IMCBio

The Integrative Molecular & Cellular Biology

GRADUATE SCHOOL

- A high-level training programme
- Focused on Molecular & Cellular Biology
- For Master & Doctoral students
- English as a working language
- An exciting scientific environment

Université de Strasbourg

IMC Bio

Join the GRADUATE SCHOOL

What is IMCBio?

An unprecendeted training programme focused on **Integrative Molecular & Cellular Biology**, gathering:

- 4 Research Clusters
- Cutting-edge technological ressources of 3 national infrastructures in Health Biology
- The insectarium I2MC, an equipment of excellence
- 5 host institutes (IGBMC, IBMC, IBMP, GMGM, INSERM U 1110)

RESEARCH

TECHNOLOGY

TRAINING

INNOVATION

For whom?

Undergraduate or graduate students with a **strong motivation for research** & insterested in the different areas of biological sciences

What for?

- A **high-level training programme** for Masters & PhD students
- Add-on **training modules** at Master level
- Additional internships in laboratories
- Summer schools for undergraduates & Master students

With the joint support of the University of Strasbourg (Faculty of Life Sciences & Doctoral School of Life and Health & the Interdisciplinary Thematic Institute « ITI IMCBio+ »), the CNRS & the Inserm, this programme has a triple ambition to strongly link training to research, to enhance the research strengths of the Strasbourg site, and to contribute to its international visibility.

What is a research Cluster (former : LabEx)?

Allowing the recruitment or retention in France of scientists of a very high level or high potential, the significant funding granted to these Research Clusters allows to increase scientific excellence and originality, the transfer of the knowledge produced and, by the same token, the international attractiveness of French research.

Research Cluster INRT

The Research Cluster (further: RC) integrative biology: Nuclear dynamics, Regenerative and Translational medicine (INRT). The INRT is driven by the Institute of Genetic and molecular biology that gathers 46 teams and national & european infrastructures hosted at the CBI and ICS.
This programme explores mechanisms of the regulation of gene expression in development, physiology, and disease by building upon the strengths of the IGBMC departments (Integrated Structural Biology, Functional Genomics & Cancer, Translational Medicine & Neurogenetics, Developmental Biology & Stem Cells) and on its emerging scientific research areas by developing a cutting edge technology and support framework to tackle major questions of fundamental and clinical relevance.

Research Cluster MitoCross

The RC MitoCross is constitued by seven teams from three Strasbourg Institutes: the Molecular Genetics, Genomics, Microbiology (GMGM), the Institute of Plant Molecular Biology (IBMP) and the Architecture and reactivity of the RNA, working on various aspects of mitochondrial research. They are also implicated in aging, incurable neuromuscular diseases & common pathologies such as Alzheimer's disease or some cases of cancer and diabetes. The MitoCross aim is to deepen the knowledge of the molecular mechanisms governing mitochondrial biogenesis, genetics and cross-talk with the nucleus and to exploit this knowledge to understand biochemical mechanisms of mitochondrial dysfunctions, to envision agronomic applications and innovative therapies.

Research Cluster NetRNA

The RC NetRNA gathers 14 teams from 3 CNRS units located at the Institute of Molecular and Cellular Biology (IBMC) and the Institute of Plant Molecular Biology. (IBMP). The teams investigated the manifold functions of the non-coding genome across kingdoms, leading to a unique "integrated RNA research institute" in France to study regulatory RNAs and their machineries in infectious diseases offering advanced interdisciplinary and innovative training. The project of NetRNA has evolved to generate an integrated view of the RNA-based strategies developed by pathogens (viruses, bacteria, parasites) and their hosts (plants, insects, mammals) during infection and on the insect strategies to resist viral infection. The consortium is based on shared conceptualization and broad collective expertise and on the use of sophisticated instrumentation.

Research Cluster HepSYS

The RC HepSYS consists of a team of highly qualified molecular biologists, cellular scientists, bioinformaticians, hepatologists and liver surgeons from the institute of Viral and Liver Disease (Unistra, Inserm Unit U1110)), and the University Hospital of Strasbourg (HUS). A key strength of the LabEx is the full integration of basic, translational and clinical research, along with strong collaborations and networks of excellence with experts from the field at the national and international level. Since its creation in 2011, HepSYS has made major contributions to the field supported by a long- standing track record in the understanding of viral and metabolic pathogenesis of liver disease and their translation into clinical applications including the development of novel preventive and therapeutic strategies.

