

Table I-1

List of Research projects Conducted by Academic Advisors (Pharmaceutical Science and Technology)
(Master's Course)

Educational area Responsible teacher Contact address	Research contents
Biopharmaceutics Professor HOSOYA Ken-ichi (will be retired in March 2026) (Sugitani Campus) hosoyak@pha	<ul style="list-style-type: none"> • Blood-retinal barrier transport function analysis and drug delivery to the retina • Blood-retinal barrier cell reconstruction and analysis of interaction between cells • Elucidation of biological function and transport function in in vivo barrier tissue
Biorecognition Chemistry Professor TOMOHIRO Takenori (Sugitani Campus) ttomo@pha	<ul style="list-style-type: none"> • Chemical biology for efficient drug discovery: target identification, visualization, utilization, and manipulation • Drug activity-based functional proteomics • Synthetic multicomponent integration strategy toward chemical biology and drug discovery
Cancer Cell Biology Professor SAKURAI Hiroaki (Sugitani Campus) hsakurai@pha	<ul style="list-style-type: none"> • Elucidation of the molecular mechanisms of tumor progression via inflammatory signaling pathways • Study on the activation mechanisms of molecular targets in cancer therapy • Study on the intracellular signals in malignant progression of melanoma
Chemical Biology Associate Professor CHIBA Junya (Sugitani Campus) chiba@pha	<ul style="list-style-type: none"> • Chemical biology based on synthetic chemistry, particularly three projects in artificial DNA, protein control, and saccharide recognition
Synthetic and Medicinal Chemistry Professor MATSUYA Yuji (Sugitani Campus) matsuya@pha	<ul style="list-style-type: none"> • Development of new organic reactions for drug discovery • Search for novel seeds of new drugs and structure-activity relationship research • Synthesis and structural optimization of bioactive compounds
Molecular Cell Biology Professor SO Takanori (Sugitani Campus) tso@pha	<ul style="list-style-type: none"> • Elucidation of the molecular mechanism of cytokine signaling regulated by TRAF5 • Development of immunotherapeutic recombinant TNF family proteins • Elucidation of the molecular pathology of X-linked adrenoleukodystrophy

Educational area Responsible teacher Contact address	Research contents
Synthetic and Biomolecular Organic Chemistry Professor YAKURA Takayuki (Sugitani Campus) yakura@pha	<ul style="list-style-type: none"> • Development of environmentally benign organic reactions • Synthesis of biologically active natural products • Pharmaceutical chemical research in bioactive substances
Biointerface Chemistry Professor NAKANO Minoru (Sugitani Campus) mnakano@pha	<ul style="list-style-type: none"> • Study of membrane lipid dynamics and elucidation of lipid transfer machinery • Elucidation of lipid flip-flop mechanisms • Biophysical research for interaction of amyloid beta with membranes • Structural and functional investigation and pharmaceutical application of lipid nanoparticles
Structural Biology Professor MIZUGUCHI Mineyuki (Sugitani Campus) mineyuki@pha	<ul style="list-style-type: none"> • Studies on the conformations of disease related proteins • Structural basis for intracellular membrane trafficking • Protein structure-based drug discovery
Pharmaceutical Physiology Professor SAKAI Hideki (Sugitani Campus) sakaih@pha	Physiological, biochemical and pharmacological studies on normal and cancer cells to clarify 1) interactions between drugs and ion transporting proteins such as pumps, transporters and channels 2) functional relations among ion transporting proteins 3) pathophysiological functions of ion transporting proteins
Pharmaceutical Technology Specially Associate Professor OKADA Kotaro (Sugitani Campus) kokada@pha	<ul style="list-style-type: none"> • Development of methods for evaluating the physical properties of pharmaceutical products using nuclear magnetic resonance relaxation
Pharma-Medical Informatics and AI Specially Appointed Professor SUGANO Aki (Sugitani Campus) sugano@pha	<ul style="list-style-type: none"> • Prediction of drug efficacy of molecular target drugs or adverse drug reactions by molecular simulation or AI based analyses • Binding affinity analysis of key molecules to human receptors by bioinformatics and molecular simulation • Analysis of candidate compounds by <i>in silico</i> drug repurposing

