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 *must* 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

Mucosal immunology of the gastrointestinal tract	
Short description	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. 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.
Keywords	Eosinophils, mucosal immunology, inflammatory bowel diseases, colorectal cancer, microbiota
Supervisor **Institute** **E-mail** **Phone**	Prof. Isabelle Arnold Institute of Experimental Immunology, Mucosal Immunology Group arnold@immunology.uzh.ch 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	Our projects focus on the investigation of microbial genetic diversity for applications in the clinic and in forensics. On the one hand, examing 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.
Keywords	microbiome, forensic body fluid identification, epidemiology, bacterial communities, next-generation sequencing
Supervisor **Institute** **E-mail** **Phone**	Dr. Natasha Arora Institute of Forensic Medicine, IRM/Forensic Genetics natasha.arora@irm.uzh.ch 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 **Institute** **E-mail** **Phone**	Prof. Dr. med. Ruxandra Bachmann Institute of Medical Genetics ruxandra.bachmann@mls.uzh.ch 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 **Institute** **E-mail** **Phone**	Prof. Dr. Martin Baumgartner University Children's Hospital Zürich, Oncology Martin.Baumgartner@kispi.uzh.ch 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	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 (*or words in the complex language*) between immune cells. Our goal is to uncover this communication network and to translate the ***language of the immune system*.** 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). Our main research interests can be categorized as such: • **Cytokine networks** in chronic inflammatory disease with a focus on *multiple sclerosis, psoriasis, graft-versus host disease* 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 We offer several MSc positions on various projects in the research team
Keywords	Cytokines, lymphocytes, single cell technologies, transgenic mice, chronic inflammation
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Burkhard Becher University of Zurich, Institute of Experimental Immunology, Inflammation Research becher@immunology.uzh.ch 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	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.
Keywords	Evolutionary Medicine, Nutrition, Obesity, Body composition, Diet
Supervisor **Institute** **E-mail** **Phone**	PD Dr. Dr. med. Nicole Bender Institute of Evolutionary Medicine nicole.bender@iem.uzh.ch 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 **Institute** **E-mail** **Phone**	Dr. Beat Bornhauser Dept of Oncology, University Children's Hospital beat.bornhauser@kispi.uzh.ch 044 634 88 17
Conditions	Commitment and motivation
Links	https://www.kispi.uzh.ch/forschungszentrum/forschungsgebiete/onkologie/leukaemie

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-type 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 **Institute** **E-mail** **Phone**	Prof. Dr. Lubor Borsig Institute of Physiology lborsig@access.uzh.ch 044 635 51 34
Conditions	Seeking a motivated student with basic knowledge of immunology. The project may include mouse models.
Links	https://www.physiol.uzh.ch/en/research/departmentgroups/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 **Institute** **E-mail** **Phone**	Prof. Dr. Lubor Borsig Institute of Physiology lborsig@access.uzh.ch 044 635 51 34
Conditions	Seeking a motivated student. The project may include mouse models.
Links	https://www.physiol.uzh.ch/en/research/departmentgroups/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 **Institute** **E-Mail** **Phone**	Prof. Dr. Onur Boyman Dept. of Immunology, University Hospital Zurich, University of Zurich onur.boyman@usz.ch +41 44 255 20 69
Conditions	none
Links	http://www.boymanlab.com

Cognitive neuroscience in childhood and adolescence	
Short description	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).
Keywords	neuroimaging, EEG, (f)MRI, children, learning
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Silvia Brem Department of Child and Adolescent Psychiatry and Psychotherapy, Psychiatric Hospital, University of Zurich sbrem@kjpd.uzh.ch 043 499 27 60
Conditions	Very good knowledge of German is essential for the work with children and their families
Links	https://www.kjpd.uzh.ch/de/transl-forschung/kog-neuro/team/leitung-kogn-neurow/brem

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 **Institute** **E-Mail** **Phone**	Prof. Dr. Thorsten Buch Institute of Laboratory Animal Science, University of Zurich Wagistrasse 12, 8952 Schlieren jane.beil-wagner@uzh.ch 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 dysfuctional 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 dysfnction and age-dependent cardiovascular diesease. 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 **Institute** **E-mail** **Phone**	Prof. Dr. Giovanni G. Camici Center for Molecular Cardiology, UZH, Schlieren Campus giovanni.camici@ uzh.ch 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 **Institute** **E-mail** **Phone**	PD Dr. Paolo Cinelli Department of Trauma Surgery, University Hospital Zurich paolo.cinelli@usz.ch 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 **Institute** **E-mail** **Phone**	Prof. Dr. Armin Curt Spinal Cord Injury Research Center marc.bolliger@balgrist.ch 044 510 7201
Conditions	- 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