Research Cluster INRT

labex-inrt.igbmc.fr
Contact: directeur@igbmc.fr

INRT consortium

«The integrative biology: Nuclear dynamics, Regenerative and Translational medicine (INRT) LabEx is based on the four departments of the IGBMC»
Frédéric Dardel, Director of the IGBMC and coordinator of the INRT

IGBMC DEPARTMENT OF Translational Medecine & Neurogenetics Biology

«***Modelling human diseases*** to explain the main mechanisms implicated in the functionning of the nerve system and understand the molecular mechanisms responsible for the genetic diseases that affect the nerve system and the muscles»
Nicolas Charlet-Berguerand, Director of the Department

RNA diseases

Headed by Nicolas Charlet-Berguerand
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Study human genetic diseases due to expansions of tri-, tetra- or penta-nucleotide repetitions that are located in the so-called «non-coding» regions of the genome, mainly : myotonic dystrophy, tremor and ataxia syndrome associated with fragile X and amyotrophic lateral sclerosis.

Physiopathology of aneuploidy, gene dosage effect & Down syndrome

Headed by Yann Hérault
yann.herault@igbmc.fr

Better understand the physiopathology of aneuploidies and other genetic diseases with Intellectual Disabilities, using mouse and rat models. Explore behaviour and cognition in models of other intellectual disabilities of genetic origin.

Study of copy number variants in autism spectrum disorders & their commorbidities

Headed by Christelle Golzio
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Understand how genetic variation can impact the development and homeostasis of the nervous system thanks to developed animal and IPSC-derived models to study the impact of gene dosage defects on basis neurodevelopmental processes to: Discover genes and alleles that contribute to disease; Capture and validate genetic interactions and Identify genes implicated in autism spectrum disorders-associated comorbidities.

Muscle and diseases

Headed by Jocelyn Laporte
jocelyn.laporte@igbmc.fr

Identify the genetic basis, better understand and validate therapeutic proof-of-concepts for rare neuromuscular disease, especially for congenital myopathies.

Regulation of cortical development in health & disease

Headed by Juliette Godin
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Our labs aims to elucidate the fundamental mechanisms that dictate cell fate acquisition and neuronal maturation during mammalian corticogenesis. Our main interests are : (i) Understand the origin of neuronal diversity in the mouse developing cortex; (ii) Study post-transcriptional mechanisms that regulate gene expression during cerebral cortex neurogenesis; (iii) Interpret the pathological mechanisms of associated neurodevelopmental disorders; and (iv) Understand the sensitivity of the brain to tRNAs defects.

Research Cluster INRT

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IGBMC DEPARTMENT OF Functional Genomics & Cancer

«Deciphering the fundamental mechanisms governing genome expression and preservation in normal and pathological contexts »
Frédéric Coin, Director of the department

Structural & functionnal basis of chromatin remodelling

Headed by Elisa Bergamin
elisa.bergamin@igbmc.fr

Understand the mSWI/SNF complex at the molecular and atomic level through the combination of electron cryomicroscopy, X-ray crystallography molecular biology and biochemistry.

Genome expression & repair

Headed by Frédéric Coin
frederic.coin@igbmc.fr

Study the mechanisms of aging and cancer in various cellular systems and animal models that are deficient in DNA repair and transcription, by using biochemistry, genetics and cell biology.

Regulation of gene expression in cancer

Headed by Irwin Davidson
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Study how transcription factors and their co-factors such as chromatin remodeling complexes regulate gene expression during development, in physiological processes, oncogenic transformation and tumor progression, through high throughput genomics and at the single cell level.

Immune & neural development

Headed by Angela Giangrande
angela.giangrande@igbmc.fr

Understand how cell diversity is generated and how cells interact to build the highly complex architecture of pluricellular organisms. Study the molecular and the epigenetic events controlling cell differenciation and reprogramming.