Educational area Responsible teacher Contact address	Research contents
Behavioral Physiology Professor TAKAO Keizo (Sugitani Campus) takao@cts	<p>"Mind" is one of many brain functions. The brain receives and processes various types of information necessary for the emergence of mind. An individual's behavior is the final output of brain functions. Even with today's technology, it is difficult to directly study "mind," but analyses of brain and behavior contribute to elucidating the principles of "mind". Our laboratory aims to resolve the cellular and molecular mechanisms of "mind", including memory, learning, and emotion, using behavioral genetics, optogenetics, data science, and pharmacological and physiological techniques. With these techniques, we also aim to resolve the pathophysiology of neuropsychiatric disorders and to develop treatments for these diseases. In addition, we are working to develop mouse models of nervous system diseases, and new reproductive technologies.</p>
Artificial Intelligence and Data Science Research Professor TAKAOKA Yutaka (Sugitani Campus) yutakaoka@med	<p>In our divisions, we address acupuncture research which is based on molecular cell biology and bioinformatics, molecular simulation-based mathematical modeling of medicine and social medicine research as follows:</p> <ul style="list-style-type: none"> • Prediction of adverse drug reactions base on molecular simulation and mathematical models • Prediction of drug efficacy of molecularly target drugs for cancer based on molecular simulation and mathematical models • Design of nucleic acid drugs and evaluation of drug efficacy • Application of drug repurposing to computational drug design • Molecular simulation analysis of pathological conditions caused by amino acid substitutions • Application of AI technologies such as machine learning and natural language processing to improvement of hospital functions • Research on diagnostic support of medical images by neural network analysis • Research for medical treatment systems and elderly care service systems • Research for Elderly Health Care as a Public Service of community healthcare • Molecular mechanisms of therapeutic effects of acupuncture
Bio-functional Molecule Engineering Professor TOYOOKA Naoki (will be retired in March 2026) (Gofuku Campus) toyooka@eng	<p>The principal focus of this group is the development of the design and synthesis procedure of small molecules, as well as their biological evaluation as candidates in drug discovery</p>
Bioorganic Medicinal Chemistry Associate Professor OKADA Takuya (Gofuku Campus) tokada@eng	<p>Based on synthetic organic chemistry, we conduct research and education on the synthesis of natural organic compounds having unique structures, and on the design, synthesis, and structural optimization of small molecules with the aim of developing novel pharmaceuticals.</p>

<p>Educational area Responsible teacher Contact address</p>	<p>Research contents</p>
<p>Engineering based on Genetic Information</p> <p>Professor KUROSAWA Nobuyuki (Gofuku Campus) kurosawa@eng</p>	<ul style="list-style-type: none"> • Development of platform technology for the production of monoclonal antibodies against difficult antigens. • Development of monoclonal antibodies for next-generation treatment and diagnosis
<p>Biofunctional Chemistry</p> <p>Professor IKAWA Yoshiya (Gofuku Campus) yikawa@sci</p>	<p>RNAs play versatile roles in biological systems because they not only serve as a genetic material but also act as functional molecules. We study the molecular basis of naturally occurring RNAs with catalytic and receptor functions. Another interest of our group lies in the artificial generation of RNAs with desirable functions through rational and evolutionary approaches.</p>
<p>Biomaterial Designing and Engineering</p> <p>Associate Professor NAKAJI- HIRABAYASHI Tadashi (Gofuku Campus) nakaji@eng</p>	<p>In our research field, the design of biomaterials and the construction of concept for the regenerative medicine are conducted in based on protein engineering, polymer science, cell biology, and molecular biology. Especially, we aim to construct functional biomaterials such as screening devices for various diseases and supporting materials for cell transplantation to cure otherwise intractable disorders.</p>
<p>Protein System Engineering</p> <p>Associate Professor INOBE Tomonao (Gofuku Campus) inobe@eng</p>	<p>Proteins are necessary for virtually every activity in the human body. Our goal is to understand how proteins are produced and degraded in the cell in terms of protein science and biophysics. Based on the above knowledge, we also aim to develop novel technologies that can regulate the lifespans of proteins for various practical applications.</p>
<p>Computers and Applied Chemistry</p> <p>Professor ISHIYAMA Tatsuya (Gofuku Campus) ishiyama@eng</p>	<p>The recent rapid development of computer technology has enabled us to analyze and predict various chemical reactions and molecular dynamics based on computational chemistry.</p> <p>This class summarizes the basic theory of ab initio electronic structure calculations, such as molecular orbital and density functional methods.</p>
<p>Biomolecular Chemistry</p> <p>Associate Professor SAKONO Masafumi (Gofuku Campus) msakono@eng</p>	<p>Organic chemistry has been vigorously applied to molecular biology. Our objectives are to reveal the properties of biomolecules using various methods based on chemical biology. We also engage in the development of new techniques for the analysis of intermolecular interactions, such as protein-protein interactions.</p>

Educational area Responsible teacher Contact address	Research contents
Synthetic and Medicinal Chemistry Professor ABE Hitoshi (Gofuku Campus) abeh@eng	This field focuses on creation of novel “functional organic molecules” based on the advanced synthetic organic chemistry. The newly designed organic molecules possess some potential to contribute to various fields of science such as discovery of novel medicines and agrichemicals. Research in our group is primarily aimed toward the development of catalytic reactions and methods for organic synthesis for the functional organic molecules.
Pharmacology Associate Professor TAKASAKI Ichiro (Gofuku Campus) takasaki@eng	<ul style="list-style-type: none"> • Elucidation of the mechanisms of chronic pain/pruritus, neuropsychiatric disorders, cancer, etc. • Drug discovery of novel small-molecule therapeutics • Pharmacological analysis of the new small-molecule compounds

Table I-2

List of Research projects Conducted by Academic Advisors (Applied Natural Medicine) (Master's Course)