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 **Institute** **E-mail** **Phone**	Prof. Dr. Daniel Eberli University Hospital Zürich, Department of Urology, Souzan.salemi@usz.ch 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

Molecular Mechanisms of Retinal Degeneration	
Short description	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. Available projects will investigate aspects of molecular mechanisms during retinal degeneration or refine therapeutical approaches to rescue vision.
Keywords	Retina, gene therapy, CRISPR/Cas9, molecular signalling, vision
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Christian Grimm Lab for Retinal Cell Biology/Dept Ophthalmology, University Hospital Zurich cgrimm@opht.uzh.ch 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	Das Clinical Trials Center verfügtüber 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.
Keywords	Klinische Forschung, Humanforschung, Good Clinical Practice, Studiendesign, Clinical Development
Supervisor **Institute** **E-mail** **Phone**	Dr. med. Regina Grossmann Clinical Trials Center, UniversitätsSpital Zürich regina.grossmann@usz.ch 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	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. 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.
Keywords	cell culture, drug treatment, (epi)genetic, iPSC-derived neurons, mental disorders, neurodevelopment, pharmacology, psychiatry, transcriptomic.
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Edna Grünblatt Translational Molecular Psychiatry; Department of Child and Adolescent Psychiatry and Psychotherapy (KJPP), Univ. Hospital Psychiatry ZH (PUK) edna.gruenblatt@kjpd.uzh.ch 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/translationale-molekularpsychiatrie.html

Innate Immunity and Human Respiratory Viruses	
Short description	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.
Keywords	Interferon, influenza, signaling, immunity, proteomics
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Benjamin G. Hale Institute of Medical Virology hale.ben@virology.uzh.ch 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	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. 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.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	PD Dr. med. Dr. sc. nat. Martin Häusler Institut für Evolutionäre Medizin martin.haeusler@iem.uzh.ch 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 **Institute** **E-mail** **Phone**	Prof. Dr. Martin Hausmann UniversityHospital Zurich, Department for Gastroenterology and Hepatology, Raemistrasse 100, 8091 Zurich martin.hausmann@usz.ch 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	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. 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.
Keywords	glycobiology, sialic acid, siglec, inflammation, antibodies
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Thierry Hennet Institute of Physiology thierry.hennet@uzh.ch 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 **Institute** **E-mail** **Phone**	Prof. Dr. Martin Hersberger Division of Clinical Chemistry and Biochemistry University Children's Hospital Zürich Steinwiesstrasse 75, 8032 Zürich martin.hersberger@kispi.uzh.ch 044 266 75 41
Conditions	None
Links	Klinische Chemie und Biochemie (uzh.ch)

Virulence and communication of the amoeba-resistant bacterial pathogen Legionella pneumophila	
Short description	Legionella pneumophila is a Gram-negative bacterium, which replicates in environmental amoeba and lung macrophages, thereby triggering a severe pneumonia termed Legionnaires' disease. The opportunistic pathogen subverts host cell functions by injecting more than 300 different "effector proteins", which modulate pivotal host processes and promote the formation of a unique replication compartment, the "Legionella-containing vacuole" (LCV). Current research in our lab focuses on the (i) mechanisms of pathogen-host cell interactions and mode of action of novel effector proteins, (ii) cell-cell communication by small signaling molecules, (iii) persistence (dormancy) and resuscitation mechanisms, and (iv) One Health aspects of different Legionella species. To this end, we use a broad range of techniques including bacterial genetics, confocal fluorescence microscopy, (imaging) flow cytometry, protein and lipid biochemistry, and structural biology.
Keywords	Cell biology of infection, innate immunity, intracellular bacteria, pathogen-host cell interactions, signaling molecules
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Hubert Hilbi Institute of Medical Microbiology hilbi@imm.uzh.ch Tel.: 043 634 26 50
Conditions	Highly motivated individuals with an interest and background in Micro-biology, Biochemistry, Cell Biology, or a related field are invited to apply
Links	https://www.imm.uzh.ch/de/research/hilbi.html

