



**Karolinska
Institutet**

KI Research Incubator



KIRI-Fellows 2022

Björn Reinius

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Current position: Principal researcher

Web: www.reiniuslab.com



Research area

Björn Reinius is a Principal Researcher at the Department of Medical Biochemistry and Biophysics at Karolinska Institutet. He is a Wallenberg Academy Fellow and a Ragnar Söderberg Fellow in Medicine.

The aim of the Reinius lab is to uncover fundamental features of gene regulation, especially regarding the control of active and inactive chromatin, such as that of X-chromosome hyperactivation and inactivation. Main topics of the lab are X-chromosome biology and dosage compensation, and Reinius pioneered the use of allele-specific single-cell RNA-seq and single-cell multiomics techniques in these fields. High-throughput sequencing is key to the work. The lab develops and improves methods for RNA- and DNA-sequencing library preparation, tailoring the methods to maximize information yield in the context of specific assays and to lower experimental costs. A clinically impactful methods translation from the Reinius lab was an RNA-extraction-free Covid-19 sample handling procedure and RT-PCR assay, published early in the first wave of the pandemic, which became instrumental for scaling up clinical testing in Sweden and internationally. This testing procedure became broadly used in diagnostics of Covid-19 and utilized in Swedish Healthcare Regions as well as in Private labs, by demand of the Public Health Agency of Sweden (millions of tests performed).

Carl Sellgren Majkowitz

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Current positions: Assistant professor, senior consultant in psychiatry.

Web: <https://ki.se/en/fyfa/experimental-psychiatry-and-neurology>



Research area

Our laboratory uses brain organoids to model the human neurodevelopment. We are especially interested in how microglia shape the developing neuronal circuits in health and disease. Through a close collaboration with the clinic, we collect somatic cells from patients with various neurodevelopmental disorders and model genetic disease risk in organoids corresponding to different developmental stages. On the level of the individual, we then translate our findings back to the patients by analyses of cerebrospinal fluid and different types of brain imaging.

Carmen Gerlach

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Current position: Assistant Professor

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Research area

T cell immunology.

CD8 T cells play a crucial role in providing protection against many infections and cancers. In recent years it has become clear that T cells are an extremely diverse group of immune cells, and that different T cell subsets have different properties. T cell subsets differ with respect to their expression of cell surface receptors, their production of inflammatory and cytotoxic mediators, their anatomic localization, and their migratory behavior. As a consequence, not all CD8 T cell subsets play an equal role in the control of infections and tumors, or the pathology associated with inflammatory disorders. What we find particularly interesting is that such diversity exists even among CD8 T cells that recognize the exact same antigen. Using a combination of several state-of-the-art single-cell technologies and experimental model systems, we study how different CD8 T cell subsets arise, what their relationship is, and what mechanisms underlie their specific properties. We hope that this knowledge will contribute to improved vaccines and immunotherapies.

Claudia Kutter

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Current position: Principal researcher

Web: <https://ki.se/en/mtc/kutter-group-regulatory-transcriptions>



Research area

Cells do not exist in one form and adapt quickly, especially in response to metabolic changes. My group studies how this reversible cell phenotype is controlled by a sophisticated entwined interaction between RNA (long noncoding, transfer and small RNAs) and RNA-binding proteins. We have developed and used experimental and computational multi-omics approaches (bulk and single cell genomics, transcriptomics, CRISPR technology combined with cell-based assays) to understand the differences between healthy, reversible and diseased liver cell phenotypes in mouse and human. Our long term goal is to integrate RNA and their regulators in biomedical research not only for diagnosis and prognosis but also for therapeutic purposes.

Eduardo J. Villablanca

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Current position: Associate Professor

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Research area

Mucosal immunology and mechanisms leading to inflammatory bowel diseases (IBD).

Our lab that lies at the interface of immunology, human health, biological engineering, and systems biology, is seeking to define the complex dynamics of host-environment interactions required to sustain intestinal homeostasis, how breakdown in these interactions may lead to intestinal inflammatory disorders, and how we can promote mucosal healing to reverse the intestinal damage caused by inflammation. The focus of our lab is to gain insights into the mechanisms that underlie the initiation and resolution of inflammatory bowel disease (IBD) to eventually develop therapeutics to treat intestinal autoimmune diseases.