Educational area Responsible teacher Contact address	Research contents
Neuromedical Science Professor TOHDA Chihiro (Sugitani Campus) chihiro@inm	<ul style="list-style-type: none"> • Elucidation of the molecular mechanism of restoring the neuronal network, and crosstalk between the central nervous system and peripheral organs to activate neural function. • Traditional medicine research for developing fundamental therapeutic drugs for Alzheimer's disease, spinal cord injury, cervical spondylosis myelopathy, glaucoma, and sarcopenia. • Clinical study aiming to develop new botanical drugs and new usage of Kampo formulas. • Clinical study to analyze factors affecting physical and mental health and to identify biomarkers of wellbeing. • Consilienceology for Wakan-yaku 1) Diagnosis for functional mental diseases based on the Wakan-yaku response, and clarification of molecular mechanisms for the diseases 2) Development of novel Wakan-yaku prescriptions to prevent lethal recurrence of heart failure
Host Defences Professor HAYAKAWA Yoshihiro (Sugitani Campus) haya@inm	<ul style="list-style-type: none"> • Study of NK cell biology and its roles in immunity • Role of innate immune responses in cancer progression • Immunological study of inflammatory & allergic diseases • Modulation of immune responses and immunological diseases by Kampo medicines • Study to regulate cancer progression & metastasis • Elucidation of novel actions of kampo medicines and food factors on the basis of modulation of intraluminal bile acid metabolism in gastrointestinal tract
Medicinal Resource Science Professor SHOJI Tsubasa (Sugitani Campus) tsubasa@inm	<ol style="list-style-type: none"> 1. Molecular regulation of alkaloid and terpenoid pathways in medicinal plants of the Solanaceae family. 2. Novel regulatory mechanisms of alkaloid pathways in tobacco plants. 3. Biosynthesis and accumulation of natural sweeteners. 4. Collaborate with industry partners to apply our research to the stable supply and production of herbal medicines.
Natural Products & Drug Discovery Professor MORITA Hiroyuki (Sugitani Campus) hmorita@inm	<ul style="list-style-type: none"> • Studies on biosynthesis of naturally occurring bioactive compounds • Structural basis for secondary metabolite enzymes • Enzyme engineering for novel drug development • Isolation of bioactive compounds from plants, microorganisms, and marine organisms • Investigation of Asia's natural resources not fully utilized • Discovery of natural anticancer agents from medicinal plant resources by employing a novel antiausterity screening strategy • Chemical investigation of medicinal plants and search for novel bioactive secondary metabolites • Investigation of the structure-activity relationship of the active natural compounds and their mechanism of action against cancer cell survival pathways • Discovery of metabolomics biomarkers associated with cancer cells by utilizing FT-NMR and MS strategy

<p>Educational area Responsible teacher Contact address</p>	<p>Research contents</p>
<p>Complex Biosystem Research</p> <p>Professor NAKAGAWA Yoshimi (Sugitani Campus) ynaka@inm</p>	<ul style="list-style-type: none"> • Functional analysis of transcription factors that regulate glucose and lipid metabolism • Study for nutrient metabolism regulation by cell-cell and tissue-tissue interaction • Study for the molecular mechanism of improvement of lifestyle-related diseases by Wakan-yaku
<p>Presymptomatic Disease</p> <p>Professor KOIZUMI Keiichi (Sugitani Campus) kkoizumi@inm</p>	<ul style="list-style-type: none"> • Understanding of the fluctuation of biometric information and its medical applications. • Development of the glutaminase inhibitor and its medical applications. • Elucidation of the function of immunostimulatory nanoparticles and nucleotide degradant discovered by traditional Japanese medicine (Kampo formula) and their medical applications.
<p>Kampo Diagnostics</p> <p>Professor SHIBAHARA Naotoshi (Sugitani Campus) shiba1@inm</p>	<ul style="list-style-type: none"> • Pharmacological effects of Kampo medicines and their herbal components, as well as their mechanisms of action • Search for indicators of clinical pathology of Kampo medicine and “sho”
<p>Clinical Pharmaceutics</p> <p>Professor KATO Atsushi (Sugitani Campus) kato@med</p>	<ul style="list-style-type: none"> • Drug design and validation of chaperone compounds for rare lysosomal diseases utilising Protein-Ligand Docking • Research on the development of functional cosmetics based on scientific evidence • Research on the isolation and purification of the iminosugars from plants and their application as pharmaceuticals. • Reverse translational research on Japanese and Chinese, taking into account clinical experience.
<p>Artificial Intelligence and Data Science Research</p> <p>Professor TAKAOKA Yutaka (Sugitani Campus) ytakaoka@med</p>	<p>In our divisions, we address acupuncture research which is based on molecular cell biology and bioinformatics, molecular simulation-based mathematical modeling of medicine and social medicine research as follows:</p> <ul style="list-style-type: none"> • Prediction of adverse drug reactions base on molecular simulation and mathematical models • Prediction of drug efficacy of molecularly target drugs for cancer based on molecular simulation and mathematical models • Design of nucleic acid drugs and evaluation of drug efficacy • Application of drug repurposing to computational drug design • Molecular simulation analysis of pathological conditions caused by amino acid substitutions • Application of AI technologies such as machine learning and natural language processing to improvement of hospital functions • Research on diagnostic support of medical images by neural network analysis • Research for medical treatment systems and elderly care service systems • Research for Elderly Health Care as a Public Service of community healthcare • Molecular mechanisms of therapeutic effects of acupuncture