Chromatin & epigenetic regulation

Headed by Ali Hamiche
ali.hamiche@igbmc.fr

Investigate the role of histone variants and their deposition mechanism in epigenetic control of human genome activity, including the role of histone variants in gene regulation and genome integrity.

Hematopoiesis &leukemogenesis in the mouse

Headed by Susan Chan & Philippe Kastner
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philippe.kastner@igbmc.fr

Investigate how transcription factors control the development of hematopoietic stem cells into pluripotent progenitor cells and then into mature blood cells, a process called hematopoiesis. Understand how altering the function of transcription factors contributes to malignant cell formation.

Pathogenesis of inflammatory diseases

Headed by Mei Li
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Decode the complex molecular and cellular networks driven by epithelium-derived cytokines such as thymic stromal lymphopoietin (TSLP) during inflammatory responses, determine the function of these networks in the pathogenesis of inflammatory diseases, notably atopic diseases and cancer, and translate the acquired knowledge into new biomarkers and therapeutic strategies.

Pathophysiology of vitamin A signaling pathways

Headed by Norbert Ghyselinck
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Combine innovative genetic, pharmacological and molecular approaches in mouse to study the cellular and molecular mechanisms underlying the ability of retinoic acid, the active metabolite of vitamin A to promote the differenciation *in vivo*, using cells as a model system.

Molecular & Translational Oncology

Headed by Gabriel Malouf
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Unravel the molecular underpinnings of kidney and rare cancers through comprehensive multi-omics analysis, encompassing single-cell and spatial transcriptomics, functional genomics, and murine modeling. The aim is to uncover novel therapeutic targets and treatment strategies.

Pathophysiological function of nuclear receptor signaling

Headed by Daniel Metzger
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Study, under physiological and pathophysiological conditions, the functions and interdependence of signaling pathways that are regulated by various nuclear receptors in different organs.

Eukaryotic mRNA decay

Headed by Bertrand Séraphin
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Understand how mRNA decay contribute to regulated g ene expression and how these mechanisms are affected in some pathologies including cancer, specific genetic diseases as well as during viral infections. Elucidate the mechanisms coordinating mRNA decay with transcription and translation.

Spatial organization of the genome

Headed by Thomas Sexton
thomas.sexton@igbmc.fr

Determine if and how chromosome folding can influence transcription. To show how gene programs can be co-ordinately regulated or lead to diseases such as cancer, and also provide tools for gene therapy.

Molecular & cellular biology of breast cancer

Headed by Catherine-Laure Tomasetto
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Understand at the molecular level the role of the mesenchymal factor, MMP11, in the progression of breast cancers. Characterize the function of genes amplified in breast cancer cells.

Research Cluster INRT

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IGBMC DEPARTMENT OF Integrated Structural Biology

« ***Mechanisms of gene expression, drug structure :*** understanding the fundamental mechanisms regulating the expression of genetic information in messenger RNA and protein »

Marc Ruff, Director of the Department

Structural biology of epigenetic targets

Headed by Jean Cavarelli
jean.cavarelli@igbmc.fr

Understand the structure/function relationships of selected epigenetic targets at the atomic level. To decipher at the molecular level the mechanisms governing selected epigenetic processes by biophysical and structural means. Structure-driven developments of chemical tools to modulate the activity of our molecular targets.

Chemical biophysics of transcriptional signaling

Headed by Annick Dejaegere
annick.dejaegere@igbmc.fr

Combine biophysical experiments (x-ray crystallography, cryo-EM, SAXS, mass spectrometry, ITC) and numerical simulations (molecular dynamics simulations) to understand how chemical signals (ligands, post-translational modifications) affect the structure and dynamics of protein and protein-DNA complexes and how these changes are implicated in their regulation.

Biomolecular condensation in nuclear organization & function

Headed by Mikhail Eltsov
mikhail.eltsov@igbmc.fr

How are 2m of DNA packed into each cell nucleus into our body? We combine cryogenic optical microscopy and electron tomography to understand chromatin condensation and its role in regulating gene expression and maintaining genome stability.

