

Master Thesis Topics Biomedicine

(Alphabetically sorted by supervisor name)

Various MSc Projects in Prion Science	
Short description	Various MSc project are available in the realm of prion science. It is possible to choose between projects dealing with (1) diagnosis of human prion diseases, (2) prion immunology, (3) prion genetics, and (4) animal models of prion diseases. Candidates should have an outstanding academic track record: for Swiss candidates, all grades <i>must</i> be 5 or higher. Candidates should be prepared to commit themselves fully to their thesis in a very demanding research environment.
Keywords	
Supervisor Institute E-mail Phone	Prof. Dr. Adriano Aguzzi Institut für Neuropathologie Adriano.aguzzi@usz.ch
Conditions	100% commitment. Above-average grades in molecular biology.
Links	http://www.uzh.ch/pathol/neuropathologie/index.html

Investigating the role of soluble epoxide hydrolase in lipid metabolism	
Short description	Mammalian soluble epoxide hydrolase (sEH) comprises an epoxide hydrolase as well as a phosphatase activity, both involved in lipid metabolism. The sEH is implicated in cardio-vascular and inflammatory diseases, mostly based on the metabolism endogenous epoxides by the EH. The phosphatase turns over intermediates of the cholesterol biosynthesis pathway. We will analyse the role of sEH in sterol and lipid homeostasis to investigate the mechanistic link between these two sEH activities. Techniques: mass spectrometry, cell culture, molecular biology and protein biochemistry
Keywords	
Supervisor Institute E-mail Phone	Prof. Dr. Michael Arand Institute of Pharmacology and Toxicology arand@pharma.uzh.ch 044 635 59 79
Conditions	-
Links	http:// www.pharma.uzh.ch

Mucosal immunology of the gastrointestinal tract	
Short description	<p>Our group is interested in understanding how eosinophils, a highly abundant cellular subset residing in the gastrointestinal tract – control the balance between intestinal homeostasis and inflammation and contribute to the development of colorectal cancer.</p> <p>We are using a combination of experimental disease models, patient cohorts, sequencing, flow-cytometry and microscopy techniques - together with new tools specifically targeting the eosinophil lineage - to investigate the mechanisms driving the pleiotropic activities of these cells in intestinal health and disease.</p>
Keywords	Eosinophils, mucosal immunology, inflammatory bowel diseases, colorectal cancer, microbiota
Supervisor	Prof. Isabelle Arnold
Institute	Institute of Experimental Immunology, Mucosal Immunology Group
E-mail	arnold@immunology.uzh.ch
Phone	0446353730
Conditions	Candidates are expected to show strong commitment and motivation, and to have a solid understanding of basic immunology. Candidates should further be ready to work with mice.
Links	https://www.immunology.uzh.ch/en/researchunit/mucosalimmunology/research.html

Microbes in Health and Forensics	
Short description	<p>Our projects focus on the investigation of microbial genetic diversity for applications in the clinic and in forensics. On the one hand, examining the genetic diversity of pathogenic bacterial strains data has the potential to improve our epidemiological understanding. On the other hand, microbial community profiling is a valuable tool in the study of diseases and also in the characterisation of body sites and individuals. This characterisation is promising for application to forensic body fluid and individual identification.</p>
Keywords	microbiome, forensic body fluid identification, epidemiology, bacterial communities, next-generation sequencing
Supervisor	Dr. Natasha Arora
Institute	Institute of Forensic Medicine, IRM/Forensic Genetics
E-mail	natasha.arora@irm.uzh.ch
Phone	044 635 60 70
Conditions	none
Links	https://www.irm.uzh.ch/de/forschung/genetik/team/NArora.html

Pathomechanisms of ciliopathies	
Short description	Ciliopathies are a group of human disorders caused by dysfunction of primary cilia, ubiquitous organelles found on the surface of most vertebrate cells where they transduce a variety of signals to the cell, including sensory signals (light in photoreceptors), chemical and mechanical signals (kidney tubules) and signaling pathways during development and cell homeostasis (Hedgehog, Wnt). Various master projects are available to elucidate the role of primary cilia and the function of ciliopathy genes, relying on zebrafish and/or iPSC-based models and applying modern techniques such as CRISPR gene editing, live imaging and -omics approaches.
Keywords	primary cilia, zebrafish, iPSC, organoids, genetics
Supervisor	Prof. Dr. med. Ruxandra Bachmann
Institute	Institute of Medical Genetics
E-mail	ruxandra.bachmann@mls.uzh.ch
Phone	044 556 33 11
Conditions	interest in genetics, development and molecular biology
Links	https://www.medgen.uzh.ch/en/forschung/gagescu.html

Molecular mechanisms of pediatric brain tumor cell migration and tissue infiltration	
Short description	Oncogenic growth, tissue invasion and tumor progression are driven by molecular mechanisms that alter normal cell functions. The objective of our lab's research activities is to unravel, understand and target molecular mechanisms that control motility and tissue invasion of the pediatric brain tumor medulloblastoma. Using biochemical, cell biological and a range of fixed and live-cell imaging approaches, we determine at the molecular and cellular levels how cells migrate and invade. Based on this, we use computer-assisted drug discovery and evaluation methods for identifying and validating novel treatment approaches.
Keywords	Medulloblastoma, molecular mechanisms of cell motility regulation, 3D-tissue models for medulloblastoma, live-cell imaging and morphological screening, drug development
Supervisor	Prof. Dr. Martin Baumgartner
Institute	University Children's Hospital Zürich, Oncology
E-mail	Martin.Baumgartner@kispi.uzh.ch
Phone	044 266 37 30
Conditions	Highly motivated, having a specific interest in one or several lab's research activities
Links	https://pediatric-molecular-neurooncology.ch/

Immunology: Inflammation Research	
Short description	<p>For the complex immune system to work, the individual cell types have not only specialized functions, but also a complex communication network. Cytokines are soluble factors with the capacity to serve as signals for the communication (<i>or words in the complex language</i>) between immune cells. Our goal is to uncover this communication network and to translate the <i>language of the immune system</i>.</p> <p>Our research aims to understand the development of tissue-specific inflammation in particular in the context of interactions of the nervous system with the immune system. Related to our studies of autoimmunity (an undesired process) we expanded our interest to apply our tool-set and expertise to study the impact of immunity to combat cancer (a desired process).</p> <p>Our main research interests can be categorized as such:</p> <ul style="list-style-type: none"> • Cytokine networks in chronic inflammatory disease with a focus on <i>multiple sclerosis, psoriasis, graft-versus host disease</i> in preclinical mouse models and human patients • Cancer-immunotherapy: specifically, the interaction of immune cells with cancer cells and therapeutic interventions to mount immune responses against tumors <p>We offer several MSc positions on various projects in the research team</p>
Keywords	Cytokines, lymphocytes, single cell technologies, transgenic mice, chronic inflammation
Supervisor	Prof. Dr. Burkhard Becher
Institute	University of Zurich, Institute of Experimental Immunology, Inflammation Research
E-mail	becher@immunology.uzh.ch
Phone	044 635 37 03
Conditions	Solid understanding of basic immunology. Good communication skills. Some understanding of computational biology (e.g. R) Interest to work in a highly motivated and team-oriented research environment
Links	http://www.immunology.uzh.ch/

Evolution of human diet and body composition	
Short description	<p>Nutrition and obesity are major topics in medicine and research. We explore insights on the evolution of human nutrition and the propensity for human obesity by studying modern data on human diet and body composition. We use data from published studies or large cohort data on the one hand, and collect own data on the other hand. We use food questionnaires, bioelectrical impedance analysis, and 3D body scanner, to collect data on nutrition, body composition, and body form of healthy and diseased human populations.</p>
Keywords	Evolutionary Medicine, Nutrition, Obesity, Body composition, Diet
Supervisor	PD Dr. Dr. med. Nicole Bender
Institute	Institute of Evolutionary Medicine
E-mail	nicole.bender@iem.uzh.ch
Phone	044 635 05 31
Conditions	None
Links	https://www.iem.uzh.ch/en/research/clinical_evolutionary_medicine_group_bender.html

Hematologic malignancies	
Short description	Different MSc projects are available in the leukemia research group at the University Children's Hospital Zurich. Projects will deal with different aspects of drug resistance in childhood acute leukemia. One project will address the role of an alternative cell death mechanism, necroptosis, in the resensitization of resistant leukemia cells to steroids. We have furthermore developed a platform to analyze the antileukemic potential of new agents in primary leukemia cells from highly drug resistant patients. This project will deal with the analysis and characterization of the hereby identified new antileukemic agents also with respect to their activity in combination with current chemotherapy.
Keywords	
Supervisor	Dr. Beat Bornhauser
Institute	Dept of Oncology, University Children's Hospital
E-mail	beat.bornhauser@kispi.uzh.ch
Phone	044 634 88 17
Conditions	Commitment and motivation
Links	http://idcmiskispi.unizh.ch/lenya/kispi/live/af/ForschungLehre/onkoonco/Leukaemie_de.html

Gut microbiota as a modulator of tumor immunity	
Short description	Changes in gut microbiota are associated with several diseases, including cancer. Tumor cells are known to carry altered cell-surface glycosylation that is associated with cancer progression. Mucin-degrading bacteria present in gut microbiota seems to define the efficacy of immune checkpoint inhibitors in cancer patients. Our preliminary data indicate a direct correlation between the presence of a commensal gut bacteria and the tumor growth control. The aim of this project is to define the role of a specific commensal mucin-degrading bacteria during tumorigenesis. We will use cell culture, co-culture techniques, flow cytometry, real-time PCR and established in vivo models to define the glycan-based mechanisms leading to tumor growth control with immune-checkpoint inhibitor treatment.
Keywords	carcinoma mucins, glycosidases, immunomodulation
Supervisor	Prof. Dr. Lubor Borsig
Institute	Institute of Physiology
E-mail	lborsig@access.uzh.ch
Phone	044 635 51 34
Conditions	Seeking a motivated student with basic knowledge of immunology. The project may include mouse models.
Links	http://www.physiol.uzh.ch/research/institutegrups/grborsig.html

Endothelium as the facilitator of metastasis

Short description	Tumor microenvironment drives tumorigenesis and metastasis, which is defined by immune cell infiltration. Activation of endothelial cells during tumorigenesis and metastasis is an essential step in cancer progression. This project aims to understand the role of endothelium during metastasis, particularly in modulation of the immune compartment. We use cell co-culture techniques, flow cytometry, immunofluorescence microscopy to delineate the contributions of tumor, endothelial and immune cells to metastasis. The focus is on two distinct receptors identified in RNA-sequencing screen of endothelial cells from metastatic foci.
Keywords	tumor inflammation, myeloid cells, activated endothelium
Supervisor	Prof. Dr. Lubor Borsig
Institute	Institute of Physiology
E-mail	lborsig@access.uzh.ch
Phone	044 635 51 34
Conditions	Seeking a motivated student. The project may include mouse models.
Links	http://www.physiol.uzh.ch/research/institutegroups/grborsig.html