<p>Educational area Responsible teacher Contact address</p>	<p>Research contents</p>
<p>Bio-functional Molecule Engineering</p> <p>Professor TOYOOKA Naoki (will be retired in March 2026) (Gofuku Campus) toyooka@eng</p>	<p>The principal focus of this group is the development of the design and synthesis procedure of small molecules, as well as their biological evaluation as candidates in drug discovery</p>
<p>Bioorganic Medicinal Chemistry</p> <p>Associate Professor OKADA Takuya (Gofuku Campus) tokada@eng</p>	<p>Based on synthetic organic chemistry, we conduct research and education on the synthesis of natural organic compounds having unique structures, and on the design, synthesis, and structural optimization of small molecules with the aim of developing novel pharmaceuticals.</p>
<p>Engineering based on Genetic Information</p> <p>Professor KUROSAWA Nobuyuki (Gofuku Campus) kurosawa@eng</p>	<ul style="list-style-type: none"> • Development of platform technology for the production of monoclonal antibodies against difficult antigens. • Development of monoclonal antibodies for next-generation treatment and diagnosis
<p>Synthetic and Medicinal Chemistry</p> <p>Professor ABE Hitoshi (Gofuku Campus) abeh@eng</p>	<p>This field focuses on creation of novel “functional organic molecules” based on the advanced synthetic organic chemistry. The newly designed organic molecules possess some potential to contribute to various fields of science such as discovery of novel medicines and agrichemicals. Research in our group is primarily aimed toward the development of catalytic reactions and methods for organic synthesis for the functional organic molecules.</p>
<p>Pharmacology</p> <p>Associate Professor TAKASAKI Ichiro (Gofuku Campus) takasaki@eng</p>	<ul style="list-style-type: none"> • Elucidation of the mechanisms of chronic pain/pruritus, neuropsychiatric disorders, cancer, etc. • Drug discovery of novel small-molecule therapeutics • Pharmacological analysis of the new small-molecule compounds
<p>Biofunctional Chemistry</p> <p>Professor IKAWA Yoshiya (Gofuku Campus) yikawa@sci</p>	<p>RNAs play versatile roles in biological systems because they not only serve as a genetic material but also act as functional molecules. We study the molecular basis of naturally occurring RNAs with catalytic and receptor functions. Another interest of our group lies in the artificial generation of RNAs with desirable functions through rational and evolutionary approaches.</p>

Educational area Responsible teacher Contact address	Research contents
Natural Products Chemistry Associate Professor MIYAZAWA Masahiro (will be retired in March 2026) (Gofuku Campus) miyazawa@sci	Numerous bioactive organic compounds occur in nature, many of which possess complex structures with large numbers of asymmetrical carbon atoms. We are developing useful reactions for the synthesis of such complex-structured organic compounds, and applying these compounds to the synthesis of bioactive natural products.
Cell Biology Professor KARAHARA Ichirou (Gofuku Campus) karahara@sci	Studies on the mechanisms of plants' responses to various terrestrial / cosmic environmental factors at organ / tissue level using various morphological techniques including three-dimensional macroscopic / ultrastructural analyses
Behavioral Neurochemistry Professor SHIMIZU Kimiko (Gofuku Campus) kshimizu@ctg	Many physiological functions are rhythmically regulated by the circadian clock and change in a circadian manner. Our laboratory aims to elucidate the “mechanism” of circadian regulation of higher brain functions such as memory formation and emotional regulation. We conduct research at the multiple levels, from the molecular to the behavioral. Examples are shown below. • Behavioral analysis of circadian rhythms of memory and emotion • Molecular mechanisms of circadian changes in memory and emotion • Visualization of synaptic changes associated with brain function • Mechanisms of action of novel neurosteroids

Table I-3

List of Research projects Conducted by Academic Advisors (Cognitive and Emotional Neuroscience) (Master's Course)

