzmann:** I was fascinated by Nicolas' research on developmental biology using blastoids, and wanted to be part of it. Also, I knew the Vienna BioCenter as an excellent environment for research.

### What did you investigate in your PhD project?

**Alison Deyett:** I established a multi-chambered cardioid system that models the five major developmental regions of the heart. This new system allowed me to study how the heartbeat initiates and how the different heart regions coordinate to work together. I also investigated how genetic and environmental factors disrupt heart formation, leading to congenital heart diseases.

**Viktoria Holzmann:** Nicolas' lab uses blastoids, a stem cell-based model of the embryo, to study embryo development at the time of implantation. My project focused on the communication between different embryonic and extra-embryonic cell populations which drives their development during and after implantation.

### How did the scientific facilities available to you contribute to your project?

**Viktoria Holzmann:** Doing a PhD at IMBA provides you with access to incredible resources and facilities that allow you to perform any experiment you can conceive. This level of support allows students to be creative in their research while producing sound data.

**Alison Deyett:** My mentor encouraged me to design and lead my own project, providing valuable support and advice throughout. In addition, having access to professional experts in various fields provided a great learning opportunity and helped streamline my project.

In 2024, Alison Deyett and Viktoria Holzmann completed their doctoral work at IMBA.

### How would you describe your experience as a PhD student at IMBA?

**Alison Deyett:** My PhD at IMBA was filled with both challenges and breakthroughs. There were many obstacles, but each one helped me refine my skills and push through with creative solutions. Leading a team and collaborating with others to overcome these challenges was incredibly rewarding, and the process of discovery kept me motivated.

**Viktoria Holzmann:** Doing a PhD was challenging, but also extremely rewarding. My experience at IMBA served as an excellent stepping stone to continue doing science at a high level. Nicolas' passion for science fostered a stimulating research environment, and I learned a lot from my lab colleagues and people in other research groups.

### What were the most challenging and rewarding parts of doing a PhD?

**Viktoria Holzmann:** The extremely high level of science performed at IMBA and the Vienna BioCenter, together with the incredible resources, challenge students to produce high-impact scientific discoveries. While this environment can be very demanding at times, it has been an opportunity for immense personal and scientific growth. Throughout my PhD, I also established close friendships with other students in my PhD cohort, who supported me during my journey and became an integral part of my life.

**Alison Deyett:** I was surprised by how many different hats I had to wear as a PhD student. Learning how to mentor younger students, produce scientific illustrations and communicate science were challenges that ultimately helped me develop a more rounded skillset. The Vienna BioCenter "Prime your PhD" course was a great opportunity to connect with other students. I also enjoyed mentoring younger students, helping them design their own projects and blossom into independent researchers.

### What skills did you learn at IMBA that you are applying in your new position?

**Alison Deyett:** I learned a lot about how to present my research in written and audiovisual forms. Additionally, I gained experience in effectively managing other scientists and helping them flourish on their own, which is essential for the future steps of my career.

**Viktoria Holzmann:** I greatly improved my ability to manage my projects to completion, successfully juggling different responsibilities. Mentoring a student was also a very rewarding experience, and has equipped me with skills I will be able to apply in the future.

INTERVIEW

# The *next* step

## Former IMBA postdoc Chong Li reflects on his time at IMBA and his new position as Group Leader at the Chinese Institute for Brain Research in Beijing.

Chong Li spent six years as a postdoctoral fellow at the lab of Jürgen Knoblich at IMBA, where he developed brain organoid models to study neurodevelopment. In 2024, Chong became the newest group leader at the Chinese Institute for Brain Research, Beijing. We sat down with Chong to discuss his experience at IMBA and how it prepared him for his new role.

**How did you first join IMBA?**

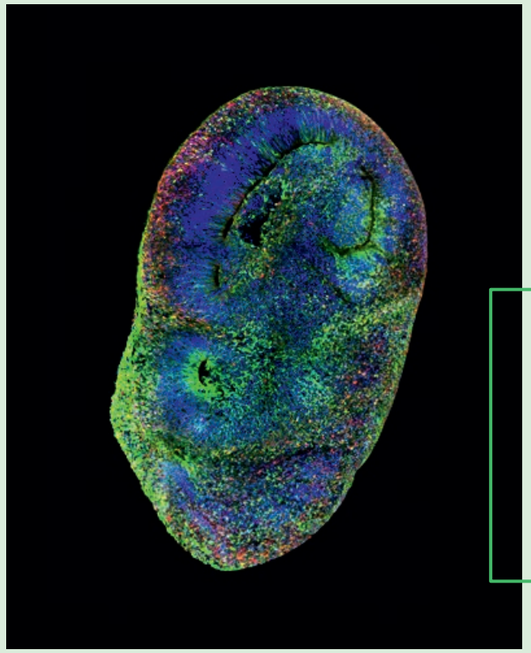
**Chong Li:** After my PhD, I wanted to work on disease modeling with stem cells and organoids, and I knew that the lab of Jürgen Knoblich at IMBA were pioneers in the field of cerebral organoids. Jürgen was very welcoming, and I was impressed by the lab's exciting research projects. IMBA's high level of science and access to world-class facilities convinced me that it was the right move for my career, so I joined as a Postdoc in August 2018.

**What did you work on while at IMBA?**

**Chong Li:** I developed a novel system, called CHOOSE, which combines CRISPR technology and single-cell genomics in brain organoids. CHOOSE provided our team with unprecedented resolution in studying the effects of genetic mutations in diverse progenitor and neuronal cell types inside a larger brain structure – we could examine the impact of single mutations at the single-cell level. Using CHOOSE, we gained new insights into the cell types, molecular pathways, and gene regulatory networks involved in autism.

**What makes doing research at IMBA special?**

**Chong Li:** IMBA provides an excellent environment to maximize your research experience – both in developing your expertise and in producing high-quality research. Having direct access to experts in the Knoblich lab was essential for learning to work with organoids. Additionally, IMBA's highly professional Core Facilities – especially Next-Generation Sequencing, Bioinformatics and BioOptics – offered invaluable technical support and helped streamline my research. And, of course, Jürgen was extremely supportive, providing guidance and advice throughout my time at IMBA. Beyond that, the Vienna BioCenter is an endless source of inspiration and innovation. Interacting with researchers using cutting-edge technologies to study a wide range of topics fosters collaboration and broadens the scope of your research.



Chong Li developed a a new system called "CHOOSE" (CRISPR-human organoids-scRNA-seq), which permits the identification of vulnerable cell types and gene regulatory networks that underlie autism spectrum disorders.
Li, C., Fleck, J. S., et al., Single-cell brain organoid screening identifies developmental defects in autism. *Nature*, 2023.

*"IMBA provides an excellent environment to maximize your research experience – both in developing your expertise and in producing high-quality research."*

**You recently left IMBA and established your own independent lab. Can you tell us more about your new position?**

**Chong Li:** I am currently a Group Leader at the Chinese Institute for Brain Research in Beijing. My research group builds upon the technology that I developed at IMBA, combining disease modeling and functional genomics to study fundamental principles and the uniqueness of human brain development, unraveling the mechanisms behind neurodevelopmental diseases.

**How did your time at IMBA help you transition into your new position?**

**Chong Li:** IMBA's strong passion for science inspired me – it's a place where scientists constantly push the boundaries of technology and knowledge. I learned that science is never easy and that persistence is key to making progress. Being a part of IMBA also gave me firsthand insight into how different group leaders manage their teams, and I draw inspiration from their approaches in leading my own lab. I want to replicate the inclusive and diverse environment that I found at IMBA and the Vienna BioCenter – where everyone has their own voice and the freedom to follow their curiosity. This philosophy, combined with constructive criticism and independent thinking, produces amazing science. I learned that at IMBA.

ETHICS IN SCIENCE

# Shaping the future responsibly: IMBA's approach to *research ethics*

**IMBA's researchers strongly engage in developing ethical frameworks for pioneering research, while receiving the institutional support to fulfil all ethical and legal obligations.**

At IMBA, researchers continuously push the boundaries of our knowledge, using innovative methods to probe fundamental question in biology. Recent advances include the development of the first multi-chamber heart organoids, new brain organoid models to study human disease and development, and novel methods to probe regeneration of the nervous system. Research is progressing at speed – and therefore, IMBA and its researchers are also driving the development of ethical frameworks to ensure the responsible use of new technologies, and the institutional support for researchers to fulfil all legal and ethical requirements.

## Strong institutional support by dedicated Ethics team

"IMBA is in a unique position: IMBA is a basic biological research institute, but basic biology is discovering the human as a novel model system – particularly to understand human biology. This, in turn, requires a unique infrastructure that enables this research, as well as the ethical and legal support to do so – which IMBA provides", says Jürgen Knoblich, Deputy Scientific Director at IMBA and a pioneer in working with organoids derived from adult stem cells.

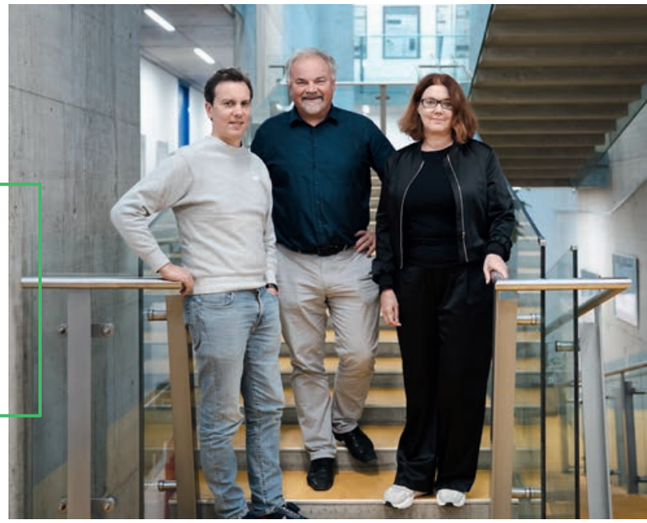
For over ten years, the Ethics and Biosafety team has played an important role at IMBA by supporting scientists in obtaining approvals and ensuring compliance with regulations. "Our dedicated team has experience in assisting with legal and ethical requirements, and so we can help researchers navigate the complex landscape of modern biological research", Arabella Meixner, Head of Ethics and Biosafety, explains.

The Ethics and Biosafety team assists with obtaining approvals, and ensures that research projects comply with international and national regulations. The team also helps researchers implement proper informed consent procedures, which is crucial when working with human subjects or materials, and assists in verifying the ethical origin of research materials. Often, researchers need to interact with multiple ethics committees, and Arabella Meixner and her team act as liaisons to facilitate this communication. "We keep researchers updated on best practices and standards, and so provide training sessions and workshops", Meixner adds. "For projects with unique challenges, we offer specialized consultation to help researchers navigate these issues."

## Frontier science opens up new questions

Such unique issues arise when working with novel model systems, for example with organoids. "We are doing science with the intention of implementing positive change in society", says Nicolas Rivron, a Group Leader at IMBA, who developed the first stem cell-derived model of the blastocyst, an early stage in development. "Understanding brain diseases that are becoming more prominent in an aging society, like Jürgen's lab does, or increasing the reproductive choices for younger people that are delaying their wish to have a child, as we do, are potential solutions for societal challenges. But along the way of discovering these, we come across new questions: How should scientists work with brain organoids, what can be done with blastoids? Cutting-edge science uncovers new questions in ethics."

At Unistem Day, Nina Malajner, Ethics & Biosafety, explored the possibilities and limits of stem cell research, with participants taking on various roles to debate the ethical considerations of this field.



Nicolas Rivron and Jürgen Knoblich, Group Leaders at IMBA, actively drive discussions of ethical implications. Arabella Meixner and the Ethics & Biosafety team support scientists in navigating the complex landscape of modern biological research.

Rivron sees it as a scientist's duty to raise these questions and instigate the process of consulting on them. "When we come across these new questions, we, the scientists, are actually the first ones to question what we are doing and to go to the appropriate bodies – whether international, European, or national – to refine the ethical framework."

In recent years, Rivron worked closely with ethicists, philosophers and other life scientists to develop the ethical framework for working with embryo models. He also liaised closely with the International Society for Stem Cell Research to update guidelines for all researchers who seek to publish their research using embryo models. Jürgen Knoblich similarly engaged with the scientific community to achieve an informed update and consensus over how to work with brain organoids. In a working group established by the German National Academy of Sciences Leopoldina, Knoblich worked with philosophers, legal experts and neurobiologists to explore ethical questions posed by organoid research.

## Open dialogue with society

"We see our responsibility in not only conducting our research in the most ethical and responsible way, but also in informing the public about what we are doing", Knoblich adds. For Knoblich, it is essential to discuss the ethical aspects of science with the public – both with wider audiences in the scientific community, and with the lay public.

Besides engaging with working groups at national and international levels, scientists at IMBA seek an open dialogue, for example by organizing ethics symposia. Also, younger audiences are engaged in discussions: At UniStem Day 2024, a day dedicated to understanding stem cell research, 300 teenage participants explored and discussed the value of stem cell research. "Scientists have a responsibility to proactively engage in discussions about our science", Knoblich underlines. "We need to communicate both transparently and realistically what our science may achieve, and inform about ethical considerations."