Modulation of immune responses by cytokines

Short description	We are interested in the function of cytokines in the immune system during health and disease. We study how cytokines coordinate immune homeostasis and responses, and how they affect various immune cells in different models of cancer, inflammatory and autoimmune disease, as well as allograft rejection. To this end, we develop and characterize natural versus modified cytokine formulations, including cytokine/anti-cytokine antibody complexes, in order to better understand cytokine biology and improve cytokine-mediated immunotherapy.
Keywords	cytokine biology, cytokine engineering, autoimmunity, transplantation, tumor immunotherapy
Supervisor	Prof. Dr. Onur Boyman
Institute	Dept. of Immunology, University Hospital Zurich, University of Zurich
E-Mail	onur.boyman@usz.ch
Phone	+41 44 255 20 69
Conditions	none
Links	http://www.boymanlab.com/

Cognitive neuroscience in childhood and adolescence

Short description	<p>Our research group examines cognitive brain networks and their development in healthy children and adolescents as well as patients. We apply behavioural tests and non-invasive, child-friendly neuroimaging techniques such as electroencephalography (EEG), functional (fMRI) and structural (sMRI) magnetic resonance imaging or combined EEG-fMRI (sequential or simultaneous). The core patient groups include children suffering from developmental dyslexia, as well as children and adolescents suffering from child-psychiatric disorders (e.g. depression, ADHD, OCD). We are particularly interested in comparing typically developing children with patients, aiming to i) clarify and delineate dysfunction of specific cognitive brain networks in different child psychiatric disorders; ii) characterize trajectories for typical and atypical functional and structural brain development; iii) identify neuroimaging measures suited to advance prediction or diagnosis; iv) evaluate and track learning-related changes in the brain during specific interventions; and v) advance the combination of child-friendly neuroimaging techniques and analyses (e.g. computational modelling).</p>
Keywords	neuroimaging, EEG, (f)MRI, children, learning
Supervisor	Prof. Dr. Silvia Brem
Institute	Department of Child and Adolescent Psychiatry and Psychotherapy, Psychiatric Hospital, University of Zurich
E-mail	sbrem@kjpd.uzh.ch
Phone	043 499 27 60
Conditions	Very good knowledge of German is essential for the work with children and their families
Links	www.kjpd.uzh.ch/de/multimod/neuroimaging/team/brem.html

T cell development and negative selection	
Short description	Hematopoietic precursor cells migrate from the bone marrow to the thymus where T cell development is taking place. During their development thymocytes have to pass different check points called positive and negative selection that ensure that randomly generated T cell receptors (TCR) of double positive (DP) cells can interact with the self-peptide presented on MHC. These check points are controlled by the avidity of the interaction, which means that cells which interact with a low avidity to self-antigen can survive and those with a high avidity die by apoptosis (negative selection). Consequently, negative selection ensures that self-reactive thymocytes are eliminated and autoimmunity avoided. However, the exact molecular pathway of the same TCR stimulation of thymocytes leading to apoptosis (negative selection) or survival (positive selection) within the thymus or the activation of peripheral T cells leading to proliferation are not fully understood. Therefore, we are analyzing the role of specific transcription factors in different transgenic mouse strains. Furthermore, we are comparing the signal transduction in thymocytes and peripheral T cells upon TCR stimulation. You will learn how to use state-of-the-art techniques like CRISPR/Cas9, flow cytometry, RT-PCR, Western blot and others to analyze the T cell development in mice. This knowledge will help to understand the development and protection of autoimmune diseases.
Keywords	
Supervisor	Prof. Dr. Thorsten Buch
Institute	Institute of Laboratory Animal Science, University of Zurich Wagistrasse 12, 8952 Schlieren
E-Mail	jane.beil-wagner@uzh.ch
Phone	044 635 50 57
Conditions	We are looking for a highly motivated master student with a strong interest in immunology, T cell development, autoimmune diseases and genetics.
Links	http://www.ltk.uzh.ch/

Vascular Dysfunction in Aging & Disease	
Short description	Vascular homeostasis is critical for the correct supply of nutrients and oxygen to all organs. The endothelium -the innermost layer of a vessel- functions as an active barrier to allow the passage of different substances; additionally, it mediates vascular dilatation and constriction. In disease states and with aging the endothelium becomes dysfunctional and through complex cascades of events leads to several complications such as myocardial infarction and stroke. Several key factors such as free radicals and inflammation are implicated in endothelial dysfunction and age-dependent cardiovascular disease. Our group performs research aimed at elucidating the interaction of regulators and mediators of vascular disease in aging, arterial thrombosis and stroke.
Keywords	Aging, cardiovascular disease, stroke
Supervisor	Prof. Dr. Giovanni G. Camici
Institute	Center for Molecular Cardiology, UZH, Schlieren Campus
E-mail	giovanni.camici@uzh.ch
Phone	044 635 64 68
Conditions	None
Links	http://www.cmc.uzh.ch/en.html

Stem cells and osteology	
Short description	Stem cells are a powerful tool not only for the study of biological processes, but also for their potential therapeutic application. One of the main issues with the use of stem cells for clinical applications is the ability to maintain these cells outside of the body (in vitro) in a self-renewing pluripotent and/or multipotent state and to differentiate them precisely to specific cell types. The mechanisms underlying maintenance and determination of pluripotency as well as the ones driving differentiation are nevertheless still largely unknown. We are interested in following research topics: 1) Understanding the molecular mechanisms involved in the regulation of pluripotency and differentiation pluripotent stem cells (ESCs and iPSCs) and mesenchymal stem cells (MSCs). 2) Development and optimization of tissue engineering approaches for bone regeneration with pluripotent and multipotent stem cells.
Keywords	Pluripotent stem cells Mesenchymal stem cells, bioengineering, bone
Supervisor	PD Dr. Paolo Cinelli
Institute	Department of Trauma Surgery, University Hospital Zurich
E-mail	paolo.cinelli@usz.ch
Phone	044 255 36 78
Conditions	
Links	http://www.traumatologie.usz.ch/forschung/

Neurorehabilitation in spinal cord injury	
Short description	A spinal cord injury is a devastating life event leading to impairment in sensory, motor and autonomic function. In order to diagnose the patient, predict and measure the functional outcome sensitive readouts are necessary. Our lab focuses on the functional assessment of human spinal cord injury employing a variety of state-of-the-art techniques, such as gait analysis, neuroimaging, electrophysiology, and sensor based technology.
Keywords	neurorehabilitation, sensorimotor control, neuroimaging, robotics, spinal cord injury
Supervisor	Prof. Dr. Armin Curt
Institute	Spinal Cord Injury Research Center
E-mail	marc.bolliger@balgrist.ch
Phone	044 510 7201
Conditions	<ul style="list-style-type: none"> - BSc in Biomedicine/Biology incl. basic knowledge in neuroanatomy - independent working attitude, curious to learn something new, full commitment and motivation for the thesis - fluent in German and English
Links	https://www.sci-research.uzh.ch/en/aboutus.html

System biology and epigenetic changes in rheumatic diseases	
Short description	There is an unmet need for novel therapies, biomarkers and humanized models for rheumatic diseases. Our laboratory focuses on the analysis of molecular pathways in inflammation, cartilage destruction and multi organ fibrosis. We investigate epigenetic mechanisms such as post-translational histone modifications, DNA methylation, DNA hydroxymethylation and non-coding RNAs, as well as signaling pathways in primary cells (fibroblasts, monocytes) derived from patients' biopsies and peripheral blood and 3D-cell cultures. Master students can select between different topics within the field of rheumatology including rheumatoid arthritis, systemic sclerosis and vertebral bone marrow lesions (modic changes).
Keywords	Epigenetics, inflammation, fibrosis, RNA Sequencing, 3D cultures
Supervisor	Prof. Dr. Oliver Distler
Institute	Center for Experimental Rheumatology, USZ, Schlieren Campus
E-mail	oliver.distler@usz.ch
Phone	044 255 29 70
Conditions	We are looking for enthusiastic master students. Basic knowledge of techniques in molecular biology is of advantage.
Links	http://www.en.rheumatologie.usz.ch/research/pages/default.aspx

Projects in Urologic Tissue Engineering and Prostate Cancer Therapy	
Short description	Our lab offers several master projects. Interested students can choose between projects associated with (1) Urological Tissue Engineering and Regenerative Therapies (2) Smooth Muscle Cell Characterization and Functional Assays (3) Therapy and Biomarkers in Prostate Cancer (4) Exosome in Blood Plasma for Early Detection of Prostate Cancer.
Keywords	
Supervisor	Prof. Dr. Daniel Eberli
Institute	University Hospital Zürich, Department of Urology,
E-mail	Souzan.salemi@usz.ch
Phone	079 578 86 54 (Lab phone)
Conditions	Motivation, team player, basic knowledge of molecular biology.
Links	https://www.usz.ch/fachbereich/urologie/forschung/eberli-gruppe/

Tailored Biomaterials for Tissue Regeneration	
Short description	Our research focuses on novel biomaterials and engineering approaches for regenerating bone, fetal membranes, blood vessels and ovary tissue. We analyze tissue composition from both human and murine sources using flow cytometry, proteomics, and single-cell sequencing. Tailoring biomaterial properties to match treatment site requirements is a key aspect of our work. Characterizing these novel biomaterials involves techniques such as rheology and imaging-based methods. Additionally, we employ three-dimensional tissue models to investigate regeneration signals and assess biomaterial performance in vitro through immunocytochemistry,

	quantitative PCR, biochemical methods, and image analysis. By engineering, expressing, and purifying recombinant proteins, we enhance our biomaterials to release healing-promoting molecules. Evaluating performance involves in vivo testing, utilizing animal models such as mice or sheep.
Keywords	
Supervisor Institute E-mail Phone	Prof. Dr. Martin Ehrbar University Hospital Zürich, Department of Obstetrics, martin.ehrbar@usz.ch 044 255 85 13
Conditions	Motivation, team player, basic knowledge of molecular biology.
Links	https://www.usz.ch/fachbereich/urologie/forschung/eberli-gruppe/