Elham Rostami

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Current position: Wallenberg clinical fellow, (Associate professor, Neurosurgeon)

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Research area

My research focuses on understanding the underlying pathology in different types of acute brain injuries with focus on traumatic brain injury. We use multimodal monitoring including microdialysis in the management of TBI patients and use data generated from these monitoring in addition to clinical data to identify important predictors of outcome. Our preclinical studies include different experimental TBI models, in vitro studies with drug testing as well as patient-specific iPSC and genetic analysis. Our main goal is to identify important prognostic markers and understand why some people recover better than others and what role our genetic background plays. Since the outbreak of COVID-19 we also initiated the COVID-19-Neuro study where we strive to investigate the associated neurological complications and possible acute injuries to the CNS caused by SARS-Co-2.

Emma R Andersson

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Current position: Principal Researcher

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Research area

We are developmental biologists, with projects in neuroscience, hepatology, vascular biology, inner ear development, and hematopoiesis. We are broadly interested in questions of cell fate, self-renewal and transdifferentiation. Our main experimental animal models include a mouse model for Alagille syndrome, and generation of new mouse models with NEPTUNE, a technique we developed for in utero genetic manipulation (eg knockouts, reporters, lineage tracing).

Erdinc Sezgin

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Current Position: Assistant Professor and Group Leader, SciLifeLab, Karolinska Institutet

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Research areas

Biophysics, Membrane biology, Advanced Microscopy, Synthetic biology.

We work on biophysical principles underlying cellular processes. We develop and use advanced imaging and synthetic biology tools to reveal the molecular mechanisms governing the cellular signaling. Overall, we aim to define the biophysical principles underlying health and disease, by developing and applying easy to use, fast, cheap and high-throughput methodologies that allow measuring multiple physical properties simultaneously such as cellular rigidity, viscosity, stiffness and metabolic potential. Applying this biophysical single-cell screening method to reveal how physical and chemical properties of cells change in cellular states and diseases will allow us to create a biophysical atlas of health and disease. Importantly, data from millions of single cells will allow us to develop machine learning algorithms to predict the disease phenotypes based on physical properties of cells.

Fredrik Lanner

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Current position: Researcher

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Research area

My research focus is on early human development and the use of pluripotent stem cells in regenerative cell therapy. Human embryo development beyond implantation is largely uncharted in the human and we instead depend on knowledge inferred from animal models. Within the KIRI program we will use recently developed human stem cell based synthetic embryo models to explore the process of implantation and cell type specification as the embryo develops towards embryogenesis. We will put specific attention towards understanding and delineating the developmental origin of extraembryonic lineages within the human including the trophoctoderm, extraembryonic mesoderm, yolk-sac and amnion and their derivatives.

Georgios A. Sotiriou

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Current position: Senior Forskare, Department of Microbiology, Tumor and Cell Biology.

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Research area

Bionanotechnology.

The focus of Dr. Sotiriou's research program at KI lies on studying the physicochemical properties of materials made by aerosol processes and then applying this fundamental understanding to tailor sophisticated functional particles and particle-enabled devices for biomedical applications. The three main research pillars of his lab regard the (i) particle formation in aerosol reactors and control of their properties towards the synthesis of nanomaterials for in vivo and in vitro bioimaging and biosensing, (ii) the fabrication of antibacterial medical devices capitalizing on aerosol nanoparticle self-assembly on surfaces combining particle synthesis and particle film fabrication in a single-step, and (iii) the utilization of flame-made nanoparticles as drug nanocarriers. A specific focus of his lab is against infectious diseases, an understudied field in nanomedicine even though infections are the leading cause of human deaths globally.

Giedre Grigelioniene

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Current position: Leader for research team “Congenital skeletal diseases”. Associate professor, research group Clinical Genetics, MMK and Senior Consultant (pediatrician and clinical geneticist), MD, Department of Clinical Genetics, Karolinska University Hospital

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Research Area

We study congenital syndromes with skeletal abnormalities, skeletal dysplasias and growth in patients with rare congenital skeletal disorders. Our main focus is defining novel genes and molecular mechanisms for syndromes with congenital skeletal anomalies. We use whole genome and transcriptome sequencing to identify novel disease causes and study molecular mechanisms behind disease development using cell studies, immunochemistry and RNA sequencing. We also perform genotype-phenotype correlations, summarizing the information on clinical findings, natural disease course and complications of rare and ultra-rare congenital skeletal diseases.