<p>Educational area Responsible teacher Contact address</p>	Research contents
<p>Anatomy</p> <p>Professor ICHIJO Hiroyuki (Sugitani Campus) ichijo@med</p>	Using the advantages and specificities of in vivo and in silico studies, we study the neural basis of experience-dependent modification of neural circuits that regulate emotion and behavioral change, and evolution of the neural mechanisms of innate attack and defense behaviors.
<p>Physiology</p> <p>Professor TAMURA Ryo (Sugitani Campus) rtamura@med</p>	This century will be the era of brain sciences. "The mind" has long been regarded as one of the most enigmatic psychological processes. Recent technological advances have enabled us to approach the neural basis of the mind. The purpose of our research is to elucidate brain mechanisms of "learning and memory", one of the key members of the mind. For this, we mainly use laboratory animals such as monkeys and rats, record neural activities in the brain of the animals while they perform a behavioral (learning and memory) task or they are asleep subsequent to the task performance, and analyze the pattern of brain activities.
<p>Brain Science</p> <p>Professor INOKUCHI Kaoru (Sugitani Campus) inokuchi@med</p>	Recently it has been clarified that neurons in the brain are active even when animals sleep or rest, denoted as "idling brain state". Idling activity of the brain appears to play important roles in information processing than previously thought. In our laboratory, we aim to clarify the role played by idling brain by making full use of molecular biology, biochemistry, cell biology, histochemistry, electrophysiology, behavioral pharmacology, optogenetics, and live-imaging.
<p>Systems Function and Morphology</p> <p>Professor ITO Tetsufumi (Sugitani Campus) itot@med</p>	We do not sense the world as it is, but do collect the information which is important for our survival and recognize the sensory objects which are further selected by both unconscious and conscious processes. For the selection, which is essential for survival, animals possess sensory organs and neuronal circuitry which are optimized for their circumstances. Our laboratory mainly focuses on the hearing system, and study the mechanisms which allow to detect and sense the meaningful information for survival from environmental sounds. Using various techniques, we would like to investigate functional and morphological basis of the brain which allows the coding of sensory information, especially sounds, and the sensory perception.
<p>Molecular Neuroscience</p> <p>Professor MORI Hisashi (Sugitani Campus) hmori@med</p>	We focus on molecular basis of brain function and dysfunction. To develop the novel methods for diagnosis and cure of neurodegenerative and neurodevelopmental disorders, we have used molecular biological approaches to generate new mouse models of such disorders and new probes to detect functional change in the brain.
<p>Neuropsychiatry</p> <p>Professor TAKAHASHI Tsutomu (Sugitani Campus) tsutomu@med</p>	Recent advances in brain imaging techniques have enabled us to explore brain structure and function non-invasively in vivo. However pathophysiology and mechanisms of mental disorders are still remain elusive. In our department, clinical and basic researches are being performed to elucidate pathophysiology of severe mental illnesses such as schizophrenia and to develop innovative and optimized approaches for diagnosing and treating patients for the purpose of improving their long-term outcome.

Educational area Responsible teacher Contact address	Research contents
Neurosurgery Professor KURODA Satoshi (Sugitani Campus) skuroda@med	〔Research content〕 Neurosurgical aspects of basic and clinical research are included in this course. 〔Guidance content〕 (1) Stem cell research (2) Molecular and stem cell research of malignant glioma (3) Angiogenesis of cerebrovascular disorders (4) Cognitive function in neurosurgical disorders (5) Electrophysiological analysis (6) Epidemiological analysis of stroke
Clinical and Cognitive Neuroscience Professor HAKAMATA Yuko (Sugitani Campus) hakamata@med	We aim at understanding the neurobiological mechanisms underlying emotional dysregulation associated with distorted cognitions, and using this understanding to develop novel, effective psychological interventions for anxiety and depressive disorders. We address these questions from the integrative view including psychology, cognitive behavioral science, endocrinology, immunology, genetics, and neuroscience.
Behavioral Physiology Professor TAKAO Keizo (Sugitani Campus) takao@cts	"Mind" is one of many brain functions. The brain receives and processes various types of information necessary for the emergence of mind. An individual's behavior is the final output of brain functions. Even with today's technology, it is difficult to directly study "mind," but analyses of brain and behavior contribute to elucidating the principles of "mind". Our laboratory aims to resolve the cellular and molecular mechanisms of "mind", including memory, learning, and emotion, using behavioral genetics, optogenetics, data science, and pharmacological and physiological techniques. With these techniques, we also aim to resolve the pathophysiology of neuropsychiatric disorders and to develop treatments for these diseases. In addition, we are working to develop mouse models of nervous system diseases, and new reproductive technologies.
Physiology Professor NISHIMARU Hiroshi (Sugitani Campus) nishimar@med	The amount of information processed in our brain in our daily life is estimated to be about 10 billion bits per second. These processes are carried out by the neural networks in the brain which are thought to be a real-time massive parallel processing system. Unraveling the mechanisms and principles of these networks is crucial for understanding how our brain works and also provides us a hint to live through the modern highly information-oriented society. To this end, we utilize neurophysiological and neuropsychological experimental approaches to elucidate higher brain functions including cognition of sensory information (input system), and behavioral manifestation based on sensory perception, memory, decision-making and motor control (output system).
Pathology Associate Professor YAMAMOTO Seiji (Sugitani Campus) seiyama@med	<ul style="list-style-type: none"> • We promote a research to elucidate the function of platelet-derived growth factor receptor (PDGFR) in mice, especially neural tissue, neural stem cells, and blood vessels. • We also conduct in vitro studies using cells isolated from such mice to elucidate that the PDGFR signal is involved in the regeneration and functional recovery of several organs and tissues. • We create novel genetically engineered animals, such as knockout mice, to study intractable human diseases, to explore and identify factors involved in disease progression, and promote research to develop novel treatment methods for patients.