Single-cell analysis strategies for immunophenotyping of preclinical Alzheimer's disease (AD)	
Short description	Evidence of immune cells responding to pathological hallmarks of AD has raised the question of whether immune markers could be used as indicators for early and progressing AD pathology in the brain. We use multidimensional single-cell analysis combined with unbiased machine learning techniques to immunophenotype cell populations of interest. Our methods range from single-cell analysis by cytometry to cell culture of primary patient-derived immune cells and subsequent testing for their antigen response.
Keywords	Neuroscience, Immunology, Flow cytometry, In vitro cell assays, Computational analysis
Supervisor Institute E-mail Phone	Dr. Christoph Gericke Institute for Regenerative Medicine (IREM) christoph.gericke@irem.uzh.ch 044 635 76 86
Conditions	Basic understanding of Immunology, ideally basic knowledge in computational analysis (e.g. R) but it is not an exclusion criterion

Links	https://www.irem.uzh.ch/en/research/Group-R.-M.-Nitsch/Immunology-of-Neurodegeneration.html
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Molecular Mechanisms of Retinal Degeneration	
Short description	<p>Many blinding diseases are caused by the degeneration of photoreceptor cells. Using several animal models of induced and inherited retinal degeneration, our research aims at the understanding of the molecular mechanisms and signalling pathways induced during the degenerative process. The acquired knowledge is used to develop and test therapeutic strategies to improve cell viability and rescue vision. Strategies include AAV-mediated gene therapy to inhibit (RNAi, CRISPRi) or activate (CRISPRa) specific gene expression, and neuroprotection.</p> <p>Available projects will investigate aspects of molecular mechanisms during retinal degeneration or refine therapeutical approaches to rescue vision.</p>
Keywords	Retina, gene therapy, CRISPR/Cas9, molecular signalling, vision
Supervisor	Prof. Dr. Christian Grimm
Institute	Lab for Retinal Cell Biology/Dept Ophthalmology, University Hospital Zurich
E-mail	cgrimm@ophth.uzh.ch
Phone	043 253 30 01
Conditions	Interest in the visual system, the retina and strategies to rescue vision. Background in molecular biology desirable. Good knowledge of the English language is an advantage.
Links	https://www.lrcb.uzh.ch/en

Klinische Forschung	
Short description	<p>Das Clinical Trials Center verfügt über eine klinische Forschungsabteilung (Clinical Research Ward / RW) im UniversitätsSpital Zürich (USZ), in welcher probanden- und patientenorientierte Forschungsprojekte durchgeführt werden. Das CTC unterstützt alle Forschungsgruppen des USZ und der Universität Zürich assoziierten Kliniken/Institute bei der Planung und Durchführung klinischer Forschungsprojekte gemäss Schweizerischem Humanforschungsgesetz HFG und internationalen Good Clinical Practice Standards (ICH-GCP-Standards. Durch aktive Mitarbeit in verschiedenen klinischen Forschungsprojekten sowie in sämtlichen Studienphasen von der Konzeption bis zum Abschluss einer Studie kann die gesamte Methodik der Pharmazeutischen Medizin und Klinischen Forschung erlernt werden.</p>
Keywords	Klinische Forschung, Humanforschung, Good Clinical Practice, Studiendesign, Clinical Development
Supervisor	Dr. med. Regina Grossmann
Institute	Clinical Trials Center, UniversitätsSpital Zürich
E-mail	regina.grossmann@usz.ch
Phone	043 253 10 35
Conditions	Selbständiges Arbeiten, Organisations- und Teamfähigkeit, Grundkenntnisse der Klinischen Forschung von Vorteil
Links	https://www.usz.ch/fachbereich/clinical-trials-center/

Elucidating neurodevelopmental mental disorders and their therapies	
Short description	<p>The Translational Molecular Psychiatry research focus on elucidating the etiopathologies of mental disorders such as attention-deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD), early-onset obsessive-compulsive disorder (OCD), cognitive and learning disabilities and psychosis/schizophrenia. Furthermore, mechanisms of drug therapy at the molecular and cellular levels and response prediction are conducted. Projects such as (see details here): (a) modelling ADHD using patient specific induced pluripotent stem cells (iPSC) to assess the molecular pathways involved. (b) Testing drug therapy using iPSC-derived neurons, e.g. psychostimulant, methylphenidate (MPH), or nutritional additives as omega-3 fatty acids. (c) Investigating the interaction of genetic and environmental factors in mental disorders, e.g. stress. (d) Searching for biomarkers such as (epi)genetic, transcriptomic and biochemistry in neurodevelopmental psychiatric disorders and therapy response.</p> <p>The student will receive close supervision and have the chance to learn broad number of methods e.g. neuronal cell culture, immunostaining, microscopy, molecular genetics and biochemical techniques (e.g. qRT-PCR, ELISA, Western blot), live-cell imaging, data assessment using several software, statistical software. The student will have the chance to practice scientific writing and presentations, and learn to interpret and discuss scientific results.</p>
Keywords	cell culture, drug treatment, (epi)genetic, iPSC-derived neurons, mental disorders, neurodevelopment, pharmacology, psychiatry, transcriptomic.
Supervisor Institute	Prof. Dr. Edna Grünblatt Translational Molecular Psychiatry; Department of Child and Adolescent Psychiatry and Psychotherapy (KJPP), Univ. Hospital Psychiatry ZH (PUK)
E-mail	edna.gruenblatt@kjpd.uzh.ch
Phone	043 556 40 39 / 043 556 40 38
Conditions	Interest in elucidating neuropsychiatric etiopathology and finding therapy. Basic knowhow in neuroscience including cellular, molecular techniques. Knowhow in iPSC and their derivatives is of advantage.
Links	https://www.kjpd.uzh.ch/de/translazionale-molekularpsychiatrie.html

Innate Immunity and Human Respiratory Viruses	
Short description	<p>The human interferon system constitutes a critical defense against viruses. Its importance is underscored by the fact that rare loss-of-function variants in the interferon pathway increase infection susceptibility. Further, interferon is tightly regulated to prevent aberrant activation, as some autoinflammatory diseases are associated with mutations in the system. We combine genetics, proteomics, cell biology and virology to identify molecular mechanisms governing the action of interferon against influenza and coronavirus infections, and how human genetic variation impacts pathogenesis.</p>
Keywords	Interferon, influenza, signaling, immunity, proteomics
Supervisor Institute	Prof. Dr. Benjamin G. Hale Institute of Medical Virology
E-mail	hale.ben@virology.uzh.ch
Phone	044 634 26 31
Conditions	Interest and solid background in virology and innate immunity (BIO615 needs to be included in learning agreement)
Links	https://www.virology.uzh.ch/de/research/ghale.html

Evolutionary aspects of musculoskeletal disorders and human birth

Short description	<p>Evolutionary medicine seeks to explain the ultimate causes of human diseases, such as musculoskeletal disorders, or the complexity underlying the tortuous birth process in humans. Musculoskeletal disorders of the vertebral column, shoulder, hip, knee or foot affect most humans at some point during their lifetime and are thus among the top causes of health costs, while human birth is notably complex and hazardous compared to that of other primates and often entails Caesarean sections.</p> <p>Our research group explores the hypothesis that these issues may be trade-offs to the adaptation of our skeleton to upright bipedal locomotion. Our methodological approach utilizes imaging techniques and comparative morphological studies together with analyses of the fossil/skeletal record to understand how such conditions evolve.</p>
Keywords	
Supervisor	PD Dr. med. Dr. sc. nat. Martin Häusler
Institute	Institut für Evolutionäre Medizin
E-mail	martin.haeusler@iem.uzh.ch
Phone	044 635 05 30
Conditions	None
Links	https://www.iem.uzh.ch/en/people/evolmorph.html

The role of pH receptors OGR1 and GPR4 in IBD	
Short description	Inflammatory bowel disease (IBD) is a prototypic chronic inflammatory disease with increasing incidence in the industrialized world (20000 Swiss people suffer from IBD) and is characterized by a chronic inflammation of the intestinal wall. A local acidification in the gut lumen as well as in the mucosa has been observed during intestinal inflammation. Our aim is to show that pH-sensing receptors OGR1 and GPR4 play a key role in modulation of intestinal fibrosis and suggest that selective inhibition pH-sensing receptors by antagonists is a promising therapeutic strategy for the treatment of intestinal fibrosis in CD.
Keywords	GPR4, OGR1, inflammatory bowel disease (IBD), fibrosis, fibroblast differentiation
Supervisor	Prof. Dr. Martin Hausmann
Institute	UniversityHospital Zurich, Department for Gastroenterology and Hepatology, Raemistrasse 100, 8091 Zurich
E-mail	martin.hausmann@usz.ch
Phone	044 255 98 08
Conditions	no
Links	http://www.gastroenterologie.usz.ch/forschung/Seiten/default.aspx

Regulation of mucosal immunity by the gut microbiota	
Short description	<p>Gut bacteria constantly stimulate the mucosal immune system, thus inducing the production of antibodies and polarization of T-cells. Gut bacteria also secrete carbohydrate hydrolases that remodel host glycans, thereby influencing the reactivity of immune cells to antigens.</p> <p>Using tools such as recombinant bacteria overexpressing carbohydrate hydrolases and arrays of bacterial carbohydrate antigens, our group investigates the role of specific bacterial products on the maturation and activation of immune cells (in cell culture and mouse models). The general methods applied are leukocyte isolation, cell culture, flow cytometry, real-time PCR, gene expression and inactivation in bacteria.</p>
Keywords	glycobiology, sialic acid, siglec, inflammation, antibodies
Supervisor	Prof. Dr. Thierry Hennet
Institute	Institute of Physiology
E-mail	thierry.hennet@uzh.ch
Phone	044 635 50 80
Conditions	knowledge in bacteriology and immunology
Links	http://www.uzh.ch/physiol

Omega-3 Fatty Acids and their Lipidome	
Short description	Intravenous lipid emulsions form an integral part of life-saving total parenteral nutrition and are provided to millions of patients who are unable to orally ingest the necessary daily amount of food. Although lipid emulsions are essential, currently available therapies often cause considerable side-effects like inflammation, metabolic derangements, and depression of cardiac function. We investigate the biological effects (and side-effects) of novel lipid emulsions with innovative lipid compositions with emphasis on mechanisms of lipid uptake and metabolism. For this, we investigate the metabolism of the omega-6 and omega-3 fatty acids to lipid mediators in vivo in mice and in primary human cells, and mechanistically analyze the effect of the derived lipid mediators in primary human immune cells on a molecular level.
Keywords	Q-PCR, FACS, Western blot, cell culture, ELISA, LC-MS
Supervisor	Prof. Dr. Martin Hersberger
Institute	Division of Clinical Chemistry and Biochemistry University Children's Hospital Zürich Steinwiesstrasse 75, 8032 Zürich
E-mail	martin.hersberger@kispi.uzh.ch
Phone	044 266 75 41
Conditions	None
Links	Klinische Chemie und Biochemie (uzh.ch)