Nuclear magnetic resonance, molecular complexity & dynamics

Headed by Bruno Kieffer
bruno.kieffer@igbmc.fr

Characterize and study the relevant molecular properties which achieve a given biological function by combining multi-scale experimental and modeling approaches (from the atom to the cell). Develop numerical methods adapted to massive data analysis. Apply these approaches to developing new therapeutic strategies for prostate cancer

mRNA processing

Headed by Clément Charenton
charentc@igbmc.fr

Study complex molecular machines that modify messenger RNAs to create valid templates for protein synthesis. Use biochemistry to capture these elusive multisubunit enzymes from their native environment and cryo-EM to obtain structural "snapshots" of their precise mechanisms of action.

Large complexes involved in gene expression

Headed by Bruno Klaholz
bruno.klaholz@igbmc.fr

Analyze the molecular mechanism of action of the bacterial and human ribosome, nucleoprotein complexes and viruses in different structural and functionnal states or with inhibitors, through integrated structural biology including biochemistry, X-ray crystallography, high-resolution cryo-EM and electron tomography.

Molecular basis of chromatin & transcription regulation

Headed by Christophe Romier
christophe.romier@igbmc.fr

Determine, at the molecular and structural level, epigenetic mechanisms, to discover how they regulate the organization of chromatin and nuclear mechanisms, and to understand their involvement in many diseases.

Chromatin stability & DNA mobility

Headed by Valérie Lamour & Marc Ruff
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marc.ruff@igbmc.fr

Decipher the molecular mechanisms governing the transport, processing and topological changes of nucleic acids. Our present targets are nucleoprotein complexes involved in retroviral DNA integration and eukaryotic DNA topoisomerases. We integrate structural data from high resolution (X-ray cristallography, NMR), medium resolution (CryoEM) with in vitro and in cellulo functionnal data.

Structural biology of molecular machines

Headed by Helgo Schmidt
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Combine cryoelectron microscopy and x-ray crystallography to elucidate how the microtubule motor dynein and the structurally related ribosome maturation Rea1 produce force to power movement along microtubules and facilitate ribosome maturation.

Architecture of nucleoprotein systems by 3D electron microscopy

Headed by Patrick Schultz
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Decipher the three-dimensional organization and understand the functioning of molecular nanomachines involved in gene expression regulation and chromatin structure using electron cryomicroscopy to visualize isolated molecules in their native state.

Viral oncoproteins & domain-motif networks

Headed by Gilles Travé
gilles.trave@igbmc.fr

Study viral oncoproteins (cancer-causing proteins) to describe the subversion of cellular functions by oncogenic viruses by generating quantitative and exhaustive information at two levels of analysis : atomic and interactomic.

Regulation of transcription

Headed by Albert Weixlbaumer
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We use biochemistry and structural biology to study transcription by RNA polymerase (RNAP). We aim to understand how RNAP is regulated and organized in supramolecular assemblies with other enzymes. These higher order complexes give rise to new functions difficult to deduce from studies of the individual components.

Cellular architecture

Headed by Florian Faessler
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Delve into the native (ultra-)structure of the cytoskeleton, scaffolding proteins, and tethers employing cryo-focused-ion beam milling, cryo-electron tomography, and subtomogram averaging. Integrate those insights with the results from cell biology and biochemistry approaches to learn how cells establish and maintain their internal organization.

Molecular basis for protein synthesis by the ribosome

Headed by Gulnara Yusupova & Marat Yusupov
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Acquire new structural knowledge on the mechanism of ribosome rpotein synthesis and the mode of action of ribosome inhibitors. Study X-ray and cryo-EM structures and mechanism of protein biosynthesis in bacteria, yeasts and humans, a process carried out by a large ribonucleoprotein complex : the ribosome.

IGBMC DEPARTMENT OF Developmental & Stem Cell Biology

«From cellular plasticity to regenerative medicine: *we study the fate and reprogramming of embryonic and adult cells as well as the signals and mechanisms that allow an organ to take its shape and function»*

Manuel Mendoza, Director of the Department

Brain development & physiology

Headed by Wojciech Krezel
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Understanding the role of certain signals including those mediated by Vitamin A (retinoic acid) and its receivers during development and brain neurogenesis, and for the efficient functionning of neuron populations.