Hanna Brauner

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Current position: Research team leader, dept. of Medicine, Solna and resident in dermatology and venereology, Karolinska university hospital.

Web pages: <https://www.cmm.ki.se/hanna-brauner-team> & <https://ki.se/en/meds/hanna-brauner-team>

Research area

The Hanna Brauner team focus on translational immunology, in particular cutaneous lymphoma and systemic inflammatory diseases affecting the skin. The ultimate aim of the projects is to generate knowledge for increasing survival and health of these patients, by combining epidemiologic and experimental studies. We will determine short- and long-term effects of treatments and identify novel molecules and cells that could be targeted in future therapeutic development for systemic autoimmune disease, cutaneous lymphoma and other lymphoma subtypes.



Jakob D Wikstrom

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Current position: Group leader MedS/CMM, clinical dermatologist.

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Research area

Dermatology, wound healing, metabolism, mitochondria, endoplasmic reticulum, extracellular matrix, psoriasis, clinical trials, rare genetic skin disease, calcium.



Jenny Mjösberg

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Current position: Researcher, group leader

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& <https://mjosberglab.wixsite.com/ilcs>

Research area

My group consists of immunologists and bioinformaticians that study innate lymphoid cells (ILCs) in the human gut and airways to determine their role in inflammation and cancer. We apply single-cell techniques on human tissue specimens to determine the transcriptional-, protein- and functional characteristics of ILCs. Our goal is to decipher how the tissue microenvironment regulates ILCs and how to target ILCs for therapy of inflammatory bowel disease, colorectal cancer and asthma. We also strive to identify ILC-related markers of therapy response in diseases.



Joana B. Pereira

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Current position: Senior Researcher, Principal Investigator, Group Leader at the NVS Department.

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Research area

Neuroimaging in aging and neurodegenerative diseases, mainly Alzheimer's disease and Parkinson's disease.

In my group we are working with different brain imaging modalities such as magnetic resonance imaging and positron emission tomography to assess gray matter atrophy, amyloid and tau depositions, glucose metabolism as well as both anatomical and functional brain connectivity. We have developed different brain imaging measures that can be applied across disciplines to understand how proteins or neurons interact with each other using network methods and machine learning approaches. We have also applied these approaches to understand how different clinical tests are related to each other. We also work with cerebrospinal fluid/plasma biomarkers, cognitive, genetic and clinical data. We have extensive experience in working with open-access cohorts and I am also currently collecting my own cohort at the Cognitive Clinic of Karolinska University Hospital.



Johan Lundberg

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Current position: Adjunct Professor of Psychiatry (40%), department of Clinical Neuroscience; Consultant psychiatrist, Norra Stockholms Psykiatri, SLSO

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Research area

The biology and pharmacology of psychiatric disorders in general and major depressive disorder. Methods: Positron Emission Tomography (PET) quantification of markers for the serotonin, dopamine, GABA and glutamate systems and (currently) of synaptic density, is applied in case control studies as well as pre-post psychological or pharmacological interventions (Cognitive Behavioral Therapy, SSRI, ketamine, psilocybin). PET enables information on druggable targets that can be translated between species and models. We also collect blood and CSF for analysis (in collaboration) of potential predictive biomarkers.



Jon Konradsen

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Current position: Associate professor in pediatrics, dept of Women's and Children's health.

Web: <https://ki.se/kbh/diagnostik-och-behandling-av-barn-med-astma-och-allergi-fran-molekyldiagnostik-till>

Research area

Diagnosis and treatment of asthma and allergy in children.

We are particularly focusing treatment of wheeze and asthma in preschool children, risk factors for developing asthma in school age and characterization of severe asthma.



Katja Petzold

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Current position: Associate Professor of Biophysics

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Research area

RNA biophysics and structural biology.

Our group's research focuses on the study of RNA dynamics of disease related systems, such as ribosomes or microRNA as well as RNA viruses. We study the structure and structural changes of regulatory RNA and their impact on the RNAs function. The group works both on method development for NMR and RNA biophysics, as well as identifying regulatory mechanism in RNA based on structural changes, so called excited states.



Konstantinos Ampatzis

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Current position: Researcher

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Research area

Neuroscience / Neuroplasticity.

How does the nervous system organized to support - and rapidly switch between – a wide range of behaviors? What processes are prompted by changing the physiological demands or after injury and disease and allow neuronal circuits to adapt to new behavioral needs?