Serine-Palmitoyltransferase and Sphingolipid Metabolism	
Short description	Sphingolipids and their metabolites are ubiquitous constituents of cell membranes and involved in various cellular functions like apoptosis, signal transduction and membrane trafficking. The serine-palmitoyltransferase (SPT) is the key regulatory enzyme in the sphingolipid synthesis pathway. Mutations in the SPT gene result in an inherited sensory neuropathy (HSN1). Pathological changes in sphingolipid metabolism have been implied to play pathogenetic roles in various diseases including Diabetes Type 2, atherosclerosis and cancer. We previously identified and characterized a third subunit of SPT and offer several MSc projects to further characterize the structure, function and regulation of the subunits of SPT.
Keywords	
Supervisor	Dr. Thorsten Hornemann
Institute	Institut für Klinische Chemie (IKC), Unispital Zürich
E-mail	thorsten.hornemann@usz.ch
Phone	044 255 47 19
Conditions	Experiences in cell culture, protein chemistry and molecular biology are preferable
Links	

The role of ADP-ribosylation in the regulation of inflammation	
Short description	Our laboratory is interested to understand the molecular regulatory mechanisms of inflammation. Inflammation is the complex biological response to harmful stimuli, such as pathogens, damaged cells, or irritants. We investigate inflammatory signaling (e.g. oxidative stress) with special focus on the role of post-translations modifications (PTM) such as ADP-ribosylation. We study the patterns of ADP-ribosylation using cutting-edge systems biology approaches including ADP-ribosyl-specific high-resolution and quantitative mass spectrometry.
Keywords	Inflammation/ NAD/ ADP-ribosylation/ Signaling/ cell compartmentalization/
Supervisor Institute E-mail Phone	Prof. Dr. Michael O. Hottiger, Department of Molecular Mechanisms of Disease michael.hottiger@dmmd.uzh.ch 044 635 54 74
Conditions	The applicant should also have good communication and writing skills, a curiosity-driven attitude and should demonstrate enthusiasm and flexibility.
Links	https://www.dmmd.uzh.ch/en/research/hottiger.html

Electrophysiological and mechanical investigations of hearing	
Short description	Our research aims to improve hearing of patients with cochlear implants, middle ear prostheses and bone conduction hearing devices. Available internships and MSc. research projects aim to either 1) perform electrophysiological measurements in cochlear implant recipients during and after surgery to improve hearing outcomes, or 2) investigate hearing mechanics in the laboratory using available tools such as a scanning laser doppler vibrometer, robotic arm, and custom control and processing software, with the aim to improve bone conduction devices and middle ear implants.
Keywords	Cochlear implant surgery, Electrophysiology, Intra- and postoperative measurements, Hearing mechanics, Laser doppler vibrometry
Supervisor Institute E-mail Phone	Prof. Dr. Alexander Huber Department of Otorhinolaryngology, Head&Neck Surgery, University Hospital Zurich orl.research@usz.ch 044 255 21 44
Conditions	For electrophysiology projects: Interest in electrophysiology and working with patients, German speaking skills. For mechanics projects: Interest in the development, execution, troubleshooting, and analysis of hands-on experiments in biomechanics. Hands-on experience with laboratory measurements is a plus. Overall, some programming experience would be beneficial, especially for MSc. projects.
Links	https://www.otobm.uzh.ch/en/

Zusammenspiel von Schlaf-Wach-Prozessen und Entwicklung bei gesunden Kindern und Jugendlichen und klinischen Populationen	
Short description	<p>Die Gehirnentwicklung sowie Verhalten und Kognition werden massgeblich durch Schlaf-Wach-Prozesse beeinflusst. Insbesondere erforschen wir mit stark interdisziplinärem Ansatz grundlegende Mechanismen der Schlaf-Wach-Regulation und wie diese mit der Hirnentwicklung zusammenhängen. Dazu untersuchen wir gesunde Kinder und Jugendliche sowie klinische Populationen, welche zum Beispiel an Epilepsie oder ADHS erkrankt sind oder ein Schädel-Hirn-Trauma erlitten haben.</p> <p>Zur Untersuchung der Schlaf-Wach-Prozesse und deren Auswirkungen verwenden wir EEG (Elektroenzephalografie), MRT (Magnetresonanztomografie) und verschiedenste kognitive Tests und Fragebögen. Des Weiteren setzen wir neuromodulatorische Ansätze ein, um die Prozesse beeinflussen zu können, beispielsweise Schlafvertiefung durch akustische Stimulation (siehe Links, SleepLoop).</p>
Keywords	
Supervisor	Prof. Dr. Reto Huber
Institute	Interdisziplinäres Schlafzentrum, Entwicklungspädiatrie, Kinderspital ZH
E-mail	reto.huber@kispi.uzh.ch
Phone	044 266 81 60
Conditions	Interesse an neurowissenschaftlicher Forschung. Selbstständiges, zuverlässiges und sehr sorgfältiges wissenschaftliches Arbeiten. Hohe Teamfähigkeit und zeitliche Flexibilität. Freude im Umgang mit Kindern und Jugendlichen. Gute Deutschkenntnisse. Erfahrungen mit Matlab/R oder die Motivation, sich in diese einzuarbeiten, sind wünschenswert.
Links	www.kispi.uzh.ch/sleep , SleepLoop: https://www.hochschulmedizin.uzh.ch/de/projekte/sleeploop.html

Neurophysiology in spinal cord injury	
Short description	<p>Objective and quantitative measures of sensory, motor, and autonomic function based on electrophysiological techniques are promising tools to diagnose patients with spinal cord injury and to track their neurological recovery. My group is especially interested in neurophysiological measures of nociceptive processing which is ultimately applied in patients with neuropathic pain after spinal cord injury.</p> <p>Techniques: evoked potentials, noxious withdrawal reflexes, quantitative sensory testing, experimental pain paradigms</p>
Keywords	neurophysiology, neuropathic pain, autonomic nervous system, spinal cord injury
Supervisor	Dr. Michèle Hubli
Institute	Spinal Cord Injury Research Center
E-mail	michele.hubli@balgrist.ch
Phone	044 510 7203
Conditions	<ul style="list-style-type: none"> - BSc in Biomedicine / Biology incl. basic knowledge in neuroanatomy - independent working attitude, curious to learn something new, full commitment and motivation for the thesis - fluent in German and English
Links	https://www.sci-research.uzh.ch/en/aboutus.html

Ecology and health among the indigenous Tsimané of Bolivia	
Short description	The Tsimané have been extensively studied because their lifestyle - small communities, high physical activity, high pathogen load, high fertility - is radically different from modern societies, but resembles conditions of our evolutionary past. As a consequence, they can teach us much about the causes and risk factors for diseases of civilization. At the same time, Tsimané society is changing and facing new health challenges stemming from access to high-caloric foods (sugars, oils) or increasing social inequalities. Against this backdrop, various Master's projects can be designed; contact me with ideas!
Keywords	Human ecology, Human variation, Mismatch, Diseases of civilization, Life history
Supervisor Institute E-mail Phone	Prof Dr. Adrian Jäggi Institute of Evolutionary Medicine, University Zürich-Irchel adrian.jaeggi@iem.uzh.ch 044 635 50 40
Conditions	Experience with data manipulation and statistical analyses (especially using R) is strongly recommended; if field work is desired need to be in good physical condition, speak Spanish, be a team player, and enjoy working under challenging conditions - ideally already have field work experience
Links	www.iem.uzh.ch/en/research/human_ecology_group_jaeggi.html

Immunology, Immune Regulation	
Short description	The Joller lab focuses on understanding how immune responses and disease susceptibility are shaped by pathogen encounter. We mostly focus on understanding changes in immune regulation (regulatory cells and co-inhibitory receptors). Here we analyze how the regulatory T cell compartment changes with infection and how these changes affect the susceptibility to infection and other diseases. To address these questions, we use a wide variety of techniques including transcriptomics, high dimensional flow cytometry, in vitro and in vivo immunological assays, and animal models.
Keywords	immunology, immune regulation, T cells, checkpoint inhibitors, infection
Supervisor Institute E-mail Phone	Prof. Dr. Nicole Joller DQBM nicole.joller@uzh.ch 044 635 4945
Conditions	Students will have to work with mice and complete the LTK1 course
Links	https://www.dqbm.uzh.ch/en/research/joller.html

Cellular and molecular mechanisms of cardiac fibrosis and dysfunction	
Short description	<p>Cardiovascular diseases are a leading cause of mortality and morbidity in the developed countries with sudden cardiac death accounting for about 15-20% of all cause deaths. Sudden cardiac deaths are often the consequence of abnormal heart rhythms called arrhythmias. Clinical studies demonstrated that ventricular fibrosis represented a strong predictor of ventricular arrhythmia and sudden cardiac death in ischemic and non-ischemic cardiac conditions. Cardiac fibrosis, usually followed by cardiac inflammation, is characterized as an excessive accumulation of stromal cells/fibroblasts and extracellular matrix proteins in the myocardium leading to heart dysfunction. Research interests/projects in the lab:</p> <ul style="list-style-type: none"> • Role of stromal cell populations and fibrosis in myocardial remodelling • Role of autophagy and cellular senescence in myocardial dysfunction • Evaluation of fibrosis-triggered arrhythmia and heart functions • 3D human cardiac microtissue fibrosis/arrhythmia models using induced pluripotent stem cell (iPSC) and tissue-on-chip technology • Role of specific (similar or distinct) myeloid and stromal cell populations in multiorgan pathology
Keywords	cardiac inflammation, cardiac fibrosis, conduction system, fibroblast, myeloid cells, systemic sclerosis, 3D microtissue, autophagy.
Supervisor Institute E-mail Phone	<p>Prof. Dr. Gabriela Kania Center of Experimental Rheumatology, USZ, Wagistrasse 14, 8952 Schlieren gabriela.kania@uzh.ch 043 253 30 13</p>
Conditions	<p>Basic knowledge in molecular biology, cell culture, heart physiology, fibrosis. Methodology: range of conventional and molecular biology techniques such as primary cell isolation, cell culture, 3D cells culture, quantitative PCR, gene silencing and overexpression methods, Western Blot, ELISA, flow cytometry, immunofluorescence and immunohistochemistry, advanced microscopy, non-invasive electrocardiogram, high-speed video analysis, mouse models. On the other hand, it might be a valuable opportunity to be involved in the innovative and clinically oriented project that will give the basis for the future PhD thesis.</p>
Links	http://www.rheumatologie.usz.ch/forschung