Differentiation & physiopathology of endocrine cells in the pancreas & intestine

Headed by Gérard Gradwohl
gerard.gradwohl@igbmc.fr

Study the mechanisms that control cellular destiny, maturation and the maintenance of pancreatic and intestinal endocrine cells identity in normal and pathological situations such as diabetes.

Cellular plasticity & direct reprogramming in *C. elegans*

Headed by Sophie Jarriault
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Cellular reprogramming : Combining Imaging, Genetics incl. CRISPR-Cas9, Molecular Biology and Transcriptomic tools to decipher the mechanisms that make specific cells naturally able to change their identity, at the single cell level; steps, positive & negative regulators, impact of extrinsic cues and the intrinsic context, environmental influence, importance of epigenetic processes for the invariance, or the cellular trajectory taken during the transition.

Syncytial cell biology

Headed by Minchul Kim
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Understanding how the unique cellular anatomy of syncytial cells affects their function in health and disease using the skeletal muscle as a paradigm. We currently explore the role and mechanism of diverse nuclear identities in muscle cells.

Common mechanisms of development, cancer & aging

Headed by Bill Keyes
bill.keyes@igbmc.fr

Investigating the cellular program of senescence, a process that can contribte to tissue development, regeneration and protection from cancer, but when misrelated causes aging and disease.

Nuclear organization & division

Headed by Manuel Mendoza
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Study cell division and differentiation, with a focus on how nuclear structures are reorganised in time and space during cell proliferation.

Stochastic systems of biology of gene regulation

Headed by Nacho Molina
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Measure protein-DNA interactions, post-transcriptional modifications of named histone proteins and the 3D structure of chromatin in the entire genome in populations and individual cells.

Molecular biology of B cells

Headed by Bernardo Reina San Martin
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Study molecular mechanisms driving antibody diversification, with a specific focus on the protein complexes involved in mediating AID targeting and in repairing AID-induced DNA damage *in vivo*.

Signal transduction in metabolism & inflammation

Headed by Roméo Ricci
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Discover and understand the signaling axes of inflammation involving protein kinases and likely to have an important role in the mechanism of inflammation.

Actin dynamics & biomechanics of the early embryo

Headed by Anne-Cécile Reymann
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Study of the actin cytoskeleton in C. elegans, notably its dynamics and mechanical properties. We are currently exploring the molecular to functional consequences of actin variants reproducing non-muscle actinopathies, a set of human rare diseases.

Cell physics

Headed by Daniel Riveline
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Understand cellular motility and division as well as the shape of cells in tissues, by studying the dynamics of the cytoskeleton and the associated Rho signalling pathways.

Cell cycle & ubiquitin signaling

Headed by Izabella Sumara
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Ubiquitin-mediated control of cell division in health an disease.

Dynamics of chromatin structure & transcription regulation

Headed by Làszlò Tora
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Identify and characterize transcription regulatory mechanisms, carried out by chromatin remodeling complexes, transcriptional coactivators, general transcription initiation factors and RNA polymerase II. Understand how deregulation of these highly controlled processes can lead to different pathologies.

Research Cluster MITOCROSS

mitocross.unistra.fr

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« Mitochondria are essential intracellular organelles responsible for respiration, ATP-generation, ionic homeostasis, regulation of reactive oxygen species or apoptosis. *Exploiting this knowledge and understand biochemical mechanisms of mitochondrial dysfunctions will allow us to envision agronomic applications and innovative therapies.»*
Ivan Tarassov, coordinator of MITOCROSS

Mitochondrial-nucleus cross-talk in health and disease

Headed by Ivan Tarassov & Alexandre Smirnov

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Focus on RNA-protein interactions in mitochondria, mitochondrial translation and on targeting macromolecules into this organelle. Understand these mechanisms and to exploite them to develop new therapy approaches of human mitochondrial diseases. Human, murine, yeast and trypanosomatid cells are exploited as models and structural, imaging, genetic, biochemical and functionnal approachs are used.