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 **Institute** **E-mail** **Phone**	Dr. Thorsten Hornemann Institut für Klinische Chemie (IKC), Unispital Zürich thorsten.hornemann@usz.ch 044 255 47 19
Conditions	Experiences in cell culture, protein chemistry and molecular biology are preferable

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 compartimentalization/
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, USZ 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	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. 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).
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Reto Huber Interdisziplinäres Schlafzentrum, Entwicklungspädiatrie, Kinderspital ZH reto.huber@kispi.uzh.ch 044 266 81 60
Conditions	Interesse an neurowissenscgaftl. Forschung. Selbstständiges, zuverlässiges und sehr sorgfältiges wissenschaftl. 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	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. Techniques: evoked potentials, noxious withdrawal reflexes, quantitative sensory testing, experimental pain paradigms
Keywords	neurophysiology, neuropathic pain, autonomic nervous system, spinal cord injury
Supervisor **Institute** **E-mail** **Phone**	Dr. Michèle Hubli Spinal Cord Injury Research Center michele.hubli@balgrist.ch 044 510 7203
Conditions	- 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 cilvilization. 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

Immunotherapy and allergy and cancer	
Short description	Our research focuses on immunotherapy in allergy and cancer using cell cultures and mice employing methods of immune assessment, molecular biology, and histology. Potential projects: (i) Cell culture models to study mast cell function and potential therapies for allergy, (ii) Novel immunotherapies targeting environmental allergens and inflammatory responses in allergy and asthma, (iii) Immune reactions in lymph nodes and skin following targeted immunotherapies in allergy and cancer, (iv) Immune responses to photodynamic therapy in cancer.
Keywords	Immunotherapy, Allergy, Cancer, Immune assays
Supervisor **Institute** **E-mail** **Phone**	Prof. Pål Johansen Department of Dermatology, University Hospital Zurich pal.johansen@usz.ch 044 255 8616
Conditions	Candidates must be highly motivated and dedicated to their project. They should be able to work with attention to detail and maintain high standards of accuracy. A strong understanding of basic immunology and proficiency in fundamental laboratory techniques are essential. Experience with cell culture, immune assays, and molecular biology methods is beneficial. Depending on the project, candidates may also be required to work with mouse models and perform animal experiments.
Links	https://www.usz.ch/en/department/dermatology/research-of-the-department-of-dermatology/research-focus-of-the-department-of-dermatology/research-group-pal-johansen-prof-phd/

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 unterstanding 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	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: • 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**	Prof. Dr. Gabriela Kania Center of Experimental Rheumatology,USZ, Wagistrasse 14, 8952 Schlieren gabriela.kania@uzh.ch 043 253 30 13
Conditions	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.
Links	http://www.rheumatologie.usz.ch/forschung

Development and characterization of blood capillaries in tissue-engineered human skin substitutes	
Short description	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.
Keywords	3D vascular networks, angiogenesis, endothelial cells, adipose stem cells, regenerative medicine
Supervisor **Institute** **E-mail** **Phone**	Dr. Agnes Klar Tissue Biology Research Unit, Kinderspital Zurich, Campus Schlieren Agnes.Klar@kispi.uzh.ch 044 634 89 19
Conditions	-
Links	http://www.skingineering.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	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. 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.
Keywords	Skeletal muscle regeneration, stem cell niche, ageing, miRNA, cell culture, flow cytometry, immunofluorescence
Supervisor **Institute** **E-Mail** **Phone**	PD Dr. Jan Krützfeldt Klinik für Endokrinologie, Diabetologie und Klinische Ernährung Universitätsspital Zürich, Schlieren Campus jan.kruetzfeldt@usz.ch 044 255 36 27
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**	Prof. Dr. Rolf Kümmerli Department of Quantitative Biomedicine rolf.kuemmerli@uzh.ch 044 635 48 01
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	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. Our current projects address challenges posed by pathologies in the cardiovascular system, the brain and the kidneys. They include the investigation of: - 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 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.
Keywords	Biofluidics, Mechanobiology, Biophysics, Computational Biology, Artificial Intelligence, Cardiovascular Physiology, Vascular Biology, CNS Fluid Physiology
Supervisor **Institute** **E-Mail** **Phone**	Prof. Dr. Vartan Kurtcuoglu Institute of Physiology vartan.kurtcuoglu@uzh.ch 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	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. 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.
Keywords	obesity, nutrients, rodents
Supervisor **Institute** **E-Mail** **Phone**	PD Dr. Christelle Le Foll Institute of Veterinary Physiology christelle.lefoll@uzh.ch 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 cancer onset and therapy	
Short description	Replication stress is frequently observed in hyperproliferating cells and is an early event fueling tumorigenesis, but the underlying molecular mechanisms are still elusive and likely tissue-specific. At the same time, interference with DNA replication is a prominent clinical strategy to counteract uncontrolled cancer cell-proliferation, with the rationale that the majority of non-cancerous cells is quiescent and thus remains largely unaffected. Hence, gaining mechanistic information on the sources of replication stress and the cellular responses to it is of crucial clinical relevance. MSc projects are frequently available in our lab, tackling these mechanistic questions. We are using preclinical samples and/or patient derived lines to investigate peculiar mechanisms of replication stress driving tumorigenesis in breast, liver or hematopoietic systems. Moreover, we are applying state-of-the-art genomic and imaging approaches to define at high resolution how the replication stress response is orchestrated in the nucleus of cultured human cells, in response to chemotherapeutic treatments or upon localized DNA damage. In particular, we are uncovering the role in the replication stress response of known and novel factors involved in nuclear architecture and genome organization. Taking contact with the PI will clarify whether and which projects are currently available in the lab, to qualify for a MSc thesis in Biomedicine. These investigations rely on a unique portfolio of approaches already established or currently being optimized in the lab. Besides standard cell and molecular biology methods, these include DNA fiber spreading assay, comet