Development and characterization of blood capillaries in tissue-engineered human skin substitutes	
Short description	<p>The survival of tissue-engineered skin substitutes during the initial phase after their transplantation depends on the rapid development of an adequate vascularization capable of delivering oxygen and nutrients throughout the engineered construct. This can be achieved through preforming blood capillaries in vitro (prevascularization). In this project, we aim to preform capillary networks in vitro using human dermal microvascular endothelial cells (HDMECs) or adipose-derived stem cells.</p>
Keywords	3D vascular networks, angiogenesis, endothelial cells, adipose stem cells, regenerative medicine
Supervisor Institute E-mail Phone	<p>Dr. Agnes Klar Tissue Biology Research Unit, Kinderspital Zurich, Campus Schlieren Agnes.Klar@kispi.uzh.ch 044 634 89 19</p>
Conditions	-
Links	http://www.skingeering.ch

Computational immunology and epidemiology of infectious diseases	
Short description	We offer a range of master projects at the interface of bioinformatics, virology, evolutionary biology, and the immunology of infectious diseases. The projects typically combine developing a computational or mathematical approach and applying this to complex biological or clinical data. Depending on inclination, interest, and skills, projects may be more data-driven or more computational-method-driven, may focus more on biological mechanism or more on public-health, and may investigate different systems and questions. Potential topics include: Characterizing transmission networks from genomic sequence data. Developing computational models for predicting the spread of antimicrobial or antiretroviral resistance. Assessing the utility of machine-learning approaches to analyze and understand complex immunological data. Develop mathematical models for the interaction between pathogens, microbiota, and the immune system. Inferring the determinants of broad antibody responses and identify the preconditions of a successful HIV vaccine.
Keywords	Infectious Diseases, Computational Approaches, Molecular Epidemiology, Immunometrics
Supervisor Institute E-mail Phone	Prof. Dr. Roger Kouyos Division of Infectious Diseases and Hospital Epidemiology roger.kouyos@uzh.ch 044 255 36 10
Conditions	
Links	https://www.virology.uzh.ch/de/aboutus/personend/forschungd/gkouyosd/kouyos.html https://www.usz.ch/en/clinic/infectiology/research/research-group-roger-kouyos/

Nucleosome footprints in cell-free DNA sequencing	
Short description	Cell-free DNA (cfDNA) is released by dying cells into the surrounding tissues and to the bloodstream. As nucleosomes protect DNA from degradation, plasma cfDNA carries information about the nucleosome organization in the cells of origin. Different characteristics of cfDNA are increasingly being used in the diagnostics of genetic diseases and the monitoring of cancer. We discern nucleosome footprints and infer the contribution of different cell / tissue types to cfDNA. In doing so, we aim to quantify cancer-derived cfDNA and detect inflammation in various tissue types.
Keywords	cfdna, cancer genomics, machine learning,
Supervisor Institute E-Mail Phone	Prof. Dr. Michael Krauthammer Department of Quantitative Biomedicine michael.krauthammer@uzh.ch
Conditions	Highly motivated students with coding experience in Python and R.
Links	https://krauthammerlab.ch/opportunity/masters-students/

Implication of microRNAs in age-related and endocrine myopathies	
Short description	<p>Skeletal muscle possesses a remarkable capacity to regenerate after disturbances like exercise or acute or chronic injury. Muscle regeneration is characterised by a well-timed network of different cell types providing an environment that allows the activation of muscle stem cells, called satellite cells (SCs) to regenerate the damaged tissue. One of the cell types involved in the regenerative stem cell niche are fibro/adipogenic progenitors (FAPs). Upon injury, FAPs enter the cell cycle and expand to produce cytokines and deposit extracellular matrix (ECM) to enhance differentiation of SCs into muscle fibers. In ageing as well as in pathological conditions such as muscular dystrophies, FAPs differentiate into adipocytes and contribute to fibrosis.</p> <p>Master thesis projectes are available to better understand the role of microRNAs in this process using mouse models for muscle regeneration and work with primary muscle cells from mice and humans.</p>
Keywords	Skeletal muscle regeneration, stem cell niche, ageing, miRNA, cell culture, flow cytometry, immunofluorescence
Supervisor Institute E-Mail Phone	<p>PD Dr. Jan Krützfeldt Klinik für Endokrinologie, Diabetologie und Klinische Ernährung Universitätsspital Zürich, Schlieren Campus jan.kruezfeldt@usz.ch 044 255 36 27</p>
Conditions	You should be (1) a team player, (2) familiar with cell culture and techniques in molecular biology (3) intrinsically motivated to be involved in research with interest in individual development into independence. Projects may include animal experiments.
Links	http://www.endokrinologie.usz.ch/forschung/seiten/rolle-der-mikrornas.aspx

Virulence evolution and novel treatments against opportunistic human pathogens	
Short description	We study bacterial opportunistic human pathogens such as Pseudomonas aeruginosa and Staphylococcus aureus. We combine approaches from microbiology, molecular biology and evolutionary biology to: (i) understand how pathogens evolve inside and outside the host and how this affects virulence; (ii) develop novel treatment approaches that target virulence factors, such as biofilm formation and quorum sensing; and (iii) combine these novel approaches with traditional antibiotics to come up with effective treatments against these pathogens.
Keywords	opportunistic human pathogens, bacterial infections, evolutionary, microbiology, antibacterial therapies, bacterial virulence factors
Supervisor Institute E-Mail Phone	<p>Prof. Dr. Rolf Kümmerli Department of Quantitative Biomedicine rolf.kuemmerli@uzh.ch 044 635 48 01</p>
Conditions	Good knowledge in microbiology
Links	https://www.dqbm.uzh.ch/en/research/groups/kuemmerli.html

Bridging the interfaces of engineering, biological and medical research	
Short description	<p>Research in biology and medicine is growing ever more multidisciplinary. Integrating engineering methods into biological and medical research provides new possibilities to investigate fundamental questions and establish new approaches for clinical needs. Following this vision, our group – The Interface Group - focuses on the interface between biology, medicine and biomedical engineering. We combine experimental methods with computational techniques to establish comprehensive models on the cellular, tissue, organ and organism level.</p> <p>Our current projects address challenges posed by pathologies in the cardiovascular system, the brain and the kidneys. They include the investigation of:</p> <ul style="list-style-type: none"> - Blood damage in artificial hearts - Mechanosensation of the vascular endothelium - Methods for non-invasive acquisition of intracranial pressure - Link between T cell distribution in CNS and Multiple Sclerosis <p>Open student projects are published on our group's website (see link below). However, we also encourage open applications if none of the published projects fit your current situation.</p>
Keywords	Biofluidics, Mechanobiology, Biophysics, Computational Biology, Artificial Intelligence, Cardiovascular Physiology, Vascular Biology, CNS Fluid Physiology
Supervisor	Prof. Dr. Vartan Kurtcuoglu
Institute	Institute of Physiology
E-Mail	vartan.kurtcuoglu@uzh.ch
Phone	044 635 50 55
Conditions	
Links	https://interfacegroup.ch/teaching/open-student-projects/

Decoding the role of nutrients on feeding behavior during obesity	
Short description	<p>In Switzerland, the part of the population obese has doubled (from 5% to 10%) over the last 20 years with a further 31% being overweight. The increasing consumption of high fat food is often correlated with the BMI increase. The complex and delicate control of food intake and glucose homeostasis involves the integration of signals directly reaching the brain (nutrients, humoral) and neural signals derived directly from vagal afferent intestinal innervation. The impaired ability of the brain to sense nutrient excess, in particular its ability to monitor and respond to alterations in fatty acid metabolism in individuals predisposed to becoming obese and in those already obese and diabetic is increasingly recognized as playing a role in the pathophysiology of these disorders.</p> <p>My group aims at deciphering the underlying mechanisms by which nutrients and particularly fatty acids act on astrocytes and neurons in the hypothalamus to alter food intake and metabolism. To achieve this aim we use multiple animal models (rat, transgenic mice) and state of the art techniques.</p>
Keywords	obesity, nutrients, rodents
Supervisor	PD Dr. Christelle Le Foll
Institute	Institute of Veterinary Physiology
E-Mail	christelle.lefoll@uzh.ch
Phone	044 635 88 36
Conditions	Master students willing to participate will learn the following skills and methods: primary cell culture; measure of behaviors in mice and rats; metabolic testing; histology; fluorescent microscopy; blood Elisa measurements; mRNA expression in brain tissue
Links	www.vetphys.uzh.ch

Neuroscientific approaches in neuro-urology	
Short description	The control of the lower urinary tract (LUT) requires intact nervous signal conduction and modulation at the peripheral level as well as in neuronal centres in the spinal cord and brain. Neuro-Urology deals with diseases and functional disorders of the LUT due to damage or lesion of the nervous system. In order to investigate neural correlates of LUT control we apply neuro-urological tests and treatments (e.g. neuromodulation), evoked potentials, electroencephalography (EEG), structural, diffusion and functional magnetic resonance imaging (MRI) in healthy adults and in patients with neurological disease.
Keywords	Neuro-Urology, lower urinary tract dysfunction, neurological diseases, neuroimaging, neurophysiology
Supervisor Institute E-Mail Phone	Dr. Martina D. Liechti Neuro-Urology, Balgrist University Hospital martina.liechti@balgrist.ch 044 386 3827
Conditions	We are looking for highly motivated and scientifically interested candidates to conduct clinical research joining neuroscience with neuro-urology in humans; willing to work in an interdisciplinary team (e.g. health care professionals, neuroscientists) at the Neuro-Urology and the Spinal Cord Injury Center, University of Zürich, and Balgrist University Hospital; holding BSc in Biomedicine, Biology incl. basic knowledge in neurosciences; with high interest in neuroscience research and data analysis; high commitment, availability and motivation for the thesis and independent working attitude; fluent in German and English
Links	https://www.sci-research.uzh.ch/en/aboutus.html

Mechanisms of DNA replication stress in liver cancer	
Short description	Hepatocellular carcinoma (HCC) is recognized as the predominant form of liver cancer which ranks as the 6th most common cancer and the 3rd most common cancer-related death worldwide. Genomic instability is a hallmark of HCC and although accumulating evidence suggests a pivotal role for replication stress in HCC onset, sources and mechanisms of replication stress in HCC remain elusive. The overall aim of this project is to decipher replication stress in HCC to develop potential therapeutic strategies for HCC patients. Thus, the first goal will be the development of HCC patient-derived organoids. Further, we will optimize and apply various molecular methods to uncover replication stress response in HCC. Additionally to the <i>in vitro</i> work, the student will gain knowledge in basic methods such as immunohistochemistry, protein extraction, western blotting and also in more specific molecular techniques such as DNA fiber spreading assay, comet assay and electron microscopy.
Keywords	Hepatocellular carcinoma, patients-derived organoids, genomic instability
Supervisor Institute E-Mail Phone	Prof. Dr. Massimo Lopes Institute for Molecular Cancer Research (IMCR), UZH, Irchel lopes@imcr.uzh.ch 044 635 34 67
Conditions	Motivation, team player, basic knowledge of molecular biology.
Links	https://www.imcr.uzh.ch/imcr/en/research/lopes https://www.imcr.uzh.ch/imcr/en/research/weber