SCIENTIFIC FACILITIES

# Scientific support enables *research excellence*

## Researchers at IMBA are supported by world-class scientific facilities.

Scientific facilities at the Vienna BioCenter offer all researchers access to advanced equipment and support them with expertise and knowledge. All scientists at IMBA are supported by scientific core facilities on campus, shared with the GMI and the IMP. In addition, researchers are supported by the Vienna BioCenter Core Facilities (VBCF), which are also open for use by external researchers.

Together, the facilities are the backbone of a dynamic and innovative research ecosystem at the Vienna BioCenter. The highly skilled experts at the scientific facilities support scientists with extensive knowledge in experimental design, use of high-end equipment, and data analysis – enabling scientists to rapidly start exploring new research topics and access new technologies.



SCIENTIFIC FACILITIES

# *Core* Facilities

## Scientists at IMBA make use of core facilities, shared with the IMP and the GMI.

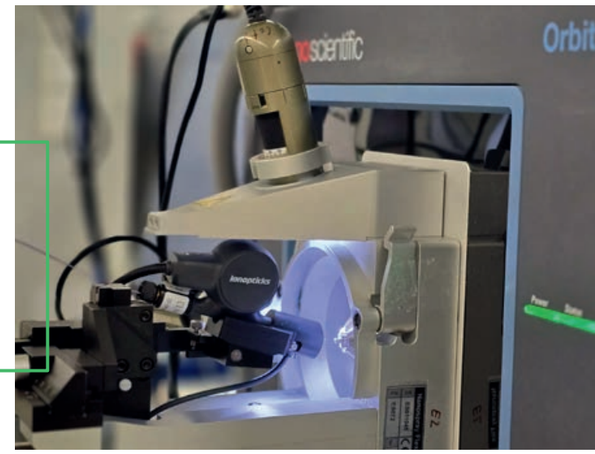
**BioOptics** provides services and support in imaging and flow cytometry. This includes analytical flow cytometry and cell sorting, a wide variety of microscopy techniques like wide-field, confocal, two-photon, light-sheet, super-resolution, TIRF, FLIM and laser ablation on 30+ microscope-systems as well as workflow development and advanced image processing and analysis.

**∆ Molecular Biology Services** provides services including Sanger Sequencing, "Speed Congenics" service and hSTR & mSTR testing. Preparation of competent cells (chemically competent cells, electrocompetent ones and agrobacteria). Recombinant protein production in *E.Coli* and *Pichia Pastoris*, as well as molecular biology reagents. Furthermore, we routinely test for mycoplasma and pathogens. We offer plasmid preparation in 96-well format, assistance for lab automation, and access to RIKEN, *C. Elegans* and hORF clone libraries.

**Peptide Synthesis** specializes in peptide synthesis with options for modifications or heavy isotope-labeled amino acids, and conducts purification of antibodies and other proteins, complemented by small-scale RP-HPLC purifications and TAQ purification in collaboration with MBS.

**∇ Proteomics Facility** provides mass spectrometry service for protein identification, characterization of posttranslational modifications and protein quantitation which includes sample preparation, MS measurement and the respective data interpretation. The facility operates a number of state-of-the-art mass spectrometers that are provided by the VBCF.

The **Proteomics Tech Hub** is at the forefront of groundbreaking research in the proteomics field, driving innovation and excellence. With a focus on single cell proteomics (SCP) and crosslinking mass spectrometry (XL-MS), the Tech Hub is pioneering two major lines of research and technological advancement. These efforts are not only crucial for a multitude of ongoing collaborations at the Vienna BioCenter but also play a significant role in transferring cutting-edge know-how & methodologies to the service facility.




The Proteomics Facility recently acquired the Orbitrap Astral, a new generation of mass spectrometer scheduled for deployment in 2025. The new instrument runs at a higher sample throughput and at the same time gains a deeper proteome coverage per sample.

**IMBA also benefits from access to dedicated facilities that cater exclusively to the needs of IMBA researchers.**

The **Fly and Worm Facility** provides micro-injections to generate transgenic animals and offers a CRISPR genome engineering service for precise knock-out and knock-in projects in the fruit fly *Drosophila melanogaster* as well as several nematode species, including *C. elegans*.

The **Stem Cell Core Facility** offers key services like human iPS reprogramming, genome targeting in mouse and human stem cells, quality control of cell lines and biobanking, which is enabled by established collaborations with research institutions. In addition, the facility offers hands-on training to individual and/or groups of scientists who want to advance their skills and knowledge in the field of stem cell research.

The **Organoid Research Facility** is a specialized IMBA center focused on advancing organoid-based research.

SCIENTIFIC FACILITIES

# IMBA's Fly & Worm Facility empowers scientists to follow *their curiosity*

## IMBA's Fly & Worm Facility supports researchers by generating transgenic and mutant fruit flies and nematodes.

Animal models are a cornerstone of modern biomedical research, essential for studying fundamental biological processes. However, generating such models is a complex and time-intensive process, requiring specialized expertise, technical proficiency and significant resources. At IMBA, the Fly & Worm Facility, led by Peter Duchek and supported by Joseph Gokcezade and Julia Marques, ensures the streamlined generation of transgenic and mutant *Drosophila melanogaster* and nematode models.

In 2024, the group of Alejandro Burga leveraged genetically engineered nematodes to uncover a molecular mechanism that silences selfish genetic elements only when inherited paternally, potentially illuminating the evolutionary origins of genetic imprinting. "*This discovery would not have been possible without a years-long collaboration between our group and the Fly & Worm facility,*" says Alejandro Burga.

### Nematodes as model organisms

The Burga lab uses nematodes as a model to study toxin-antidote selfish elements. "*Nematodes are ideal for genetics research – they're cost-effective, easy to maintain and manipulate, and produce large numbers of offspring within a short generation time,*" explains Burga. "*Nematodes' small number of cells and small genome make genetic and functional studies straightforward.*"

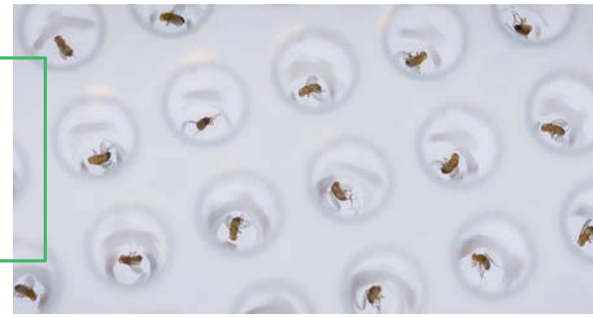
While nematodes have been established as research models since the 1980s, research so far has largely focused on *C. elegans*. The Burga group is expanding this scope by studying lesser-known nematode species. "*We're exploring the genetic diversity present in a wide range of nematode species, some of which were only recently described,*" explains Burga. "*This means that, compared to* C. elegans*, we lack the mutant and transgenic lines essential for molecular biology research.*"

Generating these resources from scratch requires translating tools and approaches to a new organism. Here, the Fly & Worm facility's expertise becomes invaluable. "*This support empowers scientists in my group to follow their curiosity, pursuing research avenues that would otherwise be considered too risky due to the time and effort involved,*" Burga comments.

### Tools and techniques at the Fly & Worm Facility

The Fly & Worm Facility assists in designing the appropriate Drosophila and nematode models, which are produced using one of two different approaches: "*To introduce new genes, we use conventional transgenesis via plasmid injection,*" explains Peter Duchek, head of the facility. "*To introduce mutations into pre-existing genes, we use CRISPR-Cas to precisely edit the genome.*"

"*Our optimized protocols allow us to establish new Drosophila lines in four to six months and nematode lines in just a few weeks,*" says Duchek, who explains that the facility produces around 80 new mutant worm lines annually.



The Fly and Worm Facility supports those scientists at IMBA who use the fruit fly *Drosophila melanogaster* or various nematode species, including *C. elegans*, as genetic model systems for their research.

### Collaborative research and innovation

The Fly & Worm facility collaborates closely with labs at IMBA, particularly those of Julius Brennecke and Alejandro Burga, who use Drosophila and nematode models respectively. In addition, the team produces engineered models for other groups at IMBA.

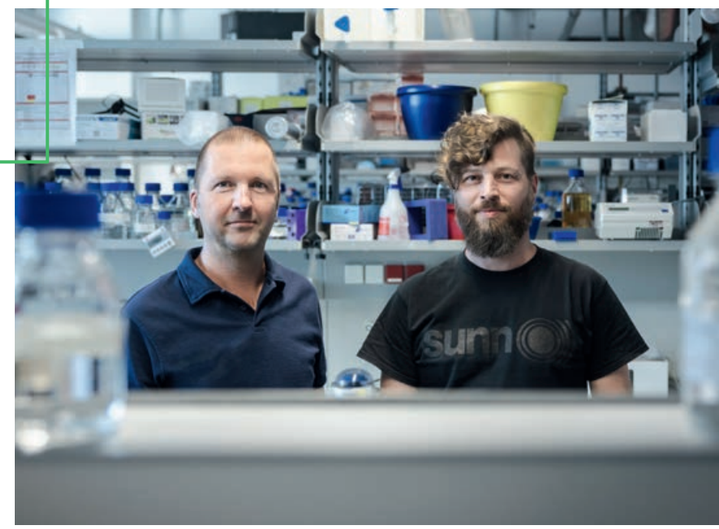
The Fly & Worm facility acts also as a research partner. "*Peter is an integral part of our research projects, being engaged in scientific discussion and actively contributing his expertise in experimental design,*" says Burga. "*Together, we recently established a new system for stable germline expression of transgenes in* C. tropicalis *that we look forward to sharing with the scientific community,*" Burga continues.

The facility also trains students to design engineered models and supports the teams with their unconventional research ideas. "*The team always finds a way to help us, whether by developing new procedures or adapting to our evolving priorities,*" Burga adds.

Innovation is at the heart of the Fly & Worm Facility. For Burga's latest publication, the team produced nematode lines containing simultaneous edits in multiple genes. "*These new lines are pushing the boundaries of genetics research in nematodes, allowing us to do experiments we couldn't have conceived years ago,*" says Burga.

The Fly & Worm facility remains a cornerstone of IMBA's research ecosystem. "*We love collaborating with the diverse groups at IMBA and the Vienna BioCenter,*" says Duchek. "*It's inspiring to contribute our expertise to cutting-edge science and solve relevant biological questions.*"

At IMBA, the Fly & Worm Facility, led by Peter Duchek and supported by Joseph Gokcezade and Julia Marques (not shown), ensures the streamlined generation of transgenic and mutant *Drosophila melanogaster* and nematode models.



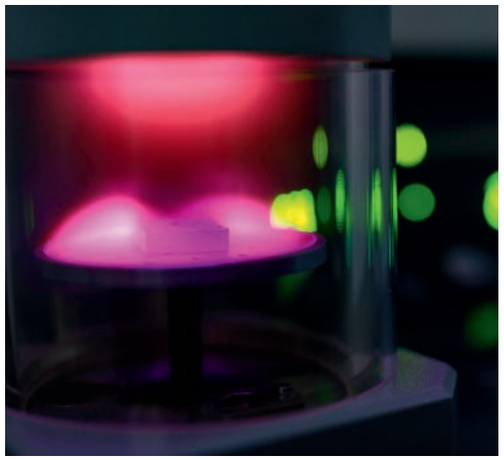
# Vienna BioCenter *Core* Facilities

**The Vienna BioCenter Core Facilities (VBCF) provides access to cutting-edge scientific infrastructure in biomedical research to all researchers at the Vienna BioCenter.**

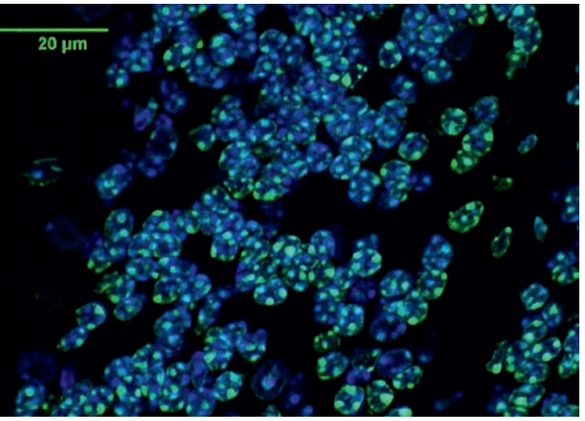
**Austrian Bioimaging/CMI** serves as the national node for Euro-BioImaging, part of the European Research Infrastructure Consortium (ERIC), and provides open access to a broad range of imaging technologies and data services, supporting research and training in biological and biomedical imaging.

**Child Care Center** advocates for career-family balance by offering childcare for children aged three months to six years for employees at the Vienna BioCenter.

**Computational Biology Training** is part of the Vienna BioCenter Scientific Training program and provides practical courses on computational data analysis.



**▷ Electron Microscopy** offers training and assisted techniques in electron microscopy, including standard methods and advanced cryo-EM for high-resolution imaging, as well as basic scanning EM for surface structure visualization.




**◁ Histology ∇** provides researchers with equipment and expertise for preserving and visualizing the microanatomy of their model organisms. It supports a range of techniques, including classical tissue processing, histochemistry, immunostaining, *in situ* hybridization and multiplex immunofluorescence, as well as multidisciplinary approaches like spatial transcriptomics and tissue clearing.