These are the fundamental questions that have fascinated me and which I am interested in the research group that I established at Karolinska Institute in Sweden in 2017. To contribute novel insight into these critical topics in neuroplasticity, I have systematically acquired expertise in a wide range of model systems, from fish to mammals, and techniques throughout my training. The expertise of the lab lies in system neuroscience and stem cell research. My ability to apply multiple and powerful methodological approaches in two different cell populations of the nervous system (neurons and stem cells) simultaneously allows me to address currently unexplored questions. My overarching scientific objective is to develop novel paradigms that intergrade state-of-the-art methods to address contemporary challenges in system neurosciences, neurogenesis, and regeneration.



Kristiina Tammimies

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Current position: Principal Researcher, Women's and Children's Health

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Research area

My research groups work on understanding the genetic and molecular architecture of neurodevelopmental disorders. We work on large scale genomics data, and identify patterns associated with diagnoses, symptoms, and intervention outcomes. Using human neuronal cells, we are mapping molecular and cellular pathways affected by genetic and environment risk factors of NDD.



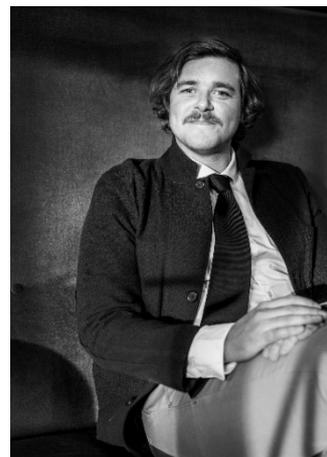
Kristoffer N T Månsson

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Current position: Assistant Professor at the Department of Clinical Neuroscience

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Research area

A significant proportion of patients with anxiety and depression do not respond to current psychiatric interventions. Improving therapeutics and clinical decision-making is thus a major challenge to achieve precision psychiatry. We use non-invasive brain imaging techniques (e.g., functional magnetic resonance imaging) to investigate psychiatric patients' moment-to-moment neural variability, with the general goal to develop reliable and accurate models to predict individual patients' therapy outcome.

Although variability in brain signals have historically been disregarded as unwanted noise, evidence continues to mount revealing that moment-to-moment fluctuations in brain activity can viably index effectiveness of neural systems. We are planning a number of studies to better characterize brain signal variability in psychiatric patients and the link to treatment success (i.e., psychological and pharmacological interventions).

Laura Orellana

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Current position: Assistant Professor & Principal Investigator of the "*Protein Dynamics and Cancer Lab*", Karolinska Institute, Cancerfonden Junior Investigator

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Research area

Structural Biophysics & Bioinformatics, Protein Dynamics, Mutations, cryo-EM.

I was always fascinated by a basic question: how is it possible that something so small as the change of a few atoms in a protein, can disrupt function and propagate throughout biological scales, up to cause life-threatening diseases? Pursuing answers, I studied Medicine, specialized in Biochemistry, and did a PhD in Physics, focusing on theoretical methods to predict protein conformational changes. I consider myself a physicist-physician, that strives to connect structural-mechanistic insights with higher-scale information on cell function and pathology. As such I have been able to push simulations far beyond their natural realm – to be tested in mice tumor models. My group, formed by researchers with backgrounds as diverse as cryo-EM or engineering, follows this spirit and aims to integrate simulations and experiments to investigate disease mutations from a dynamic and evolutionary perspective.

Marcus Buggert

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Current position: Assistant Professor (Bitr lektor) and group leader, Center for Infectious Medicine (CIM), Department of Medicine Huddinge. Docent in Immunology.

Web: <https://ki.se/en/medh/marcus-buggert-group-t-cell-immunity-to-viral-infections-and-cancer>



Research area

My lab conducts research on cell-mediated immunity against human viral infections and cancer. Through the access to unique patient cohorts (e.g. organ donors, different disease cohorts etc) and cutting-edge technologies (e.g. multi-parameter flow cytometry, gene-expression, RNA-seq, ATAC-seq, TCR-seq, proteomics analysis etc), we focus our work on different questions related to memory T cell responses in humans. Our overall aims are to i) study the heterogeneity of circulating and resident memory T cells in human organ donors, ii) identify alternative functions of memory T cells in human tissues, and iii) understand how memory T cells maintain control of tumors (e.g. chronic leukemia) and viral infections (e.g. HIV and SARS-CoV-2).