Metabolism and Traffic of RNA in Plant Cell

Headed by Laurence Drouard & Anne-Marie Duchêne-Louarn

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Understand better the molecular mechanisms linked to translation and involving mRNA trafficking and metabolism. First, study the mitochondrial translation machinery and the mitochondrial gene expression in the green alga Chlamydomonas reinhardtii. Second, elucidate the molecular mechanisms allowing cytosolic mRNA targeting and localized translation at the surface of plant and mammals mitochondria.

Dynamics & Plasticty of Synthetases

Headed by Hubert Becker

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Explore the nontranslational roles of aminoacyl-tRNA synthetases and other essential tRNA-binding proteins. In yeast, study organellar and membrane-bound pools of these proteins that participate in metabolic sensing and respiration. In pathogenic filamentous fungi, their cell-wall remodeling activity is studied to identify anti-microbial resistance strategies. In human, mutants responsible for severe diseases by loss- or gain-of-function are studied in yeast models and from patients' samples.

Maintenance and segregation of the mitochondrial genome

Headed by Jose-Manuel Gualberto

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Study the recombination pathways and factors that modulate the structural plasticity and transmission of the plant mitochondrial genome, to better understand mitochondrial genome replication and segregation; to investigate the effects of genetic instability induced by recombination mutants on mitochondrial gene expression and plant development; to develop tools to promote mitochondrial genetic variability and segregation of valuable traits in crop plants.

Metabolic compartmentalization & Membrane-less organelles

Headed by Ludovic Enkler

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Understand the physical and functional interplays between peroxisomes and mitochondria, and what makes these organelles key elements in the regulation of fatty acid metabolism and energy synthesis. This encompasses the study of two emerging fields: Identity and functions of peroxisome-mitochondria contact sites, and their regulation by membrane-less organelles. This will help to better understand the molecular dysfunctions of peroxisomes and mitochondria in metabolic and neurological disorders.

Functions of PPR proteins

Headed by Philippe Giege

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Study gene expression mechanisms in plant mitochondria, more specifically on PPR proteins, a major class of RNA binding proteins. The team identified PPR proteins carrying the 5 'rRNA RNase P activity as well as ribosome-associated PPR proteins for mitochondrial translation. The results obtained open up a wide range of applications from plant breeding to human health.

Intraspecific Variation and Genome Evolution

Headed by Joseph Schacherer

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Elucidate the genetic basis of the awesome phenotypic diversity observed in natural populations, a remaining major challenge in biology. In this context, we marry classical but high-throughput genetic methods with new approaches based on population genomics to connect the phenotypic and allelic landscape by taking advantage of the powerful budding yeast model system.

Research Cluster NetRNA

labex-netrna.cnrs.fr/

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NetRNA consortium

«Networks of Regulatory RNAs across kingdoms and dynamical responses to biotic and abiotic stresses»

Pascale Romby, Coordinator of NetRNA

Genome biology of viruses

Headed by Redmond Smyth

UPR 9002-ARN, IBMC / HIRI, Würzburg

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We are interested in the role of RNA structure in regulating viral infection and immunity. Our work is investigated RNA viruses, such as HIV-1, SARS-CoV-2 and influenza, and we also develop and apply innovative technologies based on nanopore sequencing and spatial transcriptomics. Our major questions are (i) to investigate the role of RNA structural heterogeneity in viral genomes at single molecule level, (ii) to study the role of RNA modifications on viral life cycles, and (iii) to visualise RNA molecules during viral assembly in cells to understand its impact on viral evolution

RNA regulation in viral infections

Headed by Sébastien Pfeffer

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Explore the importance and regulation of RNA silencing mediated by microRNAs and other small RNAs during viral infection in cultured cells, mice and patient samples with a specific focus on how microRNAs themselves are regulated and the interplay with other innate immunity signaling pathways.

Biology and biotechnology of grapevine virus

Headed by Christophe Ritzenthaler

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Dissect the biology of host-virus interactions to identify factors that contribute to resistance or susceptibility of the model plant Arabidopsis and grapevine to RNA-virus infection, characterize the underlying mechanisms at the molecular and ultrastructural levels, integrate the generated knowledge for biotechnological purposes with respect to virus-resistant plants and virus detection.