Obesity, eating control and metabolic diseases

Short description	<p>Obesity and type 2 diabetes are worldwide health epidemics that dramatically increase metabolic and cardiovascular diseases. The control of food intake and body weight involves numerous hormones released from the gastrointestinal tract. Some of these hormones, like the pancreatic peptide amylin or GLP-1, contribute to the control of meal ending satiation. Other hormones, like leptin, reflect the amount of body fat stores. Our research focuses on the central neural pathways mediating amylin's anorectic action as well as on the interaction of amylin with other hormones. Experimental techniques include behavioral feeding studies, immunocytochemistry, and functional tests of the reward system. Further, by using indirect calorimetry, we can assess energy intake and energy expenditure simultaneously.</p> <p>In addition, we study various aspects of the role of bariatric surgery (Roux-en-Y gastric bypass) in improving metabolism. We are also interested in dissecting the molecular pathways of vascular disease in the development of type 2 diabetes, and the improvement of cardiovascular health after improvement of the cardiometabolic status, such as improvement of vascular dysfunction and HDL metabolism after gastric bypass surgery and weight-lowering pharmacotherapy in experimental animals and in human obese patients.</p>
Keywords	obesity; diabetes mellitus; cardiovascular disease; amylin; GLP-1
Supervisor	Prof. Dr. Thomas A. Lutz
Institute	Institute of Veterinary Physiology
E-mail	tomlutz@vetphys.uzh.ch
Phone	044 635 88 08
Conditions	Master students willing to participate in one or more of these projects will learn the following skills and methods: animal handling (rat, mouse) including in vivo tests of glucose and insulin sensitivity and animal necropsy; in vitro dissecting of molecular pathways by western blot, primary human endothelial cell culture, blood HDL isolation and characterization, various enzymatic and ELISA assays.
Links	www.vetphys.uzh.ch

Guiding T-cell Selectivity by novel targeted therapeutics	
Short description	Immunotherapy is an evolving and promising cancer treatment that engages the immune system to fight cancer. T-cells have become a central focus due to their ability of antigen-directed cytotoxicity. Two general cancer immunotherapy approaches relying on T-cell redirection have recently gained marketing authorization after having shown their value in numerous models of cancer: bispecific T-cell engaging and activating antibodies (TEAs) and chimeric antigen receptor (CAR) T-cells. Despite this early success, several limitations to the broad application of single-antigen targeting immunotherapies remain, including treatment related side effects often associated with cancer relapse with antigen-negative tumors and on-target, off-tumor toxicities. These effects may be detrimental in the context of solid tumors and hematopoietic stem and progenitor cell (HSPC) malignancies, where the heterogeneous antigen expression largely overlaps with healthy vital tissues. Aiming to overcome these challenges, research activities in our group focus on the development of novel safety modules able to tune T-cell and CAR-T cell potency with the potential to conditionally inactivate T-cell activity. We offer different MSc projects focused on developing and characterizing novel CAR-T cell or TEA modules in different tumor models.
Keywords	Immunotherapy, bispecific antibodies, CAR-T cells, adaptor guided, solid tumors
Supervisor Institute E-mail Phone	Prof. Dr. med. Markus G. Manz University Hospital Zurich - Experimental Hematology markus.manz@usz.ch +41 78 4032279
Conditions	
Links	https://www.usz.ch/fachbereich/medizinische-onkologie-und-haematologie/forschung/experimental-hematology-lab-prof-dr-med-markus-manz/

Neuronal and vascular responses to reduced oxygenation : physiology and pathology	
Short description	Efficient oxygen delivery to brain tissues is crucial for neuronal function and thus proper brain function. Hypoxia characterises a variety of physiological events but also contributes significantly to progression of pathogenesis and widespread diseases including, cancer, stroke and neurodegenerative disorders. When oxygen is limited cells activate key adaptive responses mediated largely by hypoxia-inducible factor-1 (HIF-1). We recently found that the multifunctional Rho GTPases are involved in the neuronal hypoxic response and likely modulate HIF stabilisation. Our group performs research investigating the molecular mechanisms of neuronal and vascular adaptation to oxygen deprivation with emphasis on the role of RhoGTPases in regulation of HIF-1 in primary neurons and other brain specific cells in disease states and during aging.
Keywords	
Supervisor Institute E-mail Phone	Dr. Lara Ogunshola Institute of Veterinary Physiology larao@access.uzh.ch 044 635 88 05
Conditions	Basic knowledge in molecular biology and/or medical physiology
Links	www.vetphys.uzh.ch

Dental Biomaterials and Digital Manufacturing Technologies	
Short description	<p>The use of dental materials has a broad application field ranging from toothpastes to oral implants or bone substitutes. Advances in the field of biomaterials and digital technologies changed the conventional applications in the dental profession and introduced many therapy options for tooth-, implant- and mucosa-borne restorations.</p> <p>Various research projects are available to participate such as a) optimizing design parameters, surface properties of materials, b) developing or improving subtractive and additive manufacturing technologies, c) testing mechanical, chemical and physical properties of dental biomaterials (i.e. ceramics, metals and polymers).</p> <p>The research interests in the field of dental biomaterials science in our research group mainly focus on development, application of artificial materials and digital manufacturing technologies. Materials are initially tested employing standard test methods followed by their exposure to simulated clinical conditions. Laboratory-testing conditions are being optimized with improved translational significance in an attempt to diminish clinical failures and establish clinical protocols.</p>
Keywords	Additive technologies, Adhesion, Ceramics, Dental biomaterials, Digital technologies
Supervisor	Prof. Dr. Dr. h.c. Mutlu Özcan, PhD
Institute	University of Zurich, Center of Dental Medicine, Division of Dental Biomaterials
E-mail	mutlu.ozcan@zsm.uzh.ch
Phone	+41 78 948 69 39
Conditions	Physical presence at lab work
Links	https://www.zsm.uzh.ch/en/research/topics/03/01.html https://www.zsm.uzh.ch/en/research/staff/oezcan-mutlu.html https://www.researchgate.net/profile/Mutlu_Oezcan

Keratinocyte lineages in human epidermal autografts	
Short description	<p>Epidermal self-renewal in native skin or epidermal autografts indispensably requires the presence of unipotent stem cells. This particular keratinocyte population is thought to reside in the basal layer of the interfollicular epidermis. The existence of different lineages of epidermal keratinocytes appears evident, but the identification of stem cells is still pending, since no reliable immune markers are available. Using a lentiviral expression system this project aims at the definition of the role of particular keratinocyte lineages and eventually at the identification of self-renewing epidermal keratinocytes.</p>
Keywords	
Supervisor	Dr. Luca Pontiggia
Institute	Tissue Biology Research Unit, Kinderspital Zürich
E-mail	luca.pontiggia@kispi.uzh.ch
Phone	044 634 89 12
Conditions	-
Links	www.skengineering.ch

Strahlenresistenz auf molekularer und zellulärer Ebene	
Short description	Schädigung der DNA ist die wichtigste Ursache für den Strahleninduzierten Zelltod. Während den letzten Jahren zeigte die moderne Krebsforschung jedoch, dass ionisierende Strahlung auch Signalübermittlungskaskaden unabhängig von der DNA-Schädigung in der Zelle auslöst, welche das Therapieansprechen und die Therapieresistenz massiv mitbestimmen. Das Ziel unserer Projekte ist a) die molekulare und zellbiologische Untersuchung solcher strahleninduzierten Signalübermittlungskaskaden in genetisch-kontrollierten und klinisch-relevanten Tumormodellen, und b) die Entwicklung von Kombinationstherapie-modalitäten mit klinisch-relevanten Substanzen, die zur Ueberwindung der Strahlenresistenz führen.
Keywords	
Supervisor	Prof. Dr. Martin Pruschy
Institute	Labor Molekulare Radiobiologie, Universitätsspital Zürich
E-mail	martin.pruschy@usz.ch
Phone	044 255 85 49
Conditions	
Links	http://www.cnz.uzh.ch/pruschy.html

Animal models for psychopathologies and their treatment	
Short description	Animal studies provide critical insights into the aetio-pathogenesis of stress-related psychiatric states. Our approach is to study the effects of chronic social stress (CSS) on neurobehavioural states in mice, at the inter-dependent levels of cell populations, neural circuits and behaviour. We focus on increasing understanding of the aetio-pathogenesis and pharmacological treatment of specific trans-diagnostic psychopathologies, including reduced interest in reward, apathy, aversion hyper-sensitivity and deficient environmental control.
Keywords	Animal model, stress, neural recoding, behaviour, pharmacology
Supervisor	Prof. Dr. Christopher Pryce
Institute	University Clinic for Psychiatry, UZH
E-mail	christopher.pryce@bli.uzh.ch
Phone	044 634 8921
Conditions	Reward and aversion learning and motivation pathologies
Links	

Epidemiology	
Short description	We conduct cohort studies, randomized controlled studies and modelling studies in five topic areas (chronic lung disease, cancer, multiple sclerosis, myocardial infarction and currently also COVID 19). The studies address questions on burden of disease, prognosis, treatment and health care epidemiology). Closely related we have a focus on key determinants of health and disease for these chronic conditions like physical activity and nutrition. Methods include the study designs mentioned above and a broad range of regression-based approaches and modelling for benefit harm balance, causal inference and predictions.
Keywords	
Supervisor	Prof. Dr. Milo Puhan
Institute	Institut für Epidemiologie, Biostatistik und Prävention
E-mail	miloalan.puhan@uzh.ch
Phone	044 634 46 10
Conditions	
Links	https://www.ebpi.uzh.ch/en/translational_research.html

Gene Therapy for Hematologic Disorders	
Short description	We develop gene- and cell therapies (lentiviral vectors, adeno-associated viral vectors, CRISPR-based genome editing) for treating various hematologic-based genetic disorders. We are also interested in unravelling the molecular mechanisms underlying these diseases, which range from primary immunodeficiencies to neurodegeneration and cancer. We work on both in vitro and in vivo models, based on human and murine cells. Different cell types are employed to test the activity of our vectors and to develop functional assays that quantify the efficacy of our gene therapies.
Keywords	Gene therapy; hematopoiesis, viral vectors; CRISPR; iPSC
Supervisor	Prof. Dr. med. Janine Reichenbach
Institute	Institute for Regenerative Medicine
E-mail	janine.reichenbach@irem.uzh.ch
Phone	+ 41 44 634 88 67
Conditions	preferably previous lab experience
Links	https://www.irem.uzh.ch/en/research/Group-J.-Reichenbach.html