**Metabolomics** offers quantitative analysis of small molecules and metabolites using LC-MS/MS, combining liquid separation techniques with advanced mass analysis, enabling targeted and nontargeted insights into metabolic pathways and genome-environment interactions.

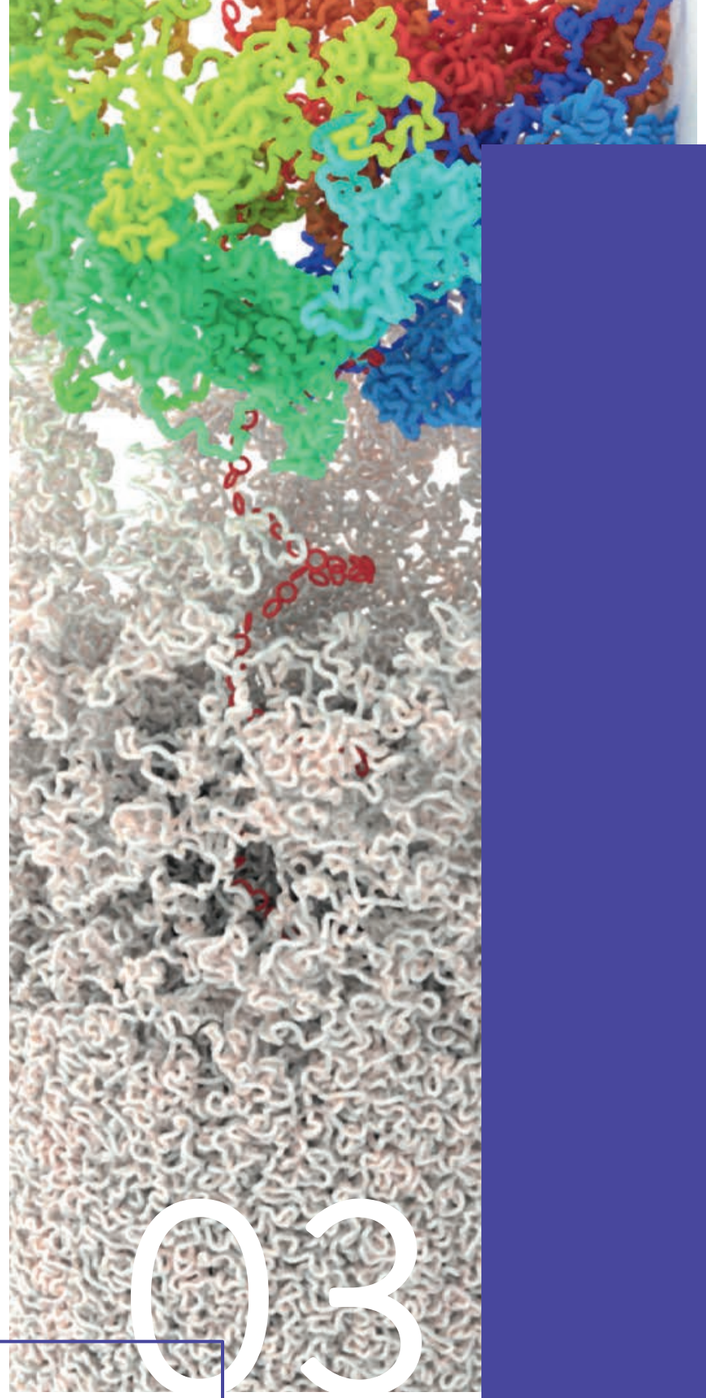
**∇ Next Generation Sequencing** provides DNA and RNA sequencing across short (Illumina, Element Bio) and long-read (PacBio and ONT) platforms. A broad selection of library preparation protocols allows for processing samples from many biomedical research areas. The diverse portfolio comprises customized approaches, user consultation, robotics services, and bioinformatic analysis. Our current focus lies in establishing and developing single-cell and spatial transcriptomic methods.

**Plant Sciences** (PlantS) operates a state-of-the-art, high-throughput, multi-sensor plant phenotyping research infrastructure (PHENOPlant) and 23 highly specialized phytotrons. They offer expertise and service in high-throughput plant phenotyping, dynamic environmental simulations, soft- and hardware engineering as well as image- and data analysis.

**Preclinical Phenotyping** (pcPHENO) specializes in advanced mouse *in vivo* studies covering behavior tests, metabolic and cardiovascular measurements, as well as surgical services.

**Protein Technologies** (ProTech) aims to advance research in molecular and cell biology, protein biochemistry, and structural biology by offering expertise in recombinant protein technologies and biophysical characterization, with core services including molecular cloning, protein production, purification, and analysis.

**∇ Vienna Drosophila Resource Center** (VDRC) is a globally significant bioresource center that promotes scientific discoveries in *Drosophila melanogaster,* primarily maintaining and distributing unique transgenic Drosophila stocks and DNA resources locally and internationally.



03

An artistic rendering of the spiral staircase model of the mitotic chromosome. In 2024, researchers at IMBA presented new tools for analyzing 3D chromosome biology and genomics. © Anton Goloborodko/IMBA

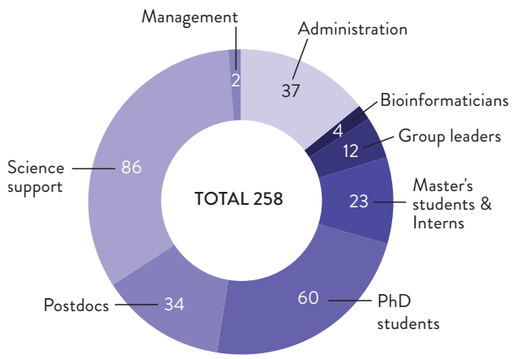
# 2024 *in* REVIEW

KEY FACTS

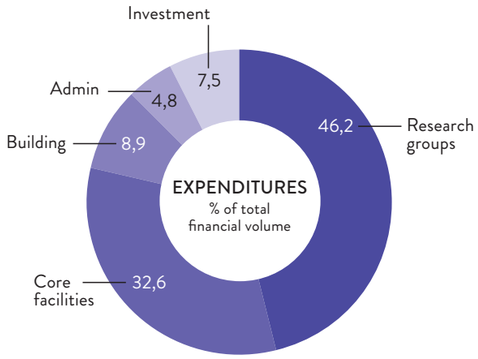
# Key numbers in *2024*

Across 2024, IMBA's international team brought together expertise across various fields and succesfully acquired funding from national, European and international sources.

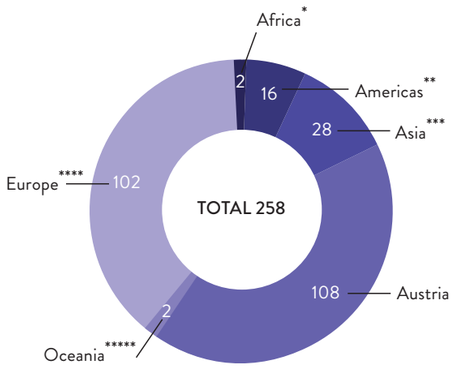
## Staff by function



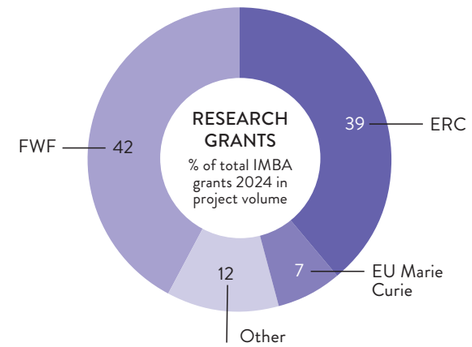

## Expenditures




## Staff by nationality




## Research grants




| | |
|---|---|
| **Africa*** | Ghana, Tunisia |
| **Americas**** | Brazil, Canada, Chile, Mexico, Nicaragua, US |
| **Asia***** | China, India, Israel, Iran, Japan, Mongolia, Philippines, Singapore, South Korea, Syria, Turkey |
| **Europe****** | Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, UK |
| **Oceania******* | Australia |

Data as of December 31, 2024.

# IMBA Publications in *2024*

## IMBA Groups

### JULIUS BRENNECKE

**Evolutionary adaptation of an HP1-protein chromodomain integrates chromatin and DNA sequence signals.** Baumgartner L, Ipsaro JJ, Hohmann U, Handler D, Schleiffer A, Duchek P, Brennecke J. Elife. 2024 Jul 12;13:RP93194. doi: 10.7554/eLife.93194.

**Proteome-scale tagging and functional screening in mammalian cells by ORFtag.** Nemčko F, Himmelsbach M, Loubiere V, Yelagandula R, Pagani M, Fasching N, Brennecke J, Elling U, Stark A, Ameres SL. **Nat Methods**. 2024 Jul 5. doi: 10.1038/s41592-024-02339-x

**Selfish conflict underlies RNA-mediated parent-of-origin effects.** Pliota P, Marvanova H, Koreshova A, Kaufman Y, Tikanova P, Krogull D, Hagmüller A, Widen SA, Handler D, Gokcezade J, Duchek P, Brennecke J, Ben-David E, Burga A. **Nature**. 2024 Mar 6. doi: 10.1038/s41586-024-07155-z.

**A conserved fertilization complex bridges sperm and egg in vertebrates.** Deneke VE, Blaha A, Lu Y, Suwita JP, Draper JM, Phan CS, Panser K, Schleiffer A, Jacob L, Humer T, Stejskal K, Krssakova G, Roitinger E, Handler D, Kamoshita M, Vance TDR, Wang X, Surm JM, Moran Y, Lee JE, Ikawa M, Pauli A. **Cell**. 2024 Oct 10:S0092-8674(24)01093-6. doi: 10.1016/j.cell.2024.09.035.

**Spatially resolved proteomics of the Arabidopsis stomatal lineage identifies polarity complexes for cell divisions and stomatal pores.** Wallner ES, Mair A, Handler D, McWhite C, Xu SL, Dolan L, Bergmann DC. **Dev Cell**. 2024 Mar 18:S1534-5807(24)00141-2. doi: 10.1016/j.devcel.2024.03.001.

**Structure of the human 20S U5 snRNP.** Schneider S, Brandina I, Peter D, Lagad S, Fraudeau A, Portell-Montserrat J, Tholen J, Zhao J, Galej WP. **Nat Struct Mol Biol**. 2024 Mar 11. doi: 10.1038/s41594-024-01250-5.

### ALEJANDRO BURGA

**Selfish conflict underlies RNA-mediated parent-of-origin effects.** Pliota P, Marvanova H, Koreshova A, Kaufman Y, Tikanova P, Krogull D, Hagmüller A, Widen SA, Handler D, Gokcezade J, Duchek P, Brennecke J, Ben-David E, Burga A. **Nature**. 2024 Mar 6. doi: 10.1038/s41586-024-07155-z.

**The Role of Epigenetic Switches in Polyphenism Control: Implications from a Nematode Model for the Developmental Regulation of Alternative Phenotypes.** Wighard S, Sommer RJ. **Biology** (Basel). 2024 Nov 13;13(11):922. doi: 10.3390/biology13110922.

**Annelid methylomes reveal ancestral developmental and aging-associated epigenetic erosion across Bilateria. Guynes, K.**, Sarre, L. A., Carrillo-Baltodano, A. M., Davies, B. E., Xu, L., Liang, Y., Martín-Zamora, F. M., Hurd, P. J., de Mendoza, A., & Martín-Durán, J. M. Genome **Biol**. 2024 Aug 1;25(1):204. doi: 10.1186/s13059-024-03346-z.

### ULRICH ELLING

**Proteome-scale tagging and functional screening in mammalian cells by ORFtag.** Nemčko F, Himmelsbach M, Loubiere V, Yelagandula R, Pagani M, Fasching N, Brennecke J, Elling U, Stark A, Ameres SL. **Nat Methods**. 2024 Jul 5. doi: 10.1038/s41592-024-02339-x

**In vivo CRISPR screens reveal SCAF1 and USP15 as drivers of pancreatic cancer.** Martinez S, Wu S, Geuenich M, Malik A, Weber R, Woo T, Zhang A, Jang GH, Dervovic D, Al-Zahrani KN, Tsai R, Fodil N, Gros P, Gallinger S, Neely GG, Notta F, Sendoel A, Campbell K, Elling U, Schramek D. **Nat Commun**. 2024 Jun 20;15(1):5266. doi: 10.1038/s41467-024-49450-3.

**Genomic surveillance of SARS-CoV-2 evolution by a centralised pipeline and weekly focused sequencing, Austria, January 2021 to March 2023.** Frank O, Balboa DA, Novatchkova M, Özkan E, Strobl MM, Yelagandula R, Albanese TG, Endler L, Amman F, Felsenstein V, Gavrilovic M, Acosta M, Patocka T, Vogt A, Tamir I, Klikovits J, Zoufaly A, Seitz T, Födinger M, Bergthaler A, Indra A, Schmid D, Klimek P, Stark A, Allerberger F, Benka B, Reich K, Cochella L, Elling U. **Euro Surveill**. 2024 Jun;29(23):2300542. doi: 10.2807/1560-7917.ES.2024.29.23.2300542.