<p>Educational area Responsible teacher Contact address</p>	<p>Research contents</p>
<p>Artificial Intelligence and Data Science Research</p> <p>Professor TAKAOKA Yutaka (Sugitani Campus) ytakaoka@med</p>	<p>In our divisions, we address acupuncture research which is based on molecular cell biology and bioinformatics, molecular simulation-based mathematical modeling of medicine and social medicine research as follows:</p> <ul style="list-style-type: none"> • Prediction of adverse drug reactions base on molecular simulation and mathematical models • Prediction of drug efficacy of molecularly target drugs for cancer based on molecular simulation and mathematical models • Design of nucleic acid drugs and evaluation of drug efficacy • Application of drug repurposing to computational drug design • Molecular simulation analysis of pathological conditions caused by amino acid substitutions • Application of AI technologies such as machine learning and natural language processing to improvement of hospital functions • Research on diagnostic support of medical images by neural network analysis • Research for medical treatment systems and elderly care service systems • Research for Elderly Health Care as a Public Service of community healthcare • Molecular mechanisms of therapeutic effects of acupuncture
<p>Applied Pharmacology</p> <p>Professor KUME Toshiaki (Sugitani Campus) tkume@pha</p>	<ul style="list-style-type: none"> • Elucidation of pathogenesis mechanisms of neurodegenerative diseases, pruritus, pain and dysesthesia and search and development of preventive and therapeutic drugs for these disorders • Establishment of novel animal models that exhibit the brain diseases and the sensory symptoms, such as itch, pain and dysesthesia • Search for cytoprotective substances derived from foods and plants
<p>Molecular Neurobiology</p> <p>Associate Professor TABUCHI Akiko (Sugitani Campus) atabuchi@pha</p>	<ul style="list-style-type: none"> • Elucidation of the molecular mechanisms underlying regulation of neuronal function and plasticity by gene expression and cellular communication between synapses and a nucleus • Studies on neurological disorders caused by dysfunction of transcription factors and synaptic molecules • Basic studies on transcription factors and synaptic molecules toward drug development targeted for neurological disorders
<p>Pharmaceutical Therapy and Neuropharmacology</p> <p>Professor NITTA Atsumi (Sugitani Campus) nitta@pha</p>	<ul style="list-style-type: none"> • Behavioral pharmacological, molecular biological and cell biological studies to clarify the function of the novel molecules for clarification of mechanism of psychiatric diseases onset • Study for the clarification of the mechanisms of establishment of addiction of nicotine, THC and methamphetamine • Development of clinical markers for additions
<p>Pharma-Medical Informatics and AI</p> <p>Specially Appointed Professor SUGANO Aki (Sugitani Campus) sugano@pha</p>	<ul style="list-style-type: none"> • Prediction of drug efficacy of molecular target drugs or adverse drug reactions by molecular simulation or AI based analyses • Binding affinity analysis of key molecules to human receptors by bioinformatics and molecular simulation • Analysis of candidate compounds by <i>in silico</i> drug repurposing

Educational area Responsible teacher Contact address	Research contents
Regulatory Biology Professor MATSUDA Kouhei (Gofuku Campus) kmatsuda@sci	Physiology and biochemistry on bioactive peptides and their receptor signaling system, and psychophysiology on instinct behavior in vertebrates
Biological Information Processing Professor TABATA Toshihide (Gofuku Campus) ttabata@eng	Neuroscience of learning and memory. We investigate cellular and molecular mechanisms regulating synaptic plasticity involved in cerebellar motor learning using advanced methods of electrophysiology, electrochemistry, fluorescence microscopy, and behavior measurement.
Artificial Intelligence Professor Shangce Gao (Gofuku Campus) gaosc@eng	We engage in education and research focused on the development, analysis, and evaluation of various machine learning techniques. This includes artificial neural networks inspired by human brain mechanisms, deep learning where artificial intelligence learns autonomously, swarm intelligence approaches like ant colony optimization, error backpropagation methods, genetic algorithms, and evolutionary strategies.
Brain and Neural Systems Engineering Professor KAWAHARA Shigenori (Gofuku Campus) kawahara@eng	By using relatively simple invertebrate neural networks, we conduct education and research on phase-dependent processing of sensory information in synchronous neural activities and dynamic interaction among the nonlinear oscillators in the brain as well as between the brain and rhythmic sensory inputs.
Behavioral Neurochemistry Professor SHIMIZU Kimiko (Gofuku Campus) kshimizu@ctg	<p>Many physiological functions are rhythmically regulated by the circadian clock and change in a circadian manner. Our laboratory aims to elucidate the “mechanism” of circadian regulation of higher brain functions such as memory formation and emotional regulation. We conduct research at the multiple levels, from the molecular to the behavioral. Examples are shown below.</p> <ul style="list-style-type: none"> • Behavioral analysis of circadian rhythms of memory and emotion • Molecular mechanisms of circadian changes in memory and emotion • Visualization of synaptic changes associated with brain function • Mechanisms of action of novel neurosteroids

Table I-4

List of Research projects Conducted by Academic Advisors (Medical Design) (Master's Course)