	assay, electron microscopy, super-resolution microscopy and 3D genome contact mapping (HiC/MicroC) on replicating DNA.
Keywords	DNA replication stress, tissue specific tumorigenesis, single-cell and single-molecule assays, genome organization and instability, chemotherapy response.
Supervisor **Institute** **E-Mail** **Phone**	Prof. Massimo Lopes Institute for Molecular Cancer Research (IMCR), UZH, Irchel (Y80, Strickhofstrasse 40a) 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

Obesity, eating control and metabolic diseases	
Short description	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. 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.
Keywords	obesity; diabetes mellitus; cardiovascular disease; amylin; GLP-1
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Thomas A. Lutz Institute of Veterinary Physiology tomlutz@vetphys.uzh.ch 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

Stem cells and their niche in colorectal cancer	
Short description	We are interested in understanding how stem cells and their surrounding niche communicate to control tissue growth, repair, and cancer development. Our research focuses on colorectal cancer, where we study how these cells co-evolve into tumors and their microenvironment. Various master projects are available that use cutting-edge approaches such as 3D organoid cultures, transgenic animal models, and single-cell sequencing to uncover how cellular interactions shape tumor behavior and to identify new strategies to promote cancer cell differentiation and improve therapies.
Keywords	Epithelial stem cells, stromal niche, colorectal cancer
Supervisor **Institute** **E-mail** **Phone**	Ermanno Malagola, PhD Department of Gastroenterology and Hepatology ermanno.malagola@usz.ch
Conditions	We are looking for motivated and curious students with strong interest in adult stem cells, their stromal niche, and cancer biology. The candidate should enjoy working in an interdisciplinary, collaborative environment and be eager to learn new techniques.
Links	https://www.usz.ch/en/department/gastroenterology-and-hepatology/

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 diffent 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/

Phage therapy as a possible alternative to antibiotic treatments	
Short description	The global rise of antimicrobial resistance has created an urgent need for new therapeutic strategies, such as phage therapy. Belonging to the Neuro-Urology department of the Balgrist University Hospital, we focus our research on the treatment of (recurrent) urinary tract infections (rUTI). In our group we offer MSc projects (1) investigating phage efficacy against diverse bacterial strains and patient isolates, with the goal of developing a phage-based therapeutic product for treating rUTIs or (2) investigating phage-antibiotic interactions involving techniques such as phage susceptibility assays, genome assembly and single nucleotide polymorphism (SNP) analysis, DNA extraction, and phage training.
Keywords	Phage therapy, antimicrobial resistance, genetic mutations, drug development
Supervisor **Institute** **E-mail** **Phone**	Dr. Shawna McCallin Department of Neuro-Urology, University Hospital Balgrist shawna.mccallin@balgrist.ch
Conditions	
Links	https://www.sci-research.uzh.ch/en/aboutus.html