**Striatin knock out induces a gain of function of INa and impaired Ca2+ handling in mESC-derived cardiomyocytes.** Benzoni P, Arici M, Giannetti F, Cospito A, Prevostini R, Volani C, Fassina L, Rosato-Siri MD, Metallo A, Gennaccaro L, Suffredini S, Foco L, Mazzetti S, Calogero A, Cappelletti G, Leibbrandt A, Elling U, Broso F, Penninger JM, Pramstaller PP, Piubelli C, Bucchi A, Baruscotti M, Rossini A, Rocchetti M, Barbuti A. **Acta Physiol (Oxf)**. 2024 May 15:e14160. doi: 10.1111/apha.14160.

**CRISPR-StAR enables high-resolution genetic screening in complex in vivo models.** Uijttewaal ECH, Lee J, Sell AC, Botay N, Vainorius G, Novatchkova M, Baar J, Yang J, Potzler T, van der Leij S, Lowden C, Sinner J, Elewaut A, Gavrilovic M, Obenauf A, Schramek D, Elling U. **Nature Biotechnology.** doi: 10.1038/s41587-024-02512-9.

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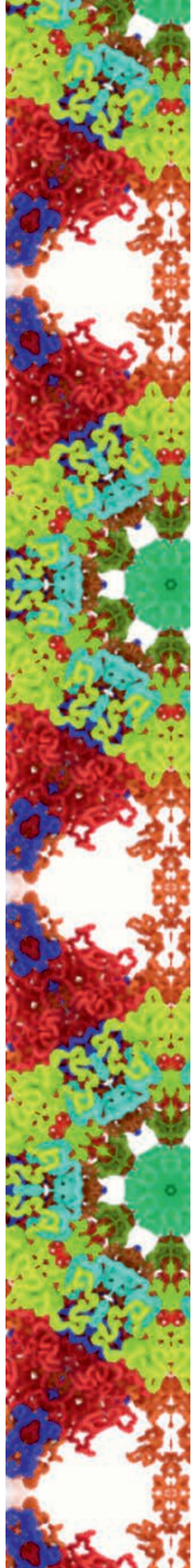



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**Neuropathological assessment of the olfactory bulb and tract in individuals with COVID-19.** Lengacher NA, Tomlinson JJ, Jochum AK, Franz J, Hasan Ali O, Flatz L, Jochum W, Penninger JM, aSCENT-PD Investigators, Stadelmann C, Woulfe JM, Schlossmacher MG. **Acta Neuropathologica Communications**, 12(1), 70. doi: 10.1186/s40478-024-01761-8.

**Non-targeted isomer-sensitive N-glycome analysis reveals new layers of organ-specific diversity in mice.** Stadlmann J, Helm J, Mereiter S, Oliveira T, Gattinger A, Markovitz D, Penninger JM, Altmann F. **Research Square**, rs.3.rs-4130712. doi: 10.21203/rs.3.rs-4130712/v1

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**mTOR activity paces human blastocyst stage developmental progression.** Iyer DP, Khoei HH, van der Weijden VA, Kagawa H, Pradhan SJ, Novatchkova M, McCarthy A, Rayon T, Simon CS, Dunkel I, Wamaitha SE, Elder K, Snell P, Christie L, Schulz EG, Niakan KK, Rivron N, Bulut-Karslioğlu A. **Cell**. 2024 Sep 18:S0092-8674(24)00977-2. doi: 10.1016/j.cell.2024.08.048.

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## ELLY TANAKA

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**Lineage tracing of Shh+ floor plate cells and dynamics of dorsal-ventral gene expression in the regenerating axolotl spinal cord.** Arbanas LI, Cura Costa E, Chara O, Otsuki L, Tanaka EM. **Dev Growth Differ**. 2024 Oct 10. doi: 10.1111/dgd.12945.

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# Core Facilities

## PROTEOMICS FACILITY

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**Identification of Pathogenic Pathways for Recurrence of Focal Segmental Glomerulosclerosis after Kidney Transplantation.** Pajenda S, Gerges D, Wagner L, O'Connell D, Aiad M, Imre R, Mechtler K, Zimprich A, Schmidt A, Sengoelge G, Winnicki W. **Diagnostics** (Basel). 2024 Jul 24;14(15):1591. doi: 10.3390/diagnostics14151591.

**Micropillar arrays, wide window acquisition and AI-based data analysis improve comprehensiveness in multiple proteomic applications.** Matzinger M, Schmücker A, Yelagandula R, Stejskal K, Krššáková G, Berger F, Mechtler K, Mayer RL. **Nat Commun**. 2024 Feb 3;15(1):1019. doi: 10.1038/s41467-024-45391-z.

**Label-Free Sample Preparation for Single-Cell Proteomics.** Hartlmayr D, Ctortecka C, Mayer R, Mechtler K, Seth A. **Methods Mol Biol**. 2024;2817:1-7. doi: 10.1007/978-1-0716-3934-4_1.

## BIOOPTICS

**Staying on track – Keeping things running in a high-end scientific imaging core facility.** Renaud O, Aulner N, Salles A, Halidi N, Brunstein M, Mallet A, Aumayr K, Terjung S, Levy D, Lippens S, Verbavatz JM, Heuser T, Santarella-Mellwig R, Tinevez JY, Woller T, Botzki A, Cawthorne C; Core4Life Consortium; Munck S. **J Microsc**. 2024 Apr 24. doi: 10.1111/jmi.13304.

# Former Group Leaders

## AMERES

**Rnalib: a Python library for custom transcriptomics analyses.** Popitsch N, Ameres SL. **Bioinformatics**. 2024 Dec 24:btae751. doi: 10.1093/bioinformatics/btae751

**Splice_sim: a nucleotide conversion-enabled RNA-seq simulation and evaluation framework.** Popitsch N, Neumann T, von Haeseler A, Ameres SL. **Genome Biol.** 2024 Jun 25;25(1):166. doi: 10.1186/s13059-024-03313-8.

## ULRICH ELLING

**The efflux pump ABCC1/MRP1 constitutively restricts PROTAC sensitivity in cancer cells.** Wolf G, Craigon C, Teoh ST, Essletzbichler P, Onstein S, Cassidy D, Uijttewaal ECH, Dvorak V, Cao Y, Bensimon A, Elling U, Ciulli A, Superti-Furga G. **Cell Chem Biol**. 2024 Dec 24:S2451-9456(24)00489-6. doi: 10.1016/j.chembiol.2024.

**CRISPR-StAR enables high-resolution genetic screening in complex in vivo models.** Uijttewaal ECH, Lee J, Sell AC, Botay N, Vainorius G, Novatchkova M, Baar J, Yang J, Potzler T, van der Leij S, Lowden C, Sinner J, Elewaut A, Gavrilovic M, Obenauf A, Schramek D, Elling U. **Nat Biotechnol**. 2024 Dec 16. doi: 10.1038/s41587-024-02512-9.

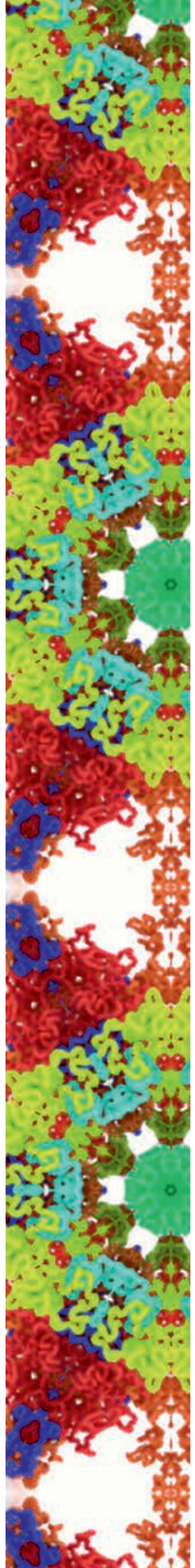
## BON-KYOUNG KOO

**Red2Flpe-SCON: a versatile, multicolor strategy for generating mosaic conditional knockout mice.** Wu SS, Kim S, Lee H, Lee JH, Park SY, Bakonyi R, Teriyapirom I, Hallay N, Pilat-Carotta S, Theussl HC, Kim J, Lee JH, Simons BD, Kim JK, Colozza G, Koo BK. **Nat Commun**. 2024 Jun 11;15(1):4963. doi: 10.1038/s41467-024-49382-y.

**Exploration of drug resistance mechanisms in triple negative breast cancer cells using a microfluidic device and patient tissues.** Lim W, Hwang I, Zhang J, Chen Z, Han J, Jeon J, Koo BK, Kim S, Lee JE, Kim Y, Pienta KJ, Amend SR, Austin RH, Ahn JY, Park S. **Elife**. 2024 Mar 27;12:RP88830. doi: 10.7554/eLife.88830.

**Quantitative and qualitative mutational impact of ionizing radiation on normal cells.** Youk J, Kwon HW, Lim J, Kim E, Kim T, Kim R, Park S, Yi K, Nam CH, Jeon S, An Y, Choi J, Na H, Lee ES, Cho Y, Min DW, Kim H, Kang YR, Choi SH, Bae MJ, Lee CG, Kim JG, Kim YS, Yu T, Lee WC, Shin JY, Lee DS, Kim TY, Ku T, Kim SY, Lee JH, Koo BK, Lee H, Yi OV, Han EC, Chang JH, Kim KS, Son TG, Ju YS. **Cell Genom**. 2024 Feb 14;4(2):100499. doi: 10.1016/j.xgen.2024.100499.







GRANTS

# Grants active or acquired in *2024*

## BRENNECKE GROUP

**ERVolution: The Inner Galapagos – Molecular Ecology of the Retroviral-piRNA Arms Race**
ERC (European Research Council) Advanced Grant: 101142075
**€ 2,498,942**
November 2024–October 2029

**Adaptation of a retroviral family to its host** *(Kirsten Senti)*
FWF (Austrian Science Fund): P 33715-B
**€ 435,985**
July 2021–April 2025

**Dissecting the molecular principles of piRNA homeostasis**
FWF (Austrian Science Fund): P 36970
**€ 414,112**
November 2023–October 2026

**RNA@core: "Molecular mechanisms in RNA biology"**
FWF (Austrian Science Fund): DOC 177-B
**€ 205,917**
September 2023–August 2027

**VIP² Fellowship** *(Maya Voichek)*
European Commission: H2020-MSCA-CO-FUND-2018: 847548
**€ 145,220**
January 2021–December 2025

**VIP² Fellowship** *(Changwei Yu)*
European Commission: H2020-MSCA-CO-FUND-2018: 847548
**€ 147,960**
July 2021–December 2025

**BIF Fellowship** *(Julia Portell I De Montserrat)*
BIF Boehringer Ingelheim Fonds
**€ 78,400**
August 2021–March 2024

**BIF Fellowship** *(Ralf Janssen)*
BIF Boehringer Ingelheim Fonds
**€58,800**
January 2024–December 2025

**DOC Fellowship Programme** *(Radhakrishna Pillai)*
ÖAW (Austrian Academy of Sciences): 26605
**€ 93,518**
August 2024–April 2026

**DOC Fellowship Programme** (*Rafanel Baptiste*)
ÖAW (Austrian Academy of Sciences): 27119
**€ 99,160**
October 2024–September 2026

## BURGA GROUP

**TOP-GUN: Ancient Virus-like Transposons: from Horizontal Gene Transfer to the Evolution of Novelty**
ERC (European Research Council) Consolidator Grant: 101171807
**€ 2,000,000**
March 2025–February 2030

**TOX-ANT: Toxin-antidote selfish elements in animals: from gene drive to speciation**
ERC (European Research Council) Starting Grant: 851470
**€ 1,498,428**
March 2020–February 2025

**Structural Basis of tRNA synthetase-based selfish killer**
FWF (Austrian Science Fund): P 34372-B
**€ 308,612**
September 2021–February 2025

**VIP² Fellowship** *(Sonya Widen)*
European Commission: H2020-MSCA-COFUND-2018: 847548
**€ 147,960**
July 2021–December 2025

**DOC Fellowship Programme** *(Florian Pühringer)*
ÖAW (Austrian Academy of Sciences): 26441
**€ 85,025**
August 2022–July 2024

**DOC Fellowship Programme** *(Daniel Ciro Krogull)*
ÖAW (Austrian Academy of Sciences): 27189
**€ 99,160**
September 2024–August 2026

## GERLICH GROUP

**TopoGenomics: Topological interactions as functional regulators of the eukaryotic genome: moving beyond intramolecular looping**
ERC (European Research Council) Advanced Grant: 101019039
**€ 2,792,500**
September 2021–August 2026

**Elucidating the mechanics of mitotic chromosome assembly by light-, electron-, and atomic force microscopy**
WWTF (Wiener Wissenschafts-, Forschungs- und Technologiefonds): LS19-001
**€ 499,600**
June 2020–May 2025

**EMBO Postdoctoral Fellowship** *(Thomas Steinacker)*
EMBO (European Molecular Biology Organization): ALTF 866-2022
**€ 72,000**
July 2023–June 2024

**DSB Architect: The role of chromosome conformation in DNA double-strand break repair** *(Federico Teloni)*
European Commission H2020-MSCA-IF-2020: 101022896
**€ 174,167**
September 2022–August 2024