Maria Kasper

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Current position: Group Leader, Associate Professor

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Research area

Skin, stem cells, and regenerative medicine.

Our research is rooted within the fields of skin and tissue stem cell biology. We use modern techniques such as *in vivo* lineage-tracing and niche-signaling alterations, single-cell transcriptomics, spatial mapping *in situ*, and computational biology, in order to uncover the cellular behavior and molecular signals of individual cells in skin during health, repair and cancer development. Our aim is to determine the boundary of stem cell plasticity and reversibility, with the long-term goal to silence or reactivate tissue stem cells in a controlled manner.

Mattias Carlström

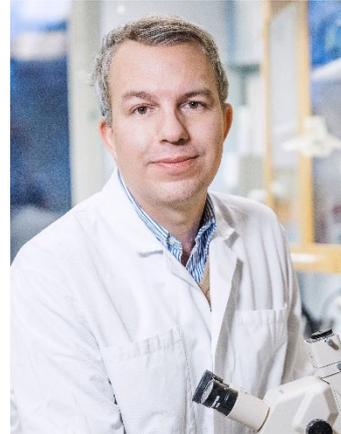
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Current Positions: Professor of Cardiorenal Physiology, Group Leader, Dept. Physiology & Pharmacology.

Distinguished Professor of Weifang Medical University, Weifang, China.

Adjunct Prof, Georgetown University, Washington DC, Dept. of Medicine, Division of Nephrology and Hypertension.

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Research area

I am leading the research group *Reno-Cardio-Metabolic Regulation in Health and Disease*, with specific focus on the role and regulation of reactive oxygen species (ROS) and nitric oxide (NO) signaling in the vasculature. We aim to identify and develop novel dietary and pharmacological therapeutic approaches to prevent or even treat cardiovascular disease and type 2 diabetes and associated adverse renal complications. To reach this rather ambitious goal we use a translational approach, *i.e.*, combination of *in vivo* studies in various disease models, *ex vivo* functional organ bioassays and *in vitro* cell studies as well as biochemical and molecular analyses, and work in teams of both preclinical researchers (*e.g.*, at Biomedicum) and expert clinicians active in cardiovascular, kidney or diabetes research (*e.g.*, at Karolinska University Hospital, SöS and Danderyd's Hospital). We have a broad and rather sophisticated methodological platform available for mechanistic studies of ROS and NO bioactivity/signaling in epithelial cells, inflammatory cells, and vascular endothelial as well as smooth muscle cells.

Nikolas Herold

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Current position: MD, PhD, associate professor. Assistant professor at Childhood Cancer Research Center, KBH & Paediatrician at Paediatric Oncology, Astrid Lindgren Children's Hospital

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Research area

Translational paediatric oncology.

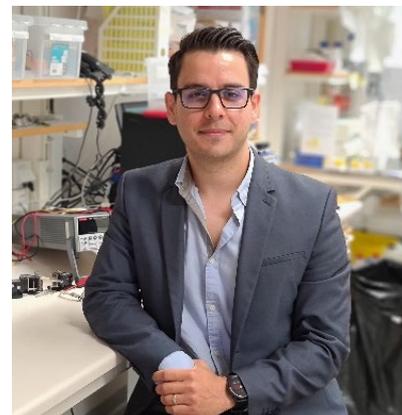
My research group focuses on molecular mechanisms of resistance to chemotherapy and immunotherapy, ranging from identifying resistance factors, screening for small molecule inhibitors and implementation of early-phase clinical trials. We use experimental designs that allow characterization of drug-drug interactions with three drugs while we combine with gene-expression data to identify critical regulators. Those regulators are then used as targets for small-molecule screens to inhibit resistance factors. Mouse animal models are used for validation purposes before designing clinical trials. We also explore immunotherapies in dog models of sarcoma.

Onur Parlak

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Current position: Assistant Professor

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Research area

Medical Sensors, Dermatology & Neuroscience.

My research interests include developing medical sensing and diagnostic devices. I am highly interested in translational methods by designing portable and wearable devices for the early diagnosis of various diseases. Besides these clinical and preclinical collaborative projects, we use our sensing devices to understand the communication between human skin and the central nervous system following various hormones and neurotransmitters and deciphering mechanisms of neurological and dermatological diseases.

Pekka Katajisto

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Current position Group leader, KI consolidator

Web: <https://www.katajisto-lab.com>



Research area

Stem cells and aging.