Pediatric Cancer Metabolism	
Short description	The Morscher Lab at the University Children's Hospital Zurich investigates the metabolic vulnerabilities of pediatric cancers. Our research aims to develop non-genotoxic treatments that effectively target tumor cells while sparing healthy tissue. MSc students will contribute to ongoing research that integrates advanced metabolomics (including LC-MS), high-throughput drug screening, molecular biology, and translational models such as patient-derived xenografts (PDX). By exploring critical regulators of cancer cell metabolism, students will help uncover novel therapeutic targets and mechanisms of drug resistance, gaining comprehensive training in analytical chemistry and translational oncology.
Keywords	pediatric cancer, metabolism, metabolomics, LC-MS, targeted therapy, translational oncology, drug resistance
Supervisor **Institute** **E-mail** **Phone**	Dr. Dr. Raphael J. Morscher Dept of Oncology, University Children's Hospital raphael.morscher@kispi.uzh.ch +41 76 838 65 84
Conditions	Commitment to work together on better treatments for children with cancer. Interest in cancer biology, metabolism and/or biochemistry.
Links	Morscher_Lab | Pediatric Cancer & Metabolism

Genetically engineered organoids as *in vitro* and *in vivo* model systems of gastric cancer	
Short description	Our lab uses genetically engineered organoids as model systems for gastric carcinogenesis. We engineer murine gastric organoid cells to overexpress oncogenes, or to lack tumor suppressor genes, and subsequently transplant the cells orthotopically into the gastric submucosa of syngeneic immunocompetent mice. CRISPR and RNAi are both used to genetically modify the cells. The model lends itself to studies of the tumor microenvironment, which we do by spectral flow cytometry and single cell RNA sequencing, and to investigating risk factors such as chronic infection with the gastric pathogen *Helicobacter pylori*, and to studying mechanisms of metastasis. We have used the model for targeted and cancer genome-wide CRISPR screens, for testing of drugs, and for functional studies of the mechanism of action of newly identified tumor suppressor candidates. It will be used in the future to study how DNA damage caused by *H. pylori* translates into an increased tumor mutational burden and accelerated tumorigenesis, and to study how commonly occurring mutations in homologous recombination genes synergize with *H. pylori* infection to drive gastric cancer. Exome sequencing, flow cytometry protocols and RNA sequencing techniques as well as multiplex immunofluorescence microscopy will all be applied to the resulting tumor material.
Keywords	Gastric carcinogenesis, organoids as model systems of cancer, *in vivo* CRISPR screening
Supervisor **Institute** **E-mail** **Phone**	Dr. Anne Müller, Professor of Experimental Medicine Institute of Molecular Cancer Research, University of Zürich mueller@imcr.uzh.ch 044 635 3474
Conditions	Strong interest in cancer research
Links	https://www.imcr.uzh.ch/en/research/mueller/research.html

Diffuse Midline Glioma: Finding a treatment for challenging brain tumor in children	
Short description	Diffuse midline glioma (DMG) is one of the most challenging childhood brain cancers. Our group focus on the investiagtion of DMG cancer biology to find new therapies and approaches to improve patients outcome. As such, our preclinical work includes handling of patient derived DMG cell lines, performing drug tests, target validation, studying drug effect on moleculare level and perform pathway analysis. Prospective students will join an international and translational team of scientists.
Keywords	Diffuse midline glioma (DMG), Brain Cancer, pediatric oncology, translational
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Javad Nazarian University Children's Hospital Zurich, Oncology research javad.nazarian@kispi.uzh.ch 044 249 7081
Conditions	motivated student with basic knowledge/high interests in cancer biology
Links	https://dipgcenter.ch

Dental Biomaterials and Digital Manufacturing Technologies	
Short description	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. 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). 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.
Keywords	Additive technologies, Adhesion, Ceramics, Dental biomaterials, Digital technologies
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Dr. h.c. Mutlu Özcan, PhD University of Zurich, Center of Dental Medicine, Division of Dental Biomaterials mutlu.ozcan@zzm.uzh.ch +41 78 948 69 39
Conditions	Physical presence at lab work
Links	https://www.zzm.uzh.ch/en/research/topics/03/01.html https://www.zzm.uzh.ch/en/research/staff/oezcan-mutlu.html https://www.researchgate.net/profile/Mutlu_Oezcan