**BIF Fellowship** (*Joseph Neos Cruz*)
BIF Boehringer Ingelheim Fonds
**€ 58,800**
January 2024–March 2026

**Molecular mechanism of sister chromatid resolution in replicated human chromosomes** *(Takuya Hidaka)*
International Human Frontier Science Program Organization (HFSPO) Postdoctoral Fellowship: LT0021/2024-C
**€ 204,666**
January 2025–December 2027

**JSPS Fellowship** *(Takuya Hidaka)*
Japan Society for the Promotion of Science (JSPS)
**€ 30,061**
April 2024–December 2024

**MicroChrom: Revealing the architecture of replicated human chromosomes by sister-chromatid-sensitive fluorescence in situ hybridization** *(Thomas Steinacker)*
European Commission H2020-MSCA-IF-2020: 101103258
**€ 199,440**
August 2024–July 2026

## GOLOBORODKO GROUP

**3DGenomeSearch: Sifting through the 3D Genome: Computational Models of Homology Search in DNA Repair**
ERC (European Research Council) Starting Grant: 101163751
**€ 1,500,000**
January 2025–December 2029

**Polymer models of homolog pairing in meiosis**
FWF (Austrian Science Fund): SFB F8804-B
**€ 325,967**
March 2022–February 2026

**MisterCHROM: Modelling sister chromatids cohesion** *(Flavia Corsi)*
European Commission H2020-MSCA-IF-2020: 101033347
**€ 174,167**
September 2022–August 2024

**Imaging of DNA folding by cohesin through time resolved single molecule light, atomic force and cryo**
WWTF (Wiener Wissenschafts-, Forschungs- und Technologiefonds): LS19-029
**€ 39,680**
May 2020–July 2024

**ELLIPSE: An Interdisciplinary Research Platform for Exploration, Innovation and Education in Liquid-Liquid Phase Separation Biology**
FWF (Austrian Science Fund): DOC 112-B
**€ 203,287**
January 2024–October 2025

## GRADE GROUP

**In vivo reprogramming to rescue alterations in Huntington's disease**
La Caixa Banking Foundation: HR21-00622
**€ 145,696**
November 2021–October 2024

**VIP² Fellowship**
*(Maria Nazareth Gonzalez Alvarado)*
European Commission: H2020-MSCA-COFUND-2018: 847548
**€ 82,200**
July 2022–December 2025

**Excellent Brains**
FWF (Austrian Science Fund): Center of Excellence 16
**€ 583,658**
December 2024–November 2029

**Stem Cell Modulation in Neural Development and Regeneration** *(Partner)*
FWF (Austrian Science Fund): SFB F7801-B/ F 7804-B
**€ 407,555**
January 2024–August 2028

## JACHOWICZ GROUP

**DarkCellFader: Uncovering the role and regulation of 3D DNA-RNA nuclear dynamics in controlling cell fate decisions**
ERC (European Research Council) Starting Grant: 101077048
**€ 1,500,000**
June 2023–May 2028

## KNOBLICH GROUP

**Stem Cell Modulation in Neural Development and Regeneration** *(Coordination/Partner)*
FWF (Austrian Science Fund):
SFB F7801-B/ F 7804-B
**€ 804,907/ € 783,548**
March 2020–February 2028

**In vitro modelling of dopamine pathways in fused organoids**
FWF (Austrian Science Fund): P 35369
**€ 414,781**
January 2022–December 2025

**Molecular mechanisms of copy-neutral loss of heterozygosity**
FWF (Austrian Science Fund): P 35680
**€ 409,658**
April 2022–March 2025

**The regulatory machinery of tubulin detyrosination** *(Lisa Landskron)*
FWF (Austrian Science Fund): J 4448-B
**€ 72,322**
August 2023–April 2024

**SCORPION: Bioengineered scaffolds for patterning of cerebral organoids**
FWF (Austrian Science Fund): DOC 72-B7
**€ 195,631**
October 2019–March 2024

**EMBO Postdoctoral Fellowship** *(Laura Kracht)*
EMBO (European Molecular Biology Organization): ALTF 45-2023
**€ 144,000**
July 2023–June 2025

**DOC Fellowship Programme** *(Ana Štravs)*
ÖAW (Austrian Academy of Sciences): 26729
**€ 116,897**
September 2023–February 2028

**BIF Fellowship** *(Jamie Littleboy)*
BIF Boehringer Ingelheim Fonds
**€ 58,800**
April 2022–April 2024

**Brain Resilience** *(Nina Corsini)*
FWF (Austrian Science Fund): EFP9
**€1,163,242**
October 2024–September 2029

**Excellent Brains**
FWF (Austrian Science Fund):
Center of Excellence 16
**€ 583,658**
December 2024–November 2029

**CHOOSE MIC** *(Laura Kracht)*
FWF (Austrian Science Fund): DI_2023-119
**€74,250**
May 2024–April 2025

**EPI-STOP: Recapitulating and preventing epileptogenesis in early human brain network development** *(Michael Zabolocki)*
European Commission H2020-MSCA-IF-2020: 101155338
**€ 183,600**
April 2024–March 2026

**Next-Generation Preclinical Models of NF1 Brain Tumor**
Gilbert Family Foundation (Foundation International): 923017
**$ 1,294,348**
January 2024–December 2026

**HOUSKAPREIS 2024**
B&C Privatstiftung
**€ 150,000**
May 2024–December 2025

## MENDJAN GROUP

**Deciphering BMP signaling in human lateral plate mesoderm**
FWF (Austrian Science Fund): PAT 4435223
**€ 399,816**
December 2023–November 2026

**SCORPION: Bioengineered scaffolds for patterning of cerebral organoids**
FWF (Austrian Science Fund): DOC 72-B7
**€ 195,631**
October 2019–March 2024

**Human 3D disease models for cardiac drug discovery**
Wirtschaftsagentur Wien
**€ 131,109**
February 2022–July 2024

**Transcriptional and morphogenic signatures of congenital heart disease pathways**
Additional Ventures, Single Ventricle Research Fund
**$ 330,000**
February 2022–February 2025

**RECREATE – non-coding RNA therapeutics to elicit cardiac reg**
FWF (Austrian Science Fund): I 6934-B
**€ 374,052**
March 2024–February 2027

## RIVRON GROUP

**BLASTOID: A drug discovery platform for early human embryogenesis**
ERC (European Research Council)
Consolidator Grant: 101002317
**€ 2,000,000**
July 2021–June 2026

**BLASTOID-DISCOVERY: Human blastoids: a drug discovery platform for women's reproductive health**
ERC (European Research Council)
Proof of Concept: 101082147
**€ 150,000**
November 2023–March 2025

**The black box of pregnancy first steps**
FWF (Austrian Science Fund): I 6392-B
**€ 426,114**
December 2023–November 2027

**HU_BLAST: Understanding human peri-implantation development**
FWF (Austrian Science Fund): I 6214
**€ 434,049**
January 2023–December 2026

**Creating a symphony from noise: stochastic and coordinated regulation of stem cells in embryogenesis**
Human Frontier Science Program (HFSP): RGY0081_2019
**€ 346,723**
November 2019–October 2024

**IMPLANTATION: A stem cell-based approach for modelling implantation in vitro** *(Heidar Heidari Khoei)*
European Commission H2020-MSCA-IF-2020: 101026451
**€ 174,167**
September 2022–August 2024

**VIP² Fellowship** *(Saurabh Pradhan)*
European Commission H2020-MSCA-CO-FUND-2018: 847548
**€ 112,340**
August 2022–December 2025

**JSPS Fellowship** *(Harunobu Kagawa)*
Japan Society for the Promotion of Science (JSPS)
**¥ 13,541,500**
April 2022–March 2024

**IMPLANTEU**
European Commission: H2020-MS-CA-IF-2020: 101169349
**€ 270,331**
October 2024–September 2028

## SAHA GROUP

**Role of nuage in germline cell fate**
FWF (Austrian Science Fund): P 34278
**€ 418,715**
June 2021–May 2025

**DOC Fellowship** *(Radhakrishna Pillai)*
ÖAW (Austrian Academy of Sciences): DOC-26605
**€ 93,518**
January 2024–January 2024

## TANAKA GROUP

**AxoBrain: Mapping the axolotl brain and its regeneration** *(Coordinator)*
ERC (European Research Council)
Synergy Grant: 101118739
**€ 3,000,000**
April 2024–March 2030

**Excellent Brains**
FWF (Austrian Science Fund):
Center of Excellence 16
**€ 579,912**
December 2024–November 2029

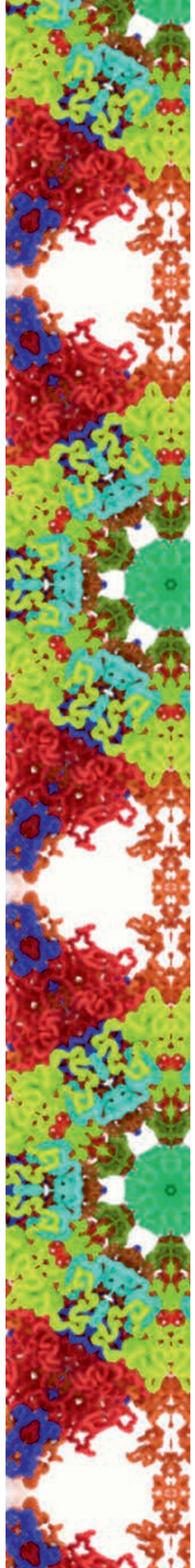
**DANIO-ReCODE: DANIO-CODE – the next frontier: Decoding transcription regulation in regeneration by advanced genomics and computational tools**
European Commission: H2020-MS-CA-IF-2020: 101169349
**€ 270,331**
November 2024–October 2028

**Temporal dynamics of self organized terminal cord patterning**
FWF (Austrian Science Fund): SFB F 7803_B
**€ 416,448**
March 2020–February 2029

**REGENERATE-IT: Learning from animals how to regenerate: multidisciplinary training programme in regenerative biology**
European Commission: H2020-MS-CA-IF-2020: 101073238
**€ 225,276**
March 2023–February 2027

**EMBO Postdoctoral Fellowship** *(Stephan Raiders)*
EMBO (European Molecular Biology Organization: ALTF 184-2023
**€ 144,000**
April 2024–December 2025

**REANIMA: New-generation cardiac therapeutic strategies directed to the activation of endogenous regenerative mechanisms**
European Commission: H2020-RIA: 874764
**€ 240,615**
April 2020–June 2025



**Signal scaling during limb regeneration of different sized animals**
FWF (Austrian Science Fund): I 4846
**€ 392,268**
November 2020–October 2024

**Mechanical Principles of vertebrae regeneration** *(Wouter Masselink)*
FWF (Austrian Science Fund): PAT 4101524
**€ 449,726**
April 2025–March 2028

**Vertebrae patterning during regeneration**
FWF (Austrian Science Fund): P 34841
**€ 412,551**
October 2022–June 2025

**Impact of transposable elements during animal regeneration**
FWF (Austrian Science Fund): I 4353
**€ 406,008**
January 2021–December 2024

**Regenerative strategies for cardiac repair**
FWF (Austrian Science Fund): P 36045
**€ 432,386**
October 2022–September 2026

**Patterning and connectivity of the regenerated nervous system** *(Carina Seidl)*
Peter und Traudl Engelhorn Stiftung zur Förderung der Lebenswissenschaften
**€ 185,722**
January 2025–December 2026

**AxoMatrx: How do dynamic changes extracellular matrix guide regenerative events in Axolotl?** *(Elad Bassat)*
European Commission H2020-MSCA-IF-2020: 101026451
**€ 186,167**
September 2022–August 2024

**TRANSPOLOTL: Unraveling the role of transposable elements in the evolution of the gene-regulatory-networks driving limb regeneration in Axolotl** *(Diego Rodriguez-Terrones)*
European Commission: H2020-MSCA-IF-2020: 101026451
**€ 174,167**
September 2022–August 2024

## URBÁN GROUP

**Excellent Brains**
FWF (Austrian Science Fund):
Center of Excellence 16
**€ 583,658**
December 2024–November 2029

**Stem Cell Modulation in Neural Development and Regeneration**
FWF (Austrian Science Fund): SFB F 7808_B
**€ 880,901**
March 2020–February 2028

**Targeted protein degradation – from small molecules to complex organelles**
FWF (Austrian Science Fund): SFB F7907-B
**€ 836,382**
March 2020–February 2028

**SMICH: Extrinsic regulation of adult neural stem cell quiescence**
FWF (Austrian Science Fund): W 1261-B28
**€ 236,840**
May 2021–April 2025

**Using activity-based probes to study the mechanism and regulation of the giant E3 ligase Huwe1**
WWTF (Wiener Wissenschafts-, Forschungs- und Technologiefonds): LS21-029
**€ 279,970**
June 2022–May 2026

**A Role for MEK1 in WNT and TGFß Signaling**
FWF (Austrian Science Fund): P 35694
**€ 51,134**
October 2022–September 2025

**Treatment decision based on organoids in gastric cancer** *(Gabriele Colozza)*
FWF (Austrian Science Fund): I 5900-B
**€ 50,403**
July 2023–March 2025

**SCORPION: Bioengineered scaffolds for patterning of cerebral organoids**
FWF (Austrian Science Fund): DOC 72-B7
**€ 195,631**
October 2019–March 2024

## Sponsors in 2024

- Additional Ventures, Single Ventricle Research Fund
- B&C Privatstiftung
- BIF Boehringer Ingelheim Fonds
- EMBO (European Molecular Biology Organization)
- ERC (European Research Council)
- European Commission
- FWF (Austrian Science Fund)
- Gilbert Family Foundation (Foundation International)
- Human Frontier Science Program (HFSP)
- International Human Frontier Science Program Organization (HFSPO)
- Japan Society for the Promotion of Science (JSPS)
- La Caixa Banking Foundation
- Peter und Traudl Engelhorn Stiftung zur Förderung der Lebenswissenschaften
- Wirtschaftsagentur Wien
- WWTF (Wiener Wissenschafts-, Forschungs- und Technologiefonds)
- ÖAW (Austrian Academy of Sciences)

# Seminars and scientific events in *2024*

IMBA scientists host leading global scientists on campus for seminars and conferences.