Digital biology of RNA

Headed by Michael Ryckelynck

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Set-up and use ultrahigh-throughput analytical pipelines exploiting droplet-based microfluidics in tandem with next generation sequencing to: i) develop new RNA-based fluorescence imaging tools, ii) finely characterize RNA-based regulatory mechanisms and iii) perform single-cell resolution gene expression monitoring (especially non-coding RNAs).

Insect antiviral immunity: signaling and effectors

Headed by Jean-Luc Imler & Carine Meignin

UPR 9022-M3I, IBMC

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Explore the transcriptional response of insects to viral infections to decipher: (i) how viral nucleic acids are sensed by the innate immune system; (ii) the role of noncanonical RNA signals such as cyclic dinucleotides in STING dependent responses; (iii) the mode of action of novel antiviral restriction factors.

Control of arthropod-borne viruses by mosquito antiviral pathways

Headed by Joao T. Marques

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Dissect the biology of virus-host interactions in Aedes aegypti mosquitoes to: (i) characterize mechanisms such as RNA interference that contribute to resistance or susceptibility to arbovirus infection in mosquitoes, (ii) identify the natural virome of Aedes mosquitoes and determine its impact on vector competence, and (iii) manipulate antiviral mechanisms to generate mosquitoes that are resistant to arboviruses.

Genetic immune response

Project leader: Nicolas Matt

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Headed by Dominique Ferrandon

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Focusing on the roles of non-coding RNAs and transcriptional regulatory proteins, we explore the innate immune response in Drosophila that underlies a complex regulatory network including epigenetic mechanisms involved in the control of NF-kB-induced transcriptional selectivity.

Plant-virus interactions during viral cell-to-cell movement

Headed by Manfred Heinlein

UPR 2357, IBMP

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Investigate how plant viruses and dsRNA activate host antiviral immunity and how viral proteins interfere with immunity signaling to enhance the intercellular spread of infection.

Plant Epigenetics

Headed by Pauline Jullien

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Investigate the function of DNA methylation and small RNA molecular pathways during plant sexual reproduction and pathogen defense. Explore how small RNA molecules could act as a link between environmental stresses and transgenerational epigenetic changes.

RNA regulation in pathogenic bacteria

Headed by Pascale Romby

UPR 9002-ARN, IBMC

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Investigate the role of RNAs in gene regulation in major bacteria pathogens, elucidate their involvement in establishing pathogenicity, analyze the decoding rules of the pathogen during infection, generate regulatory networks and study their dynamic properties.

Mechanisms of small RNA biogenesis and action

Headed by Todd Blevins

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Investigate how multisubunit RNA polymerases distinguish genetic parasites (e.g., retrotransposons and endogenous retroviruses) from essential host genes in plant chromosomes, allowing the synthesis of small-interfering RNAs and the targeted silencing of repetitive DNA by repressive chromatin modifications and DNA methylation.

Role of ubiquitin in cellular regulation

Headed by Pascal Genschik

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Explore the role of post-translational modifications and protein turnover in plant antiviral immunity. Elucidate how biotic and abiotic stresses impact the stability and activity of key components of the RNA silencing machinery.

RNA degradation in plants

Headed by Dominique Gagliardi & Hélène Zuber

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Investigate the impact of uridylation in controlling the degradation of mRNAs, non-coding RNAs and viral RNAs. Explore the biological roles of novel RNA decay factors assisting the RNA exosome, the decapping machinery and novel components of processing bodies.

RNA packaging and viral assembly

Headed by Roland Marquet & Jean-Christophe Paillart

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Identify the packaging signals present in the genomic RNA of coronaviruses and explore the impact of the binding of the viral proteins to these signals on RNA packaging, liquid-liquid phase separation, and inhibition of the host innate immunity.

Research Cluster HepSYS

www.liverstrasbourg.org
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« Unravelling the cell circuits of liver disease and cancer: an innovative integrative research program to uncover novel therapeutic strategies for prevention and treatment of liver disease and associated cancer. By integrating basic, translational and clinical research, our program aims at translating our findings and compounds into clinical applications.»