<p>Educational area</p> <p>Responsible teacher</p> <p>Contact address</p>	Research contents
<p>Measurement Systems Engineering</p> <p>Professor SUZUKI Masayasu (will be retired in March 2025) (Gofuku Campus) suzukimy@eng</p>	We conduct education and research on small and integrated measurement systems developed using advanced technologies in biotechnology and electronics, such as integrated miniature biosensors, biochips, and microarrayed chips for medical diagnostics and environmental monitors.
<p>Dynamical Systems and Robotics</p> <p>Associate Professor TODA Hideki (Gofuku Campus) toda@eng</p>	Our education and research activities focus on dynamical systems, control and robotics. The topics include decentralized control, hybrid systems and networked control as well as autonomous mobile robots, bio-inspired robots, rehabilitation robots.
<p>Computational Biophotonics</p> <p>Professor KATAGIRI Takashi (Gofuku Campus) katagiri@eng</p>	We conduct research and education aimed at creating basic principles of next-generation medical measurement and diagnostic technology and building an academic system by combining photon science, laser spectroscopy, optical communication technology and information science.
<p>Clinical Optical Information Engineering</p> <p>Specially Appointed Professor OSHIMA Yusuke (Gofuku Campus) oshima@eng</p>	We conduct research on advanced optical devices such as novel lasers or microscopy techniques, diagnosis, photodynamic therapy, image information processing, and AI technology for practical use in the life science and medical fields focusing on the interaction of light and living bodies and its mechanisms and working with engineering researchers, technicians, biologists, and clinicians in a cross-disciplinary approach.
<p>Medical Information Sensing</p> <p>Professor HASEGAWA Hideyuki (Gofuku Campus) hasegawa@eng</p> <p>Assistant Professor OMURA Masaaki (Gofuku Campus) momura@eng</p>	We conduct education and research on the theory and applications of noninvasive ultrasonic imaging and sensing of morphological and functional information of biological bodies. In particular, we develop advanced signal- and image-processing techniques, such as ultrasonic beamforming, target motion estimation, and tissue viscoelasticity estimation, for ultrasonic measurements.

<p>Educational area Responsible teacher Contact address</p>	<p>Research contents</p>
<p>Biological Information Processing</p> <p>Professor TABATA Toshihide (Gofuku Campus) ttabata@eng</p>	<p>We focus on both basic and applied neuroscience of learning and memory. We investigate cellular and molecular mechanisms underlying learning and memory using advanced methods of electrophysiology, electrochemistry, fluorescence microscopy, and behavior measurement. Based on the results of these studies, we devise brain-tech gadgets such as a mobile device for episodic memory performance training.</p>
<p>Mechanical Information and Instrumentation</p> <p>Professor SASAKI Tohru (Gofuku Campus) tsasaki@eng</p>	<p>Our aim is image-position measuring of large-scale environments and force sensing for micro-handling. We conduct education and research on the development of new measuring methods, systems, and sensors. We also focus on robotic vision systems including 3D measurement and object recognition based on image processing.</p>
<p>Medical Image Analysis, Bioinformatics</p> <p>Associate Professor TERABAYASHI Kenji (Gofuku Campus) tera@eng</p>	<ul style="list-style-type: none"> • Image understanding of cells in blood for cancer patients • Analysis of CT data for fracture fixation • Understanding central nervous system disease based on proteomics
<p>Brain and Neural Systems Engineering</p> <p>Professor KAWAHARA Shigenori (Gofuku Campus) kawahara@eng</p>	<p>By using relatively simple invertebrate neural networks, we conduct education and research on phase-dependent processing of sensory information in synchronous neural activities and dynamic interaction among the nonlinear oscillators in the brain as well as between the brain and rhythmic sensory inputs.</p>
<p>Human-Computer Interaction</p> <p>Professor NOZAWA Takayuki (Gofuku Campus) nozawa@eng</p>	<p>We conduct education and research on the analysis and evaluation of human cognition and social interaction, and on the design of information technologies that support people's intellectual activities in real life. For this purpose, we use a combination of multimodal measurement of brain, psychological, physiological, and behavioral activities with data science and artificial intelligence techniques.</p>
<p>Materials Plasticity Engineering</p> <p>Professor AIDA Tetsuo (Gofuku Campus) aida@sus</p>	<p>For various industrial materials, we conduct education and research on molding methods, plastic working deformation behavior and applications of molding materials controlled by advanced processing technology</p>