## Speakers

**Building and regenerating the vertebrate retina** | Seth Blackshaw, Johns Hopkins University School of Medicine, US

**Targeting a gerozyme to reverse muscle aging and increase healthspan** | Helen Blau, Stanford University School of Medicine, US

**Understanding cell fate patterning with minimal in vitro models of early human development** | Guillaume Blin, MRC Edinburgh, UK

**Novel actors in chromatin-based control of transposable elements** | Deborah Bourc'his, Institut Curie, FR

**Transcriptional regulation of heart development and disease** | Benoit Bruneau, Gladstone Institute of Cardiovascular Disease, US

**Evading ageing: mitochondrial and proteostasis adaptations in oocytes** | Elvan Böke, CRG Barcelona, ES

**Epigenetic regulation of transcription** | Kristian Helin, The Institute of Cancer Research, UK

**Building human spinal cord organoids: Biomodels to study neural tube defects** | Elisa Marti, Instituto de Biologia Molecular de Barcelona, ES

**Sister chromatid cohesion is mediated by individual cohesin complexes** | Fena Ochs, University of Copenhagen, DK

**A comparative approach to teleost rheotaxis** | Pablo Oteiza, Max Planck Institute for Biological Intelligence, DE

**Genomic conflicts and speciation in Drosophila** | Nitin Phadnis, University of Utah, US

**Improving precise genome editing for ancestralization of human stem cells** | Stephan Riesenberg, Max Planck Institute for Evolutionary Anthropology, DE

**Multiscale plant bioimaging using advanced microscopy** | Jozef Samaj, Palacky University Olomouc, CZ

**A charged patch drives eukaryotic chromosome clustering via Ki-67–RNA bridging** | Valerio Sorichetti, Institute of Science and Technology Austria, AT

**Dissecting post-transcriptional gene expression regulation in humans and viruses** | Marvin Tanenbaum, Hubrecht Institute, NL

**Control of cell fate and morphogenesis in the developing brain** | Shubha Tole, TIRF, IN

**Voyage of the Starships: giant transposons as crucibles of evolution** | Aaron Vogan, Uppsala University, SE

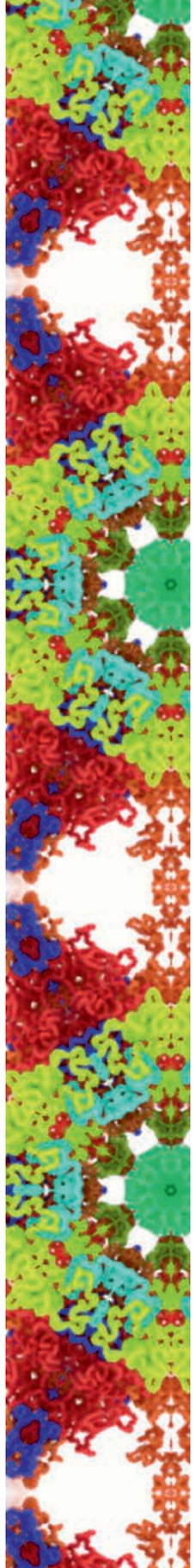
Lea Klement, Science Support Officer, organized SY-Stem and is accompanied by Bon-Kyoung Koo, former Group Leader, and Elly Tanaka, Scientific Director.

## SY-Stem symposium

The 2024 SY-Stem symposium, jointly organized by IMBA, the IMP, Max Perutz Labs, and the IBS Center of Genome Engineering, brought together stem cell researchers across career stages. Keynotes by Magdalena Götz (Helmholtz Munich) and Hiro Nakauchi (Stanford Medicine) highlighted recent advances. SY-Stem fosters collaboration and discussion within the stem cell community, focusing on the next generation of stem cell researchers.

## 18th Microsymposium on RNA Biology

The 18th Microsymposium on RNA Biology is an international conference co-organized by IMBA, IMP, GMI, Max Perutz Labs, and the Vienna BioCenter's RNA community. The Microsymposium is a platform for young scientists, group leaders, and company representatives to share and discuss their latest advancements in small RNA research and related fields.

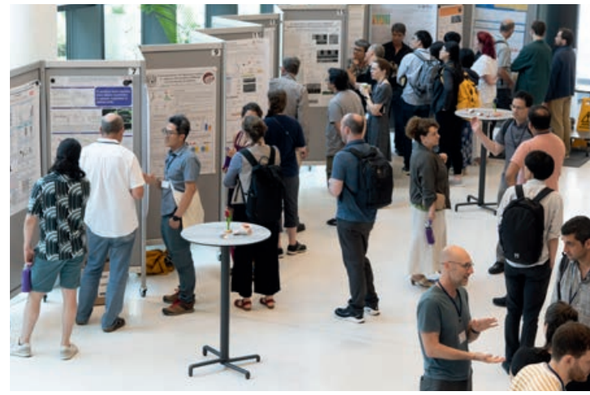
## 10th edition of "Evolutionary Biology of Caenorhabditis and other Nematodes"

In 2024, the 10th edition of the "Evolutionary Biology of Caenorhabditis and other Nematodes" conference was co-organized by IMBA and took place at the Vienna BioCenter campus. This international conference brings together researchers from diverse disciplines to explore the evolution and natural diversity of nematodes, fostering collaboration and the exchange of innovative ideas.

The PhD Symposium is organized exclusively by students at Vienna BioCenter.

## pre-FENS workshop

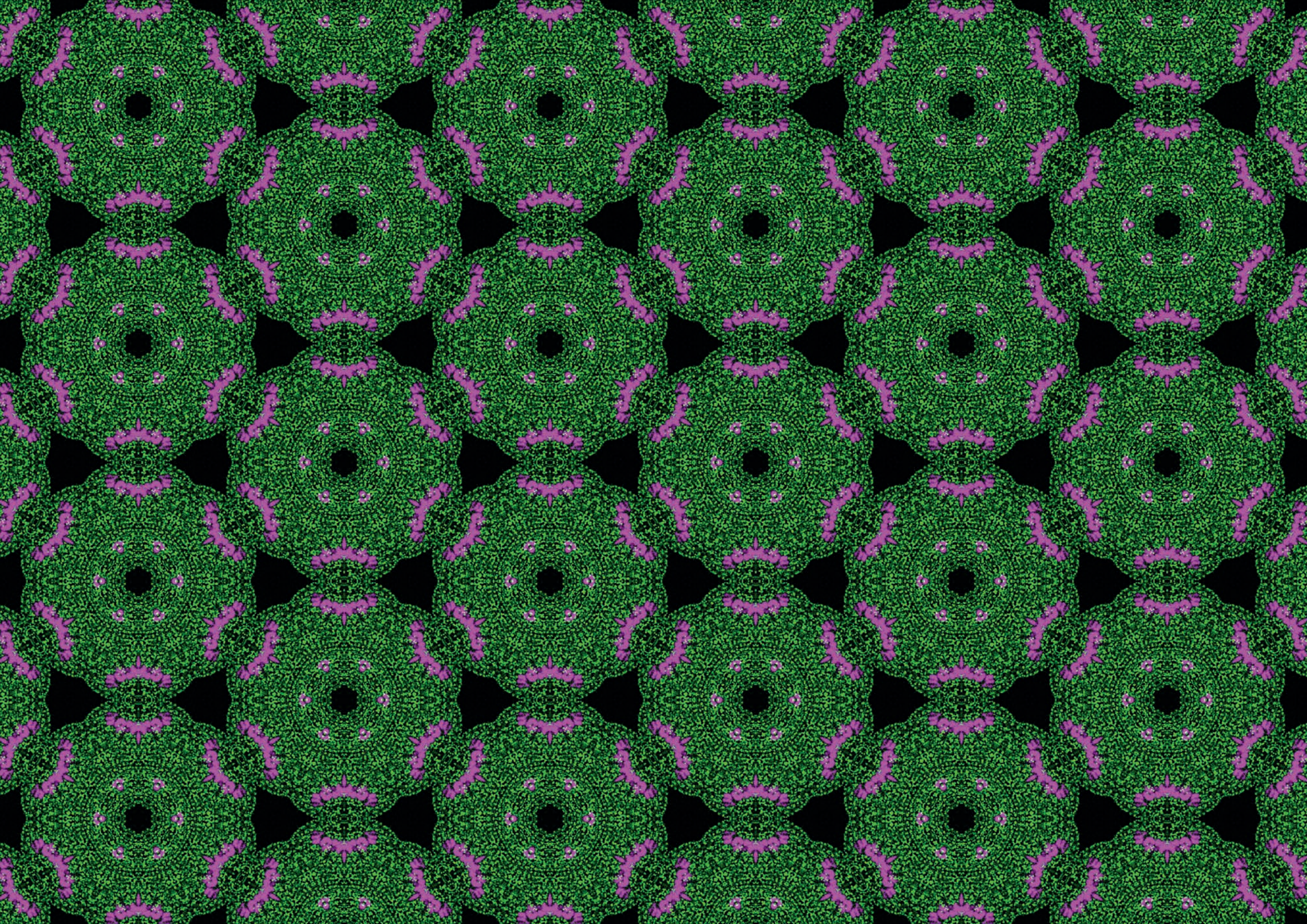
IMBA hosted the one-day FENS satellite event "Cajal's Challenge Accepted: Overcoming the Barriers in Making New Neurons in the Adult Brain" as a prelude to the 2024 Federation of European Neuroscience Societies conference in Vienna. The program featured talks by experts in reprogramming, neurogenesis, and brain repair, including IMBA Director Elly Tanaka and IMBA group leaders Noelia Urbán and Sofia Grade.

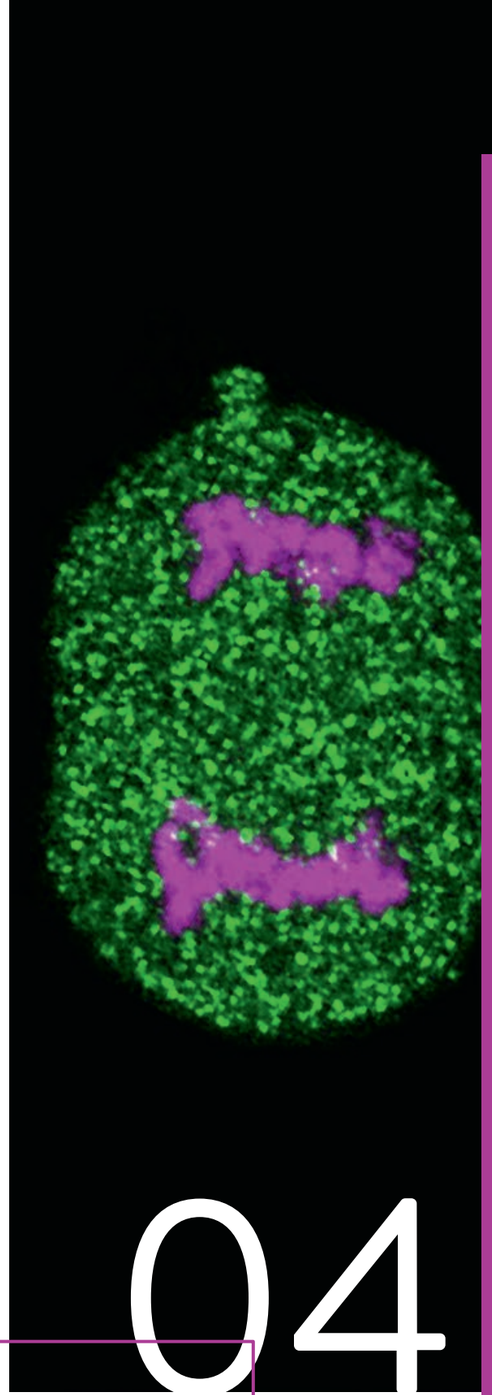


"Paths to Regeneration", an artwork by Ella Steinbacher and inspired by Tanaka Lab researcher André Fischer, captures an extraordinary natural process in axolotls, where adult somatic cells revert to a more versatile state, enabling regeneration.

## 21st Annual Vienna BioCenter PhD Symposium

The annual Vienna BioCenter PhD Symposium, organized by PhD students and the Scientific Training Unit, is a key event for scientific exchange. Gathering a diverse audience and renowned speakers from Europe and beyond, this year's theme, "Into the Unknown: Exploring Uncharted Territory in Research", featured talks about groundbreaking discoveries and innovative techniques in structural biology, genetics, organismal biology, and disease mechanisms. The event promotes dynamic discussions on tackling challenges in uncharted research, embodying the Vienna BioCenter's interdisciplinary scientific approach.