Thomas Baumert, coordinator of HepSYS

Unravelling the cell circuits of liver disease and cancer to discover novel therapeutic targets

Headed by Thomas Baumert

Contact: thomas.baumert@unistra.fr

Chronic liver disease and cancer are key challenges of public health with unsatisfactory treatment options. Using a recently established single cell RNASeq pipeline, combined with advanced proteomics, patient - derived cell culture and animal models, we aim to understand the cell circuits of virus - induced and metabolic liver cancer. The understanding of disease biology on a molecular level, enables us to uncover novel targets and componounds for treatment. A unique hallmark of our program is the integration of laboratory studies with patient data using advanced computational analyses.

Key aims of HepSYS:

- Unravel the cell circuits driving liver disease progression
- Develop innovative patient-derived models for liver disease
- Characterize SARS-CoV / HBV / HCV / HDV virus host interactions
- Translate discoveries into novel therapeutic strategies.

An exciting scientific environment

3 national infrastructures in biology and health and 1 equipment of excellence

The CELPHEDIA PHENOMINICS (Clinical Mouse Institute) infrastructure provides a complete range of specific services to the scientific community for using mouse models to progress in the functionnal diagnosis of the human genome and to better understand human diseases, their physiological and pathological bases.

www.phenomin.fr
www.celphedia.eu

phenomin Celphedia

The national and European infrastructures FRISBI and Instruct-ERIC, which provide cutting-edge tools in integrated structural biology, from the molecular to the cellular level, allowing multi-scale integration between X-ray, NMR, cryo-EM & tomography structures and functional data. It includes technological developments such as protein expression systems, scientific computing, correlative microscopy and super-resolution imaging.

frisbi.eu
instruct-eric.com

FRANCE GENOMIQUE is an infrastructure that shares the resources of the main French platform in genomic data production and analysis which are strategic technologies in all areas of research. It offers the community cutting edge expertise in genomics and associated bioinformatics.

www.france-genomique.org

FRANCE GENOMIQUE

The insectarium for Molecular Cellular infectiology (I2MC) is an equipment of high excellence that includes a biosecurity insectarium to study the interactions between pathogen such as the Plasmodium falciparum parasite (malaria agent), the Dengue virus and the mosquitoes transmitting them to humans.

the insectarium I2mc

REGISTRATION PROCESS

At Master level:

- *1st stage*: Online registration in the Master course of your choice in the Faculty of Life Sciences, *via* Mon Master:
  https://www.monmaster.gouv.fr/

- *2nd stage:* Check your wish to include the IMCBio Graduate School in your wish list when applying online

- *3rd stage*: End of June, selection of candidates for admission to the Master's degree by Faculty of Life Sciences

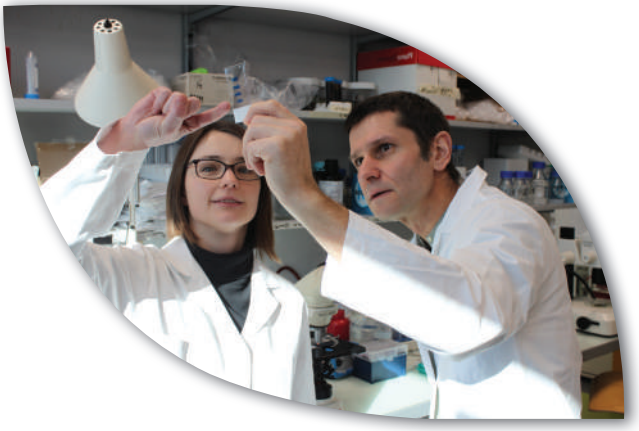
- *4th stage*: Selection of candidates for cycle 2024-25 beginning September 2024 at the Master Day IMCBio - for more info:

https://imcbio.unistra.fr/imcbio-training-programs/#master

At Doctoral level:

Check out our current PhD Call here:

https://imcbio-phdprogram.unistra.fr



Apply now!

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Nicolas Matt, *Prof Unistra, IBMC*
Contact: Gwenaëlle Graulier, *Unistra, IMCBio Coordinator*