<p>Educational area Responsible teacher Contact address</p>	<p>Research contents</p>
<p>Digital Contents</p> <p>Professor TSUJIAI Hidekazu (Takaoka Campus) tsujiai@tad</p>	<p>We conduct education and research on digital content including 3D, fulldome and projection mapping, AR and VR environment construction, and image processing.</p>
<p>Design of visual environment</p> <p>Professor AKIZUKI Yuki (Gofuku Campus) akizuki@edu</p>	<p>We conduct education and research on visual environment design based on the characteristics of light sources, spatial factors, visual targets, as well as human vision mechanism. The topics include lighting planning of medical and nursing spaces, creation of skin samples for pathological conditions, and support for disaster relief medical activities at night.</p>
<p>Behavioral Physiology</p> <p>Professor TAKAO Keizo (Sugitani Campus) takao@cts</p>	<p>"Mind" is one of many brain functions. The brain receives and processes various types of information necessary for the emergence of mind. An individual's behavior is the final output of brain functions. Even with today's technology, it is difficult to directly study "mind," but analyses of brain and behavior contribute to elucidating the principles of "mind". Our laboratory aims to resolve the cellular and molecular mechanisms of "mind", including memory, learning, and emotion, using behavioral genetics, optogenetics, data science, and pharmacological and physiological techniques. With these techniques, we also aim to resolve the pathophysiology of neuropsychiatric disorders and to develop treatments for these diseases. In addition, we are working to develop mouse models of nervous system diseases, and new reproductive technologies.</p>
<p>Internal Medicine</p> <p>Professor KINUGAWA Koichiro (Sugitani Campus) kinugawa@med</p>	<p>Cardiovascular diseases have been increasingly popular in Japan along with aging society. Ischemic heart disease due to atherosclerosis with uncontrolled multiple risk factors, valvular disease in aged population, heart failure as a terminal figure of all heart disorders, and a number of arrhythmias modifying their clinical course are common. It is crucial to find out the underlying mechanisms of them, and to explore the therapeutic and preventive strategies for them. Also, renal diseases are closely related with cardiovascular diseases, and the relationship has been called as cardio-renal syndrome. Not only primary kidney disease such as nephritis, but also secondary renal dysfunction caused by heart failure should be an important target for investigation</p>
<p>Urology</p> <p>Professor KITAMURA Hiroshi (Sugitani Campus) hkitamur@med</p>	<p>Our medical staffs in the department have dedicated themselves to better care for patients having urological diseases. We are conducting basic and translational research for providing various strategies for treatment of the diseases that patients are satisfied with. We are enthusiastic about studying basic science of urology that will lead to a future innovative treatment.</p>

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Internal Medicine Professor SATO Tsutomu (Sugitani Campus) tsutomus@med	With the advancement of an aging society, patients who have hematological malignancies have been steadily increasing. Since hematological malignancies are highly sensitive to chemotherapy, progress of chemotherapy has been accompanied by that of hematology. Hematopoietic stem cell transplantation was an answer reached by an extreme line of thought that the more chemotherapeutic agent was administered, the more cancer cells were killed. However, there were limits to that therapy, that is, severe side effects and multidrug resistance in tumor cells. Molecularly-targeted therapy and preventing side effects of chemotherapy is modern trends today. To meet such social needs, bench-to-bed research has been conducted in our department.
Surgery Specially Appointed Professor TSUCHIYA Tomoshi (Sugitani Campus) tsuchiya@med	Collaboration with the Department of Biosystems and Biomedical Engineering, Faculty of Engineering, aims to regenerate lung organs. An organ regeneration method to recellularize rat decellularized tissue skeleton will be used to create disease models. Research areas will encompass stem cells, cell adhesion, mechanical stress, and cancer research. (Ref ; https://www.organengineering.com/)
Comprehensive Oral Sciences Professor YAMADA Shin-ichi (Sugitani Campus) shinshin@med	<ul style="list-style-type: none"> • Research on pathological diagnosis and image diagnosis of oral diseases using artificial intelligence. • Basic research on anticancer drug sensitivity using human oral squamous cell carcinoma cell lines. • Basic research on cancer proliferation and invasion mechanisms using human oral squamous cell carcinoma cells. • Immunological analysis using mouse oral squamous cell carcinoma model. • Research on prevention of oral mucositis using human fibroblasts. • Research on the development of minimally invasive oral cancer treatment. • Research on the effects of oral bacteria on systemic diseases.
Artificial Intelligence and Data Science Research Professor TAKAOKA Yutaka (Sugitani Campus) ytakaoka@med	<p>In our divisions, we address acupuncture research which is based on molecular cell biology and bioinformatics, molecular simulation-based mathematical modeling of medicine and social medicine research as follows:</p> <ul style="list-style-type: none"> • Prediction of adverse drug reactions base on molecular simulation and mathematical models • Prediction of drug efficacy of molecularly target drugs for cancer based on molecular simulation and mathematical models • Design of nucleic acid drugs and evaluation of drug efficacy • Application of drug repurposing to computational drug design • Molecular simulation analysis of pathological conditions caused by amino acid substitutions • Application of AI technologies such as machine learning and natural language processing to improvement of hospital functions • Research on diagnostic support of medical images by neural network analysis • Research for medical treatment systems and elderly care service systems • Research for Elderly Health Care as a Public Service of community healthcare • Molecular mechanisms of therapeutic effects of acupuncture

- A portion of email address is listed in the contact address. Please use it for preliminary consultations with the relevant academic advisor in the field of your choice. Please add ".u-toyama.ac.jp" after the address.

Example) abc@def → abc@def.u-toyama.ac.jp