The goal of my lab is to understand the mechanisms of aging, and to contribute to healthy aging with stem cell-based strategies. We study adult stem cells that undertake the continuous renewal of our tissues and ask how aging changes the ability of stem cells to maintain tissue function. We have for example discovered how the stem cell surrounding microenvironment guides stem cell function in response to food intake, and how such stem cell extrinsic mechanisms can become dysregulated during aging and cancer. In addition, we focus on the stem cell intrinsic metabolism. We have found that stem cell function requires certain type of mitochondria, and that stem cells selectively apportion their organelles between daughter cells to drive one into differentiation while allowing the other to remain as a stem cell. These discoveries were facilitated by our novel tools and mouse models allowing us to follow the age of single organelles.

Petter Brodin

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Current position: Clinical consultant, pediatrics & Professor of pediatric immunology

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& <https://brodinlab.com/>



Research area

Human immunology.

The Brodin lab develops and applies systems-immunology methods to the study of immune system development early in life as well as human immune variation in relation to age, sex and disease. The lab has established a birth cohort and showed differences in early life adaptation between preterm and term infants (Olin et al, Cell, 2018), mapped the global repertoire of maternal antibodies (Pou et al, Nat. Med, 2019) as well as the imprinting effect of select colonizing microbes such as bifidobacterial early in life (Henrick et al, Cell, 2021). During the pandemic the team also applied its technologies for systems-level immune system analysis during the COVID-19 pandemic to understand acute COVID-19 in children (Brodin, P, Immunity 2022), the immunology of MIS-C (Consiglio et al, Cell, 2020) and severe COVID-19 in adults (Rodriguez et al, Cell Reports Med, 2020) and serve as active members of the global COVID-Human Genetic Effort where Brodin is also a member of the steering group (<https://www.covidhge.com/>).

Qiaolin Deng

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Current position: Principal researcher, Associate professor

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Research area

Our lab is interested in understanding the developmental principles of the germline in health and disease such as Klinefelter Syndrome and Neurofibromatosis type 1. Moreover, we focus on how the maternal effects are transmitted via developmental programming and germline moderation to future offspring, a process known as epigenetic inheritance. High-throughput single-cell sequencing, stem cell differentiation modeling, 3D organoid culture and transgenic mouse models are our frequently used tools among others.

Sara Garcia-Ptacek

E-mail: sara.garcia-ptacek@ki.se

Current position: Assistant professor at NVS, KI (50% research) combined with clinical work as a neurologist at Cognitive Clinic, Karolinska University Hospital, Solna (50%).

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Research area

I conduct registry research with the Swedish Dementia Registry, looking at factors to improve diagnosis, care, treatment and outcomes in dementia. I also study COVID, particularly regarding geriatric populations and cognitive risks after COVID. Right now, I'm leading a translational project to identify medication repurposing candidates to slow cognitive decline in dementia: this includes cohort studies, machine learning and lab studies with animal and cellular models of Alzheimer's.

Ujjwal Neogi

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Current position: Principal Researcher, Group Leader

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Research area

Our primary research focus is a comprehensive mapping of the underlying molecular mechanisms of cell metabolism reprogramming and their relevance to physiology in infectious diseases related to RNA viruses. We integrate several layers or *-omics* including transcriptomics, proteomics, metabolomics, and microbiome, to map the cellular pathways that are significantly modulated during infection in HIV-1, SARS-CoV-2, and Crimean-Congo hemorrhagic fever viruses (CCHFV). Using the patient materials, *in vitro* and *in vivo* studies we aim to elucidate novel molecular mechanisms of viral infection and disease severity. We combine computer-guided data integration techniques with biological network analysis and genome-scale metabolic modeling to characterize the metabolic and signaling rearrangement of host cells upon viral infection and identify potentially targetable genes and pathways. We have an experimental approach to investigate the role of those host factors that either support or limit viral replication.

Vicente Pelechanoa

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Current position: Principal Researcher, KI MTC

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Research area

Functional genomics.

Our team aims to improve the quantitative understanding of gene expression in biomedical relevant systems. To reach that goal, we combine experimental and computational biology and focus on the development and application of novel genome-wide technologies. We are particularly interested in understanding how subtle variations in gene expression can lead to the appearance of phenotypic differences across cells. We investigate this process at chromatin, transcription and post-transcriptional level.