Keratinocyte lineages in human epidermal autografts	
Short description	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.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Dr. Luca Pontiggia Tissue Biology Research Unit, Kinderspital Zürich luca.pontiggia@kispi.uzh.ch 044 634 89 12
Conditions	-
Links	www.skingineering.ch

Strahlenresistenz auf molekularer und zellulärerEbene	
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 Signalüber-mittlungskaskaden 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 **Institute** **E-mail** **Phone**	Prof. Dr. Martin Pruschy Labor Molekulare Radiobiologie, Universitätsspital Zürich martin.pruschy@usz.ch 044 255 85 49
Conditions	
Links	http://www.cnz.uzh.ch/pruschy.html

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 musculoskeletal diseases). The studies address questions on burden of disease, prognosis, treatment and health care epidemiology/health systems research. Closely related we have a focus on key determinants of health and disease for these chronic conditions like physcial 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, as well as qualitative methods.
Keywords	
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Milo Puhan Institut für Epidemiologie, Biostatistik und Prävention miloalan.puhan@uzh.ch 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; hematopoisis, viral vectors; CRISPR; iPSC
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. med. Janine Reichenbach Institute for Regenerative Medicine janine.reichenbach@irem.uzh.ch + 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	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. 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.
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	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.

	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
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	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
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 **Institute** **E-mail** **Phone**	Prof. Dr. Peter Sander Institute of Medical Microbiology, University of Zurich psander@imm.uzh.ch 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 **Institute** **E-mail** **Phone**	Prof. Dr. Johannes Sarnthein Klinik für Neurochirurgie, Universitätsspital Zürich johannes.sarnthein@usz.ch 044 255 56 72
Conditions	Interest in neuroscience, programming experience or willingness to learn
Links	https://hfozuri.ch/

DNA damage and repair: From molecular mechanisms to targeted therapy	
Short description	DNA repair pathways ensure genome stability, which is crucial for cellular survival and the prevention of cancer. On the other hand, DNA repair enzymes are attractive targets to improve the efficacy of current cancer therapy regiments. Human FAN1 is a DNA nuclease involved in processing of DNA interstrand crosslinks induced by platinum-based chemotherapy. Moreover, genetic evidence has implicated FAN1 as a major risk modifier of Huntington's disease, an incurable neurodegenerative disorder.
Keywords	cancer biology, genomic instability, neurodegenerative disorders
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Alessandro Sartori Institute of Molecular Cancer Research (IMCR), UZH, Irchel sartori@imcr.uzh.ch 044 635 34 73
Conditions	The ideal candidate should possess a strong interest in molecular cancer biology, DNA repair mechanisms, and therapeutic innovation. A high level of motivation and responsibility is essential. While direct supervision by the PhD student will be provided, the student should be prepared to work with increasing independence and demonstrate effective communication skills.
Links	https://www.imcr.uzh.ch/en/research/sartori.html

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, *in vivo* and Tg mouse models, *in vitro* 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/institutegroups/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 in vivo 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/gstertzd.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 clinicly-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	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. 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 Jungfraujoch research station (3500 m above sea level).
Keywords	Jungfraujoch, High Altitude, Hypoxia, Cancer, Animal Study
Supervisor **Institute** **E-mail** **Phone**	Dr. Markus Thiersch Institute of Veterinary Physiology markus.thiersch@uzh.ch 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	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.
Keywords	HIV-1, vaccine, entry, inhibitor design, neutralizing antibody
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. Alexandra Trkola Institute of Medical Virology trkola.alexandra@virology.uzh.ch 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 **Institute** **E-mail** **Phone**	Dr. Shiva Tyagarajan Pharmacology and Toxicology tyagarajan@pharma.uzh.ch 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/neurodevelopmentalpharmacology/projects.html

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 **Institute** **E-mail** **Phone**	Prof. Dr. Carsten Wagner Institute of Physiology carsten.wagner@physiol.uzh.ch 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

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 techiques and in vitro and in vivo models of infection and cancer.
Keywords	Cell death signaling, inflammasome, immune response, mitochondrial signaling
Supervisor **Institute** **E-mail** **Phone**	Prof. Dr. W. Wei-Lynn Wong Department of Molecular Life Sciences lynn.wong@uzh.ch 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 **Institute** **E-mail** **Phone**	Prof. Dr. Oliver Zerbe Department of Chemistry, UZH oliver.zerbe@chem.uzh.ch 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/

23.04.2026/SJ