Pluripotent stem cell-derived organoid models to study inner ear development and model disease	
Short description	<p>Loss or damage of inner ear sensory cells results in permanent hearing deficit. The long-term goal of our research is to develop novel therapeutic strategies to counteract sensorineural hearing loss by uncovering fundamental biological principles that underlay development and disease.</p> <p>We are making use of in vitro models known as “inner ear organoids”, derived from differentiation of pluripotent stem cells (PSCs), to gain insight into inner ear sensory organ development and we use them as unique tools to model disease. By leveraging recent advances in bioengineering, organoid culture and organ-on-chip technology, we aim to develop reproducible and robust models to validate novel drug-based or gene-based therapeutics for hearing restoration.</p>
Keywords	Inner ear development, Hearing loss, Neuroscience, Disease Modeling, iPSC-organoids
Supervisor Institute E-mail Phone	PD Dr. Marta Roccio Department of Otorhinolaryngology, Head and Neck Surgery, USZ marta.roccio@usz.ch 043 253 3278
Conditions	<p>We are looking for master student(s) interested in stem cell biology and tissue regeneration to help develop in vitro models of the inner ear sensory components.</p> <p>The laboratory is located at the Schlieren Campus, Wagistrasse 18 in a totally new lab space. Microscopy and flowcytometry facility of UZH on campus. Techniques: stem cell culture, immunostaining, microscopy, molecular biology</p>
Links	https://www.scopus.com/authid/detail.uri?authorId=24345169900 https://www.ipsc-research.uzh.ch/en/Research-groups/Sensory-organs.html

Next-generation cell therapy to promote functional recovery following stroke	
Short description	<p>Cell-based therapies are emerging as a novel and promising treatment paradigm following stroke. Major bottlenecks of current cell therapies is the correct migration and homing of the transplants in the damaged brain circuits. In our group, we genetically engineer and functionalize iPSC-derived human neuronal progenitor cells and transplant them into mouse models of stroke. The efficacy of cell transplantation is assessed using state-of-the-art in vivo imaging and functional testing</p>
Keywords	neuroscience, stroke, cell therapy, iPSCs, regeneration
Supervisor Institute E-mail Phone	Dr. Ruslan Rust Institute for Regenerative Medicine (IREM) ruslan.rust@irem.uzh.ch 044 635 7682
Conditions	LTK 1 course
Links	https://www.irem.uzh.ch/en/research/Group-NitschHoerstrup/AGITA.html

Mycobacterium abscessus - physiology and resistance	
Short description	Mycobacterium abscessus is an emerging pathogen from the group of non-tuberculous mycobacteria. Pulmonary infections caused by M. abscessus are difficult to treat due to a broad range of antibiotic resistance determinants against broad-range as well as tuberculosis-specific drugs. We are interested in the molecular mechanisms of resistance and the physiology of M. abscessus. We generate and characterize isogenic mutants for growth, drug susceptibility and interaction with host cells.
Keywords	Mycobacterium abscessus, drug resistance, genetics, physiology
Supervisor	Prof. Dr. Peter Sander
Institute	Institute of Medical Microbiology, University of Zurich
E-mail	psander@imm.uzh.ch
Phone	044 634 26 84
Conditions	strong background in microbiology, molecular biology, work with BSL2 pathogens
Links	https://www.imm.uzh.ch/de/research/experimental/sander.html

Human intracranial recordings to understand epilepsy and cognitive processes	
Short description	Epilepsy surgery is among the most efficient treatment options to achieve seizure freedom. Our research on intracranial recordings before and during surgery aims to improve seizure outcome. We analyze recordings from the cerebral cortex, the hippocampus and the amygdala to detect electrophysiological signatures of epileptogenic brain tissue. In addition, we record while patients perform cognitive tasks. The analysis of local field potentials and the firing of single neurons helps us to understand the electrophysiological mechanisms that underlie higher cognitive functions like memory or emotion in humans.
Keywords	intracranial EEG, epilepsy surgery, single neuron firing, working memory
Supervisor	Prof. Dr. Johannes Sarnthein
Institute	Klinik für Neurochirurgie, Universitätsspital Zürich
E-mail	johannes.sarnthein@usz.ch
Phone	044 255 56 72
Conditions	Interest in neuroscience, Matlab experience or willingness to learn
Links	https://www.ini.uzh.ch/~johannes/

Crosstalk between tissue-resident immune cells and their tissue niche environment	
Short description	Tissue-resident immune cells play key roles in organ physiology by their cross-talk with non-immune cells. Our lab has a strong interest in type 2 immune pathways, including ILC2s and epithelial tuft cells, and we explore the molecular mechanisms, which mediate critical sentinel function in detection of tissue perturbation (i.e. parasitic infections and injury) and regulation of tissue remodeling. Available master thesis projects will deal with the identification of processes that regulate the communication between tissue-resident immune cells and their tissue niche environment, with some focus on macrophage and ILC2 biology, in particular in the lung and intestine. Techniques include multiparameter flow cytometry, fluorescence microscopy, <i>in vivo</i> and Tg mouse models, <i>in vitro</i> organoids.
Keywords	Immunity, Tissue-resident immune cells, ILC2, Tuft cells, Parasitic infections, Transgenic mouse models
Supervisor Institute E-mail Phone	Prof. Dr. Christoph Schneider UZH, Institute of Physiology, Immunophysiology Group christoph.schneider@uzh.ch 044 635 50 40
Conditions	You should be (1) interested in immunology/physiology, (2) a team player, (3) intrinsically motivated to explore basic research, (4) familiar with basic immunology.
Links	https://www.physiol.uzh.ch/en/research/institutegrups/grschneider.html

Improvement and application of novel genome editing tools	
Short description	Genome editing represents an attractive approach for the treatment of monogenic diseases. Our laboratory focuses on developing and applying CRISPR-Cas-based genome editing tools, including base editors and prime editors. We aim to improve these technologies by rational design and directed protein evolution and apply them <i>in vivo</i> to treat liver and brain disorders. Prospective MSc students will get a comprehensive insight into the world of synthetic biology and genome editing by learning a broad set of skills such as molecular cloning, mammalian cell culture, next-generation sequencing, data analysis (Python), and more. Please refer to our website or contact the PI for a more detailed description of the available projects.
Keywords	Genome editing, prime editing, base editing, protein engineering, directed evolution
Supervisor Institute E-mail Phone	Prof. Dr. Gerald Schwank Institute of Pharmacology and Toxicology, UZH Irchel Campus gerald.schwank@pharma.uzh.ch 044 635 59 26
Conditions	We are looking for highly motivated students that are willing to push the boundaries of currently existing genome editing tools. Students should be collaborative, curiosity-driven, and excited to work in a team with young scientists. Prior knowledge of the techniques described above is an advantage.
Links	https://schwanklab.org/people/open-positions/

Thesis Projects in the Neuroscience of Pain	
Short description	The Integrative Spinal Research group (ISR) at the Balgrist Campus studies pain processing and pain modulation in chronic patients and healthy controls using behavioral and neuroimaging techniques. We offer two types of Master projects: I1] For candidates who wish to gain experience with experimental techniques, a psychophysical and/or neuroimaging project an emphasis on data acquisition. I2] For candidates with a computational background, a project focusing on data-analysis (data-driven techniques, machine learning) and computational modeling on acquired data sets.
Keywords	neuroimaging, fMRI, data analysis, modeling, neuroscience, pain
Supervisor Institute E-mail Phone	Prof. Dr. Petra Schweinhardt UZH Department of Chiropractic Medicine, Balgrist Campus isr@balgrist.ch 044 510 73 81
Conditions	High commitment and availability to work, strong motivation, and high interest in neuroscience research and/or data analysis, with interest in individual development into independence
Links	https://www.balgrist.ch/en/research/research-units/research-chiropractic/

Infectious diseases in Switzerland in the 20th century (pandemics, childhood diseases, etc.)	
Short description	Quantitatively, infectious diseases have been under-researched in Switzerland in the 20th century. This is mainly due to the fact that data have not been accessible until now. We changed this last year by digitizing larger amounts of historical data series from the 20th century. These data allow us to reconstruct outbreaks and to look at the impact of interventions (non-pharmaceutical measures, vaccinations, etc.). The topics announced here will complete selected data series (data transcription) and then analyze them for the first time. Possible topics include pandemics (1890, 1918, 1957, etc.) and childhood diseases. Statistical support is provided.
Keywords	Historical Epidemiology, Evolutionary Medicine
Supervisor Institute E-mail Phone	PD Dr. Kaspar Staub (Head Anthropometrics & Historical Epidemiology Group) Institute of Evolutionary Medicine kaspar.staub@iem.uzh.ch 044 635 05 13
Conditions	Interest in historical data/topics and quantitative methods
Links	https://www.iem.uzh.ch/en/research/anthropometrics_scanlab_group_staub.html

Host cell entry of influenza viruses	
Short description	Influenza viruses are of high medical and economic concern in humans. While we have vaccines and antiviral drugs available both come with severe limitations. A novel strategy currently being explored is to target host cell proteins that the virus requires for its replication. To identify such potential drug targets a detailed understanding of virus-host interactions at a molecular level is needed. With our work, we aim to identify host factors involved in the viral entry process and characterize their mode of action with the overall goal of revealing novel drug targets.
Keywords	influenza virus, antivirals, virus entry
Supervisor Institute E-mail Phone	Prof. Dr. Silke Stertz Institute of Medical Virology Winterthurerstrasse 190 8057 Zürich stertz.silke@virology.uzh.ch 044 634 28 99
Conditions	Interest and solid background in virology (BIO615 needs To be included in learning agreement)
Links	https://www.virology.uzh.ch/de/research/gstertz.html

Modeling and treating brain diseases with induced pluripotent stem cells (iPSCs)	
Short description	Our group applies human induced pluripotent stem cells, iPSCs, for modelling human brain diseases and for regenerative therapies. Using iPSCs expressing different risk genes for Alzheimer's disease (AD), we aim to uncover AD pathomechanisms in iPSC-derived neurons and astrocytes. We further establish protocols for the differentiation of iPSCs into clinically-relevant neural progenitor cells to develop next-generation cell-based therapies for brain diseases such as stroke.
Keywords	
Supervisor Institute E-mail Phone	Dr. Christian Tackenberg Institute for Regenerative Medicine – IREM christian.tackenberg@irem.uzh.ch 044 634 09 29
Conditions	The applicant should show high motivation and dedication to perform research at high quality. Very good English skills, both oral and written, are expected. Experience in cell culture is of advantage.
Links	https://www.irem.uzh.ch/Tackenberg