04

As the cell exits mitosis, compact chromosomes sequester cytoplasm when the cell nucleus reassembles. Scientists at IMBA study chromosome structure and interactions in the three-dimensional space.
© Mina Petrovic & Daniel Gerlich/IMBA

# CAMPUS & COMMUNITY


THE VIENNA BIOCENTER

# IMBA – a part of the *Vienna BioCenter*

**IMBA is located at the Vienna BioCenter, a campus uniting life science institutes, universities and biotech.**

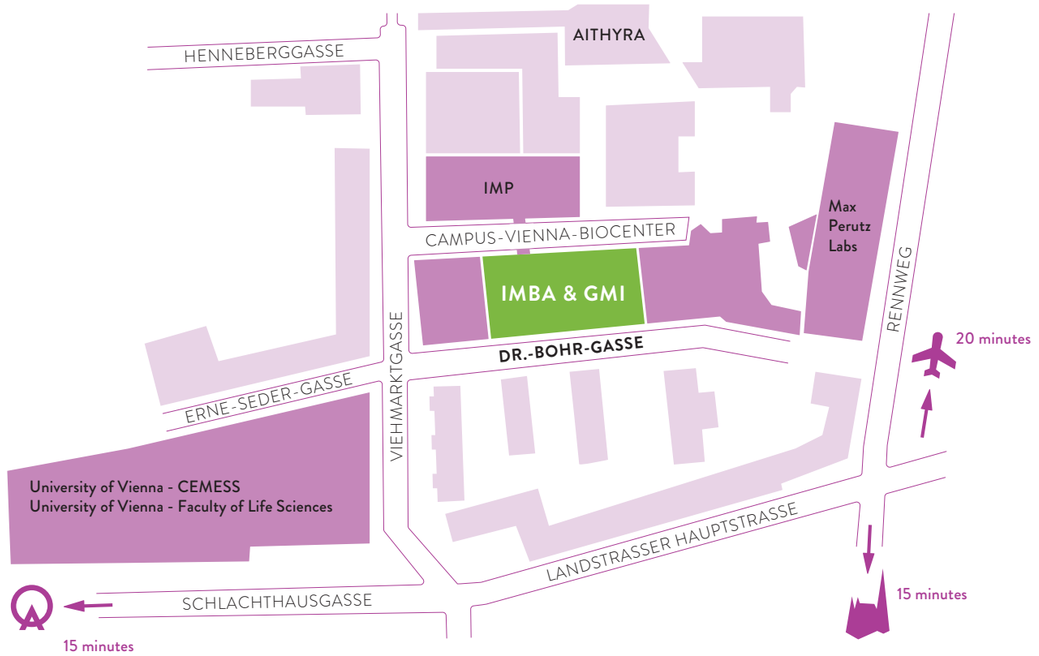
The Vienna BioCenter is a vibrant international hub where world-class research institutes, universities and biotech companies come together to push the boundaries of knowledge. Research at the Vienna BioCenter encompasses basic and applied sciences, tackling fundamental biological questions while advancing solutions for real-world challenges.

The Vienna BioCenter brings together more than 2,000 scientists and is home to six research institutes, dedicated to exploring life science and its intersections from a variety of viewpoints: IMBA; the Gregor Mendel Institute of Molecular Plant Biology (GMI); the Research Institute of Molecular Pathology (IMP); the Max Perutz Labs; the University of Vienna Faculty of Life Sciences and the Center for Microbiology and Environmental Systems Science. As announced in 2024, a seventh research institute, AITHYRA – the Research Institute for Biomedical Artificial Intelligence, will soon start operating at the Vienna BioCenter. The new institute will develop AI-first approaches to biomedicine in order to revolutionize the way work is done in the field.

What scientists value about working at the Vienna BioCenter are the infrastructure and resources available on campus. Scientific facilities, all staffed by experts, provide access to innovative technologies. These specialized teams and resources allow researchers to focus on the "big questions", significantly accelerating scientific discovery.

The Vienna BioCenter welcomes students, researchers, and support staff from over 80 countries, all of them with diverse backgrounds and experience levels. Just minutes away from Vienna's city center and directly connected to the airport, the campus is ideally situated for international travel and collaboration. Recently, the Vienna BioCenter established a welcome office, to enhance the support of international employees and students.

As a vibrant hub of activity, the Vienna BioCenter fosters a sense of community through social events, a variety of sports clubs, and a childcare center, creating a welcoming and inclusive environment for everyone on campus.



EDUCATION & TRAINING

# Scientific training and *mentoring* at IMBA

Rooted in Vienna's thriving scientific community, IMBA's training and mentoring programs connect researchers at all stages, shaping well-rounded early career scientists and equipping experienced researchers to leave a lasting impact.

## Education

Education is central to the mission of IMBA. A range of programs are designed to support students at every stage of their academic journey.

Undergraduate students participate in the Vienna BioCenter Summer School, sponsored by the Max Birnstiel Foundation, allowing students to gain hands-on experience and begin building their research profiles.

At the doctoral level, the **Vienna BioCenter PhD Program** stands out as one of Europe's premier training programs in the life sciences. Jointly operated by the University of Vienna and the Medical University of Vienna in collaboration with IMBA, the GMI, the IMP, and the Max Perutz Labs, the program's structure provides access to extensive resources and creates a comprehensive and supportive program for advanced scientific education.

New PhD students at IMBA are part of the larger community of 400 PhD students across the Vienna BioCenter. From the outset, students pursue independent research projects. This specialization is balanced by exposure to a broad spectrum of research. The "Prime Your PhD" lecture series introduces students to the breadth of research conducted across the Vienna BioCenter.

IMBA PhD students participate in weekly seminar series, which feature prominent researchers from around the world. Additional training includes journal clubs, science communication workshops, and classes offered by scientific facilities in specialist techniques, such as electron microscopy and statistics for data analysis.

PhD students at IMBA are also active contributors to the academic and social fabric of the Vienna BioCenter. They co-organize the annual Vienna BioCenter PhD Symposium, a three-day event now in its 21st year. The symposium includes networking opportunities, career development workshops, and scientific presentations on topics ranging from gene control to cancer and immunology.

## Career and leadership development

**The Vienna BioCenter Leadership Programs**
At the Vienna BioCenter, including IMBA, the **Vienna BioCenter Leadership Program** sharpens leadership skills and fosters collaboration among leaders from various departments. Through practical modules and a peer-mentoring network, the program empowers participants to guide their teams effectively toward innovative discoveries. A condensed version of this program is offered in the **Vienna BioCenter PhD and Postdoc Leadership Training Course.**

**Student and Postdoc Initiatives**
Through peer-driven interinstitutional activities, researchers apply their expertise in diverse professional contexts – while emphasizing career development, networking, scientific exploration, and knowledge-sharing. The **Vienna BioCenter PhD Symposium, Vienna BioCenter Postdoc Retreat, Postdoc Networking Day (POND),** and **Vienna Biocenter PhD Program Retreat** are organized by early career researchers from the Vienna BioCenter. A subset of events organized by PhD students and Postdocs aim at connecting researchers from other institutes in Vienna and its surroundings such as CeMM and ISTA.

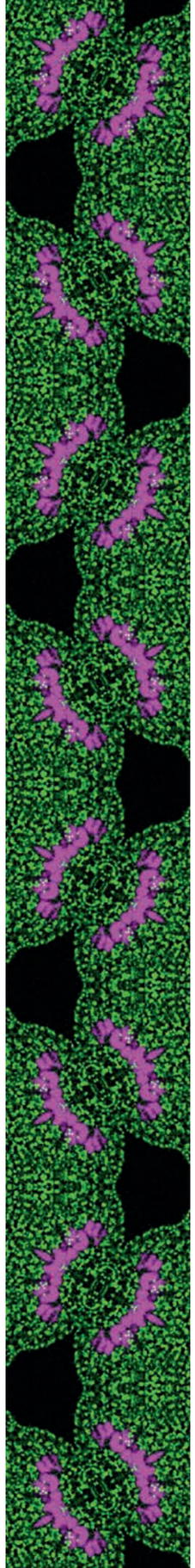
**Campus Chat Series**
The **Campus Chat Series** offers career-focused discussions for PhD students and postdocs, providing guidance on postdoctoral lab placements, establishing independent labs, crafting competitive CVs, and transitioning from academia to industry.

## Mentoring and Fellowship programs

**Vienna International Postdoctoral (VIP²) Fellowship Program**
IMBA is a member of the Vienna International Postdoctoral (VIP²) Fellowship Program. Lasting five years, VIP² offers 3-year postdoctoral fellowships to support research projects that may lead to distinct research lines. The fellowship includes exposure to a variety of sectors, as well as a two-mentor scheme.

**The PhD-PD Mentoring Program**
The PhD-Postdoc Mentoring Scheme offers an additional layer of mentoring by connecting students with postdoc mentors from other research groups.





INTERVIEW

# Better leadership, *better science*

Daniel Gerlich and Joanna Jachowicz lead their teams to new discoveries by training better scientists – with help from the Vienna BioCenter Leadership Program.

Scientific expertise alone doesn't make a great leader. The Vienna BioCenter Leadership Program helps researchers develop leadership skills that strengthen teams and improve research outcomes, as Daniel Gerlich and Joanna Jachowicz share in this interview.

**Why is the Vienna BioCenter Leadership Program a valuable addition to the catalogue of resources at IMBA?**
**Daniel Gerlich:** As scientists, we are selected for leadership positions, not by leadership skills, but by being experts in our research field. But when you take on a leadership role, you have to enable others to be good at the task you did before. And that's not a simple thing. In science, the daily tasks of leading are often unrelated to the skills you needed to become a leader.

**Joanna Jachowicz:** New group leaders often lack clear guidance when starting a research group. In the Vienna BioCenter Leadership Program, workshops, retreats and courses teach researchers how to lead – all within the context of the Vienna BioCenter.

**What insights from the program are shaping your leadership journey?**
**Joanna Jachowicz:** I'm feeling more confident in my role because I now know how to reach my goals for my team. In the workshop we could see – in addition to the content itself - how the trainers would structure, organize and lead the group. This has helped me improve how I organize my lab meetings and develop our team's values.

**Daniel Gerlich:** I think we group leaders tend to give advice from the expert's point of view. Instead, we should support our team members to perform well at their tasks. The question is: How can we help people become better scientists, rather than just doing the next experiment well? Empowering others to find solutions, rather than providing the solution, develops people towards independent work as scientists. In the lab, we are ideally asking questions so that people figure out the next step in their project. This is the difference between expert advice and coaching.

**Are there any techniques you are using for leading your lab?**
**Daniel Gerlich:** My calendar is full of meetings. Very often a group comes together, but the reason for the meeting is unclear. It can be unsatisfying. As part of the leadership program, we learned different techniques for managing effective interactions. Flashlight and frame-setting are techniques that have improved meetings by equalizing participation and clarifying goals.

**Joanna Jachowicz:** Flashlights are a great example. We started doing flashlight rounds in our meetings and discussions because, indeed, it gives everyone a chance to think about their contribution.

**How is leadership training shaping the way your team discovers and innovates?**
**Daniel Gerlich:** Since the training, I appreciate better the emotional components behind discussions. My lab's success entirely depends on the success of the people in my lab, and communicating openly about the priorities and goals in our research is crucial, but not enough on its own. I practice active listening, a form of empathy that deepens our understanding of each other's needs, challenges, and ideas. By recognizing these experiences, I can offer the right resources and guidance to overcome obstacles. This, in turn, allows the team to perform well and advances our research. In fact, I liked the training so much that I plan to have a lab workshop retreat, together with one of the coaches.

**Joanna Jachowicz:** The leadership program is only in its second year, but it may be changing the culture on campus. Great science and great papers are important for advancing science, but cannot happen without open communication and an understanding of leadership.

Daniel Gerlich and Joanna Jachowicz, two IMBA group leaders, joined the Vienna BioCenter Leadership Program in its second year.

OUTREACH

# Sparking curiosity in *science*

IMBA researchers are making science accessible for everyone through interactive outreach that sparks curiosity and emphasizes impacts on daily life.

IMBA's outreach initiatives provide hands-on experiences that translate complex scientific concepts into relatable experiences, extending discoveries made at IMBA beyond academia and showcasing the real-world impact of science. Lectures, workshops, lab visits, and interactive science stations nurture curiosity and foster a deeper understanding of science. Programs are tailored to meet the needs of diverse audiences. IMBA outreach is science - accessible and engaging for everyone.

### Inviting curious young people to the campus

For UniStem Day, IMBA welcomed over 700 school-aged learners to a hybrid program exploring stem cell research. Participants attended a lecture by Theresa Sommer and Viktoria Holzmann, conducted hands-on lab experiments at the Vienna Open Lab, and participated in a Bioethics Commission reenactment led by Nina Malajner and colleagues from Open Science.

On UniStem Day, participants had the opportunity to join lab tours at the Stem Cell Facility, as well as the Mendjan, Knoblich, Rivron, and Urbán labs.