The Impact of High Altitude on Cancer Growth	
Short description	<p>Living at high altitude (HA) correlates with reduced cancer mortality in humans independent of ethnicity and socio-economical environment. Although the reasons and underlying mechanisms are unknown, we hypothesize that the systemic adaptation to hypoxia is involved in preventing cancer formation and tumor proliferation.</p> <p>For this master thesis we generated tumor-bearing mice (allografts) that will be exposed to hypoxia and HA to test tumor proliferation and response to chemotherapy. Studies will be conducted in our lab (Hypoxia Chamber to mimic high altitude) and at the Jungfrauoch research station (3500 m above sea level).</p>
Keywords	Jungfrauoch, High Altitude, Hypoxia, Cancer, Animal Study
Supervisor	Dr. Markus Thiersch
Institute	Institute of Veterinary Physiology
E-mail	markus.thiersch@uzh.ch
Phone	044 635 88 16
Conditions	We are looking for biology, medical or veterinary students. First experiences in animal experimentation are appreciated but not mandatory.
Links	www.vetphys.uzh.ch

HIV-1 vaccine development	
Short description	<p>HIV-1 infection remains a tremendous health burden worldwide. Antiretroviral treatment is highly effective in suppressing HIV-1 replication, but cannot cure the infection and thus needs to be taken life-long. The development of a protective vaccine remains thus the ultimate goal to reduce HIV-1 spread. Broadly neutralizing antibodies (bnAbs) that inhibit genetically diverse HIV-1 strains are considered a critical component of a protective vaccine that is active against circulating HIV-1 subtypes worldwide. bnAbs are rare in HIV-1 infection and thus far cannot be elicited by vaccination. In our work we aim to identify bnAbs in infected individuals, define the determinants of their induction, characterize the bnAbs' activity and define their mode of action. By studying the HIV strains that co-evolved in these patients we retrieve information on the immunogens that gave rise to the bnAb response. Collectively, the gained information will be used to create novel bnAb inducing immunogens and bnAb therapeutics. Learning from the natural occurring bnAbs, we develop in parallel entry inhibitors, that share the capacity of bnAbs in blocking a wide range of diverse HIV-1 strains.</p>
Keywords	HIV-1, vaccine, entry, inhibitor design, neutralizing antibody
Supervisor	Prof. Dr. Alexandra Trkola
Institute	Institute of Medical Virology Winterthurerstrasse 190 8057 Zürich
E-mail	trkola.alexandra@virology.uzh.ch
Phone	044 634 53 80
Conditions	Interest and solid background in virology (BIO615 needs To be included in learning agreement)
Links	https://www.virology.uzh.ch/de/research/gtrkolad.html

GABAergic Inhibition: A case for dynamic thinking	
Short description	My lab's research has played a significant role in shaping the idea that scaffolding protein phosphorylation can contribute to dynamic GABAergic inhibition, allowing flexible, input-specific adaptations of excitatory cells. Over the years, our research projects have offered unique perspectives to synaptic processes and consistently linked molecular mechanisms to a broad spectrum of diseases, namely bipolar disorder, intellectual disability, stroke, circadian and sleep regulation. We have obtained evidence to show that the scaffolding protein gephyrin acts as a signalling hub regulating sleep. In recent years, analysis of gephyrin phosphorylation in interneuron subtype has unravelled its role in sex dimorphic hippocampal circuit development and Autism. We employ diverse molecular, imaging, biochemical and functional techniques to address these exciting questions.
Keywords	synaptic plasticity, molecular mechanisms, protein modifications for brain function, GABAergic inhibition
Supervisor	Dr. Shiva Tyagarajan
Institute	Pharmacology and Toxicology
E-mail	tyagarajan@pharma.uzh.ch
Phone	044 635 59 97
Conditions	The lab members come from diverse ethnic backgrounds adding to the collaborative and fun working atmosphere. We are looking for friendly, curiosity driven students motivated to challenge oneself, learn new techniques and collaborate with the team, thus contributing to the fun learning experience.
Links	https://www.pharma.uzh.ch/en/research/neurodevelopmental pharmacology/projects.html

Mediators of vasoprotective or antidiabetic functions of high density lipoproteins (HDL)	
Short description	Low plasma levels of HDL cholesterol are associated with increased risk of coronary heart disease (CHD) or diabetes. HDL particles exert many effects on vascular cells as well as insulin producing and reactive cells which may explain these inverse associations. Nevertheless, HDL has not been exploited for prevention or treatment of CHD or diabetes. An important reason for this shortfall is the structural and functional complexity of HDL particles, which carry hundreds of lipid species and proteins. By a systems biology approach our lab has identified several candidates (lipids and proteins) that are undergoing mechanistic validation in cell culture experiments
Keywords	Atherosclerosis, diabetes, endothelial cells, beta cells, HDL
Supervisor	Prof. Dr. Arnold von Eckardstein
Institute	University Hospital Zurich, Institute for Clinical Chemistry
E-mail	arnold.voneckardstein@usz.ch
Phone	044 255 22 60
Conditions	none
Links	https://www.ncbi.nlm.nih.gov/pubmed/31830004

The kidneys, phosphate and acid-base in health and disease	
Short description	Our group studies the regulation and relevance of phosphate metabolism and acid-base balance, two major homeostatic functions affecting virtually all cells and organs in the mammalian body. We combine state-of-the art technologies, cell culture and animal experiments with studies in healthy human subjects and patients to uncover the genetic basis, the impact of nutrition and metabolism, and the neuro-endocrine regulators of these functions. We are interested in studying the normal physiology, but also the development and consequences of diseases affecting phosphate or acid-base metabolism and to develop or test novel therapies. We are involved in several clinical studies and cooperate with various pharmaceutical companies. Organs of special interest are the kidneys, bone, the gastrointestinal system, and various endocrine organs. For more details on possible master thesis topics and background information, please visit our homepage (link below).
Keywords	Kidney, nutrition, bone, chronic kidney disease, cardiovascular disease, bone health, hormonal regulation, kidney stones, aging
Supervisor	Prof. Dr. Carsten Wagner
Institute	Institute of Physiology
E-mail	carsten.wagner@physiol.uzh.ch
Phone	044 635 50 23
Conditions	BSc in Biology, Biomedicine or related subjects. Some projects can involve animal experiments, in these cases the LTK1 module may be helpful but can be taken during the master studies.
Links	https://www.physiol.uzh.ch/en/research/institutegroups/Acidbasetransport.html

Cellular Oxygen Physiology	
Short description	The ability of cells to sense and respond to reduced oxygen conditions (hypoxia) is crucial for many (patho-)physiological processes. Hypoxia leads to the activation of the hypoxia-inducible transcription factor (HIF). In normoxia, the HIF alpha subunit is hydroxylated by HIF hydroxylases and rapidly inactivated/degraded. The elucidation of these molecular mechanisms has recently been awarded with the Nobel Prize in Physiology or Medicine. Our goals are to understand how oxygen-sensing protein hydroxylases are regulated and to identify novel hydroxylation targets. Ongoing projects deal with the cross-talk between asparagine hydroxylation and protein (de-)ubiquitination, oxygen sensing and erythropoietin regulation in the kidney, and the pathophysiology of fibrotic processes during chronic kidney disease.
Keywords	Chronic Kidney Disease, Erythropoietin, Hypoxia, Tissue Fibrosis , Ubiquitination
Supervisor	Prof. Dr. Roland H. Wenger
Institute	Institute of Physiology
E-mail	roland.wenger@access.uzh.ch
Phone	044 635 50 65 / 044 635 50 75
Conditions	Good knowledge of biochemistry, molecular and cell biology
Links	https://www.physiol.uzh.ch/en/research/institutegroups/CellularOxygenPhysiology.html

Automated cognitive assessment of mice in a social setting	
Short description	Our group has developed the IntelliCage, an apparatus permitting to assess and record cognitive performance of mice in a social setting with minimal exposure to stress. In a typical master project we expect that individual cognitive abilities of mice will be assessed both in the IntelliCage and in conventional individual tests such as swimming navigation or Pavlovian conditioning, permitting to validate novel IntelliCage protocols. Behavioral parameters may also be correlated to neuroanatomical measures obtained after histological processing of the brains.
Keywords	learning and memory, mouse models, cognition, behavior
Supervisor	Prof. Dr. David P. Wolfer
Institute	Anatomisches Institut, Universität Zürich, Campus Irchel
E-mail	dpwolfer@anatom.uzh.ch
Phone	044 635 53 60
Conditions	Interest in behavioural research with mice, computer skills, basic knowledge of statistics
Links	http://www.uzh.ch/anatom/forschung/f_forschung_e.htm

Cell death signaling and immune response	
Short description	Our research focuses on identifying how internal circuitry of the cell regulates programmed cell death, cytokine production and release. This includes understanding how post-translational modifications in protein complexes can affect the production of cytokines, remove damaged organelles and allow immune cells to function in response to sterile or pathogenic stimulation. To do this, we utilize primary cells isolated from genetically modified mice for transcriptomics, imaging and biochemical techniques and in vitro and in vivo models of infection and cancer.
Keywords	Cell death signaling, inflammasome, immune response, mitochondrial signaling
Supervisor	Prof. Dr. W. Wei-Lynn Wong
Institute	Department of Molecular Life Sciences
E-mail	lynn.wong@uzh.ch
Phone	044 635 37 20
Conditions	Students will enroll in LTK Module 1 and work with mice
Links	www.thewonglab.com

Applied BioNMR	
Short description	In the Zerbe lab we are interested in investigating the molecular mechanisms of different protein systems such as novel Thanatin-derived antibiotics, G-protein coupled receptors, metallothionines, cancer-driver protein MYC and repeat proteins (Armadillo, DARPin). Using NMR spectroscopy, we provide atomic-level insight into the structure and dynamics of these systems and aim to infer their structure-function relationships and what implications these might have on health and disease.
Keywords	cancer, biochemistry, protein expression, NMR spectroscopy
Supervisor	Prof. Dr. Oliver Zerbe
Institute	Department of Chemistry, UZH
E-mail	oliver.zerbe@chem.uzh.ch
Phone	044 635 42 63
Conditions	Interest in biochemical work, biophysical studies (NMR), cutting-edge biochemical tools, in close collaboration with an experienced postdoc (no prior knowledge or experience on NMR required)
Links	https://www.zerbe-lab.org/

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