### Inspiring girls to explore STEM fields

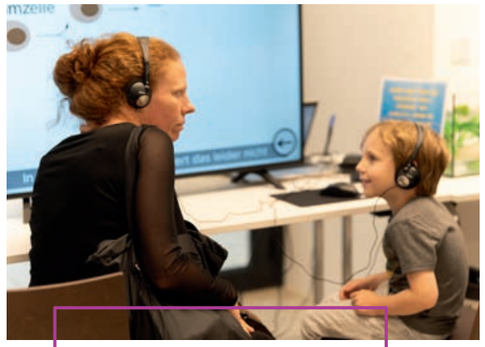
On Daughters' Day at the Vienna BioCenter, teenage girls participated in activities that gave them insights into diverse STEM career paths.

On Daughters' Day, girls visited scientific facilities on campus and engaged with the Urbán Lab, learning about neuronal stem cells.



### Science for everyone at the Long Night of Research

IMBA scientists showcased their research during the Long Night of Research at the Austrian Academy of Sciences, attracting over 3,000 visitors.



An interactive video on the axolotl's regenerative abilities, created by Elad Bassat, was shown at Long Night of Research and shared at KinderUni online.

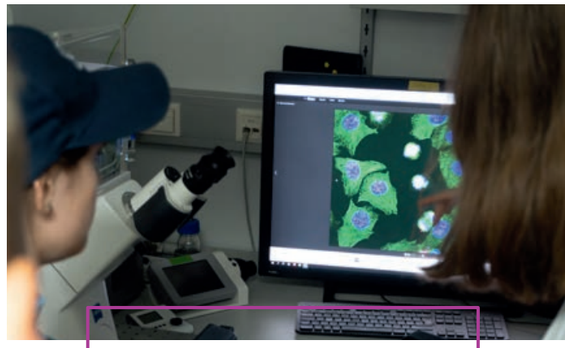
The Rivron Group presented 3D models of embryonic development and discussed the role of blastoids in investigating human fertility.


The Tanaka Group showcased axolotl models used to study tissue and limb regeneration.

### Other outreach engagements in 2024

IMBA researchers presented their work at various events to engage with the wider public.

Laura Kracht shared insights into her research on microglia in autism at the Pint of Science Festival, while Max Kellner introduced bat viruses at the NHM's Deck 50. Christian Krauditsch provided career advice at Kilt Day, and Ralf Jansen engaged students from Junge Uni Waldviertel-Vysočina by presenting his research into transposons. Helena Okulski visited an elementary school, introducing the axolotl and her research on regeneration, and produced a podcast for the ÖAW series Makro Mikro.



The Gerlich Group hosted science fair winners from Austria and the Czech Republic, giving them a hands-on lab tour and introducing the young researchers to the lab's work on chromosome biology.

COMMUNITY & CULTURE

# Building connections on a *thriving campus*

**The Vienna BioCenter brings together individuals from diverse cultural backgrounds and nationalities and fosters community connections through a variety of initiatives, networking events, and activities.**

By translating complex scientific concepts into accessible formats, IMBA ensures its discoveries resonate beyond academic circles. Through public lectures, workshops, lab visits, and interactive science stations, researchers engage with diverse audiences, fostering curiosity and understanding of the scientific process across all ages and backgrounds.

### IMBA Family Day

In 2024, IMBA hosted its first-ever Family Day. All IMBA staff were invited to introduce their families to the institute. The youngest visitors enjoyed crafting stations, a bouncy castle and an axolotl lecture, while adults followed laboratory tours and a lecture.

### Vienna BioCenter parents

The Vienna BioCenter provides a knowledge-sharing platform for family life events and supports those on the journey of parenthood.

### Climate initiative

The Vienna BioCenter is committed to reducing the environmental footprint of its research institutes by adopting new sustainable research procedures that reduce energy consumption and waste generation. In 2024, the climate initiative organized two Max Perutz Climate Lectures and promoted various activities, including a campus clean-up day.

### Charity activities

Members of the Vienna BioCenter organize and engage in charity activities addressing various societal adversities. In 2024, significant contributions provided humanitarian aid for Ukrainian refugees in Vienna and supported children in palliative care.

### Equity, Diversity & Inclusion

The Equity, Diversity & Inclusion volunteer group is committed to promoting inclusive and socially conscious work environments and cultures. Initiatives in 2024 included seminars on impostor syndrome and challenges faced by female scientists in academia. The team also organized the "Women Groundbreakers" art exhibition and a Social Hour highlighting cultural diversity at the Vienna BioCenter.

### Industry Insights

The student-led Vienna BioCenter Industry Insights (VBCII) initiative builds bridges between Vienna BioCenter scientists and the life sciences industry. This year, VBCII collaborated with BioNTech and Merck to host three events. Over 100 participants explored career opportunities and visited Boehringer Ingelheim Vienna.

### Sports initiatives

The Vienna BioCenter offers sports to suit all interests and activity levels, with activities such as running, hiking, CrossFit and basketball.

### Social hours

Each Friday evening, a research group at the GMI, IMBA or the IMP organizes a social hour with a theme inspired by the lab's personality and interests.

### Amateur Dramatic Club

Since 2008, the Amateur Dramatic Club presents three to four theatrical productions each year, including the Christmas Play: a pantomime that creatively parodies well-known movies or books and cleverly integrating familiar faces and locations from the Vienna BioCenter.

### Musicians @ VBC

A strong network makes it possible for musicians, vocalists, and music enthusiasts to work together to create, perform, and enjoy music of various genres.

The IMBA Family Day offered fun activities for all employees and their families.

The Vienna BioCenter volleyball team is one of the many sports groups on campus.

This year's Christmas Play "The Lord of the Plasmids" was a resounding success, with two sold-out shows.

A new campus band, "Negative Feedback" debuted this year.

ADMINISTRATION AND INFRASTRUCTURE

# Supporting excellent *science*

## Administrative and infrastructure staff at IMBA, shared with the GMI and IMP, facilitate efficient operations, resource sharing, and collaboration.

Administrative and infrastructure staff at IMBA support daily operations. To increase synergies, administrative staff is shared by IMBA and the GMI, the two life science research institutes of the Austrian Academy of Sciences located at the Vienna BioCenter. The infrastructure team enhances resource sharing across IMBA, the GMI and IMP. This collaborative approach ensures an efficient use of resources and fosters a cooperative environment.

### Administration

The **Scientific Office** organizes seminars, conferences, the annual recess and SAB meetings, and prepares scientific reports.

The **Scientific Affairs** department is accountable for scouting and preparation of strategic opportunities, the development of support programs, mediation and counseling.

The finance departments **Accounting and Controlling** are responsible for accounting, financial controlling, and financial reporting.

The **Grant Management** team assists in preparing proposals, managing active grants and is responsible for project financial reporting and project audits.

The **Human Resources** team supports staff in relation to employment and living in Austria, including helping with visa and work permit issues.

The **Technology Transfer Office** manages the intellectual property assets and the transfer of knowledge, materials and technology to partners, including spin-off companies.

The **Communications and Partnerships** team makes research at IMBA accessible for diverse audiences and stakeholders.

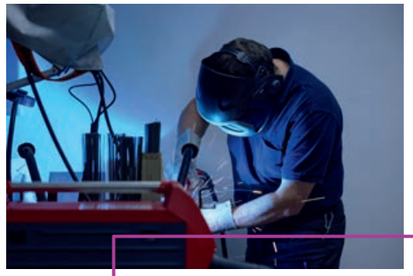
The **Graphics Department** provides figures, illustrations, presentations, animations and layouts for scientists. The Department is shared by IMBA and IMP.

The **Ethics & Biosafety** team backs legal and compliance procedures.

The **Project Management Office** coordinates the smooth implementation of projects. The Office is shared by IMBA, IMP and the GMI.

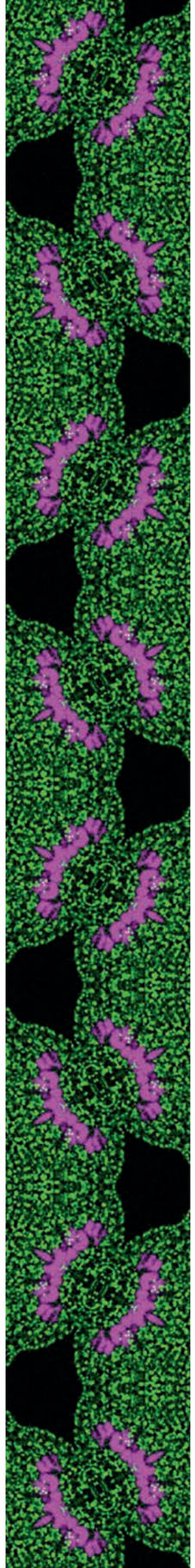
The **Cafeteria** offers healthy food to scientists and staff throughout the day, providing the basis for excellent work.

The **Comparative Medicine Facility** maintains cultures of model organisms for researchers who need to study biology in context. All research is carried out in accordance with the strict Austrian laboratory animal act. The **Transgenic Service Department** assists in-house investigators by offering services for the creation and preservation of genetically engineered laboratory animal strains. The Comparative Medicine Facility is shared by IMBA and IMP.



The Mechanical Engineering Center provides customized technical solutions – from idea development to design, manufacturing and assembly.

The Max Perutz Library is a specialized reference library that maintains and develops literature collections and information services in support of the present and future research and teaching needs of the institutes.



### Infrastructure

**Bioinformatics** offers a wide range of support to molecular biology research groups, including data analysis, software, training, and assistance with experimental design for high-throughput biological datasets.

The **Environment, Health and Safety** team implements occupational health and safety measures. The EHS team provides support in fulfilling legal requirements in accordance with the Employee Protection Act. EHS takes targeted measures in the work and disposal channels to protect the environment and employees. The health of employees is supported by occupational health programs.

**Facility Management** is responsible for building management, technical equipment, waste disposal and operational support.

The **IT Department** operates and supports services including high-performance computing (CLIP), as well as hard- and software and data storage.

**Lab Support** is dedicated to helping in the daily operations of scientists by providing support to facilitate the daily lab work and experiments. Its services range from maintenance, repairs, and proactive equipment upkeep to efficient on- and offboarding processes, along with strategic resource allocation.

**Purchasing** is responsible for all purchasing activities for goods and services including maintaining the purchase order system and operation of the warehouse.

The **Max Perutz Library** supports researchers with access to literature, advice about open-access publishing, and the implementation of electronic laboratory notebooks.

The **Mechanical Engineering Center** assists scientists in any hardware challenge: designing and building prototypes, robotics or any custom-made experimental setup that requires expert skills and professional tools to translate ideas into custom-made products in the service of discovery.

The **Sterile Processing Department** provides researchers directly and indirectly via the Media Lab with sterile glassware and sterilized lab-plastic ware. They also collect dirty glassware from the defined areas, which are cleaned before sterilization.

The Administration and Infrastructure team, led by Dr. Barbara Kraus and Dr. Markus Kiess.

SCIENTIFIC ADVISORY BOARD

# Striving for *excellence*

## The scientific advisory board supports IMBA in conducting research at the highest level.

To maintain the highest standards of research, IMBA has installed a process of review and feedback: The Scientific Advisory Board (SAB), consisting of internationally recognized scientists, meets yearly at IMBA, and, together with IMBA researchers, evaluates the quality, significance, and focus of research conducted at IMBA.

In 2024, IMBA was delighted to congratulate Gary Ruvkun, Member of IMBA's scientific advisory board since 2008, on receiving the 2024 Nobel Prize in Physiology or Medicine.

### Elaine Fuchs, Chair

The Rockefeller University

### Gregory Hannan

Cancer Research UK Cambridge Institute, University of Cambridge

### Eric Kandel

Columbia University in the City of New York

### Guido Kroemer

Paris Descartes University; INSERM; Institut Gustave Roussy

### Maria Leptin

European Research Council; University of Cologne

### Gary Ruvkun

Massachusetts General Hospital; Harvard Medical School



THE AUSTRIAN ACADEMY OF SCIENCES

# Strong *support*

## The Austrian Academy of Sciences, the leading non-university institution for research in Austria, funds and supports IMBA.

IMBA is the largest research institute of the Austrian Academy of Sciences (ÖAW). The ÖAW is the leading Austrian non-university institution for science and research. Founded in 1847 as a learned society in Vienna, the ÖAW today stands for fostering societal dialogue, disseminating new knowledge, and conducting foundational research at the highest international level.

With a mission to promote science in every way, the ÖAW fulfills two main functions in Austrian and international science. On the one hand, its 760 members form a scholarly society, advising decision-makers from politics, industry, and society and conveying scientific insights to the public. On the other hand, the Academy is Austria's major supporter of research outside the university system, funding 27 research institutes in both the humanities and the natural sciences – including IMBA.

The Austrian Academy of Sciences funds 27 research institutes across Austria, including IMBA.

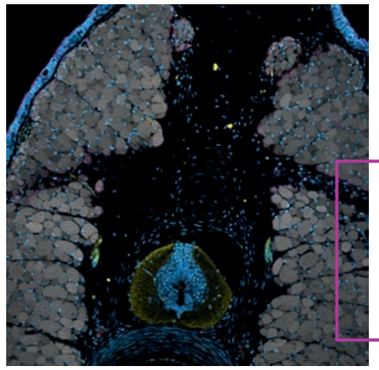


Image of an axolotl tail section showing muscle tissue (grey), neuromuscular junctions (pink), neurons (yellow) and nuclei (cyan).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# Notes: