Table I-1 List of Research projects Conducted by Academic Advisors (Pharmaceutical Science and Technology)

Educational area Responsible teacher Contact address	Research contents
Biopharmaceutics Professor HOSOYA Ken-ichi (will be retired in March 2026) (Sugitani Campus) hosoyak@pha	・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	・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	・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	・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	・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	・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
Synthetic and Biomolecular Organic Chemistry Professor YAKURA Takayuki (Sugitani Campus) yakura@pha	・Development of environmentally benign organic reactions ・Synthesis of biologically active natural products ・Pharmaceutical chemical research in bioactive substances

Educational area Responsible teacher Contact address	Research contents
Biointerface Chemistry Professor NAKANO Minoru mnakano@pha	・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 mineyuki@pha (Sugitani Campus) (Sugitani Campus)	We determine protein conformation by NMR and X-ray crystallography to analyze functions and conduct researches on the relation between changes in protein structures and diseases by examination of abnormal structures such as amyloid fibril.
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 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 Appointed Associate Professor OKADA Kotaro (Sugitani Campus) kokada@pha	・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	・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 *in silico* drug repurposing
Behavioral Physiology Professor TAKAO Keizo (Sugitani Campus) takao@cts	・Investigation of the physiological basis of learning, memory, emotion, and cognition ・Exploration and evaluation of mouse models of neuropsychiatric disorders using behavioral analyses ・Elucidation of the pathophysiology and development of therapies for neuropsychiatric disorders using mouse models ・Elucidation of the pathophysiology of psychiatric and neurological disorders using computational and information engineering methods ・Development of new genetically engineered mice ・Development of new reproductive technologies

Educational area Responsible teacher Contact address	Research contents
Computational Drug Design and Mathematical Medicine Professor TAKAOKA Yutaka (Sugitani Campus) ytakaoka@med	Our aims to construct theoretical medicine, which has an analogous concept of theoretical physics in contrast with experimental physics. It is not easy to describe the human body, that is, a complex system, with a hard science which uses mathematical models in such field as physics or chemistry. Therefore, we utilize molecular simulation analyses to describe human body partially, and use this approach to predict the future disease treatments. It is a challenge to evolve the medical system as a science with accumulated logic for prediction from the one which emphasizes experiences and results. Our final goal is to enable a paradigm shift from "validation" to "prediction" in the system of medical science. It is important to note that we pay attention whether the mathematical model is applicable to the real world and do not aim for mathematical sophistication. In addition, we also study the themes for Kampo and Acupuncture, machine learning and natural language processing, and social medicine such as community medical policies, improvement of hospital function, and medical management as follows: ・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 genetic mutations resulting in amino acid substitutions ・Molecular mechanisms of therapeutic effects of acupuncture and moxibustion ・Application of AI technologies such as machine learning and natural language processing to improvement of hospital functions ・Population dynamics and the future prediction of community medicine
Biofunctional Chemistry Professor IKAWA Yoshiya (Gofuku Campus) yikawa@sci (Gofuku Campu	Research interest in our group is to elucidate the molecular basis of naturally occurring RNAs with catalytic and receptor functions. Another research interest of our group lies in the artificial generation of novel RNAs and RNA-based molecular systems with through rational and evolutional approaches.
Bioorganic Medicinal Chemistry Associate Professor OKADA Takuya (Gofuku Campus) tokada@eng	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.
Engineering based on Genetic Information Professor KUROSAWA Nobuyuki (Gofuku Campus) kurosawa@eng	The research focused on the development of monoclonal antibodies for diagnosis, therapy and to analyze the functionality of biomolecules. The research focused on the production of substances through biological reaction engineering using microorganisms and the elucidation of microbial cellular mechanisms. The research focused on the production of substances by biological reaction engineering using microorganisms and the elucidation of microbial cellular mechanisms. The research is focused on the techniques of synthetic biology for the artificial reconstruction of the molecules and systems that make up life.

Educational area Responsible teacher Contact address	Research contents
Biomaterial Designing and Engineering Associate Professor NAKAJI Tadashi (Gofuku Campus) nakaji@eng	The research object in our laboratory is the construction of the novel concept to developing functional biomedical devices and the creation of biomaterials using synthetic polymer, biopolymer, protein and cells. I conduct the research education to train researchers who can construct material development concepts and have the ability to advance the novel research.
Computers and Applied Chemistry Professor ISHIYAMA Tatsuya (Gofuku Campus) ishiyama@eng	We construct a model of biomolecular interactions based on quantum chemical principles and analyze the molecular structure and dynamics through computer simulations. From the molecular trajectories obtained by simulations, we calculate static and dynamic physical quantities based on statistical mechanics theory to elucidate biological phenomena at the molecular level.
Biomolecular Chemistry Associate Professor SAKONO Masafumi (Gofuku Campus) msakono@eng	The purpose of this research is to elucidate the chemical and molecular aspects of biological compounds. We conduct research on improving conventional bioengineering methods and developing new biosensing methods.
Synthetic and Medicinal Chemistry Professor ABE Hitoshi (Gofuku Campus) abeh@eng	In this field, education and research is conducted on the development of efficient synthetic methods for biologically active compounds such as pharmaceuticals and various functional organic molecules.
Pharmacology Associate Professor TAKASAKI Ichiro (Gofuku Campus) takasaki@eng	Education and research will be conducted on intractable chronic pain diseases such as postherpetic neuralgia, migraine, and cancer pain, and intractable chronic pruritic diseases such as atopic dermatitis, in order to elucidate their pathological mechanisms and to discover novel therapeutic agents.

※In addition to the above table, the following laboratories are also available.
 protein metabolism

Table I-2 List of Research projects Conducted by Academic Advisors (Applied Natural Medicine)

Educational area Responsible teacher Contact address	Research contents
Neuromedical Science Professor TOHDA Chihiro (Sugitani Campus) chihiro@inm	・Elucidation of the molecular mechanism of restoring the neuronal network for activation of neural function. ・Traditional medicine research for developing fundamental therapeutic drugs for Alzheimer's disease, spinal cord injury, degenerative cervical myelopathy, glaucoma, and disuse syndrome. ・Molecular basis of crosstalk between the central nervous system and peripheral organs, which controls neural function. ・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 well-being.
Host Defences Professor HAYAKAWA Yoshihiro (Sugitani Campus) haya@inm	・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	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	・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 metabolomic biomarkers associated with cancer cells by utilizing FT-NMR and MS strategy
Complex Biosystem Research Professor NAKAGAWA Yoshimi (Sugitani Campus) ynaka@inm	・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

Educational area Responsible teacher Contact address	Research contents
Presymptomatic Disease Professor KOIZUMI Keiichi (Sugitani Campus) kkoizumi@inm	・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.
Clinical Pharmaceutics Professor KATO Atsushi (Sugitani Campus) kato@med	・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 medicines, taking into account clinical experience.
Bioorganic Medicinal Chemistry Associate Professor OKADA Takuya (Gofuku Campus) tokada@eng	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.
Biofunctional Chemistry Professor IKAWA Yoshiya (Gofuku Campus) yikawa@sci	Research interest in our group is to elucidate the molecular basis of naturally occurring RNAs with catalytic and receptor functions. Another research interest of our group lies in the artificial generation of novel RNAs and RNA-based molecular systems with through rational and evolutional approaches.
Cell Biology Professor KARAHARA Ichirou (Gofuku Campus) karahara@sci	Research and education to understand the environmental responses of plant organs and tissues, analyzing from macroscopic to ultrastructural structures, including 3D levels
Engineering based on Genetic Information Professor KUROSAWA Nobuyuki (Gofuku Campus) kurosawa@eng	The research focused on the development of monoclonal antibodies for diagnosis, therapy and to analyze the functionality of biomolecules. The research focused on the production of substances through biological reaction engineering using microorganisms and the elucidation of microbial cellular mechanisms. The research focused on the production of substances by biological reaction engineering using microorganisms and the elucidation of microbial cellular mechanisms. The research is focused on the techniques of synthetic biology for the artificial reconstruction of the molecules and systems that make up life.
Synthetic and Medicinal Chemistry Professor ABE Hitoshi (Gofuku Campus) abeh@eng	In this field, education and research is conducted on the development of efficient synthetic methods for biologically active compounds such as pharmaceuticals and various functional organic molecules.

Educational area Responsible teacher Contact address	Research contents
Pharmacology Associate Professor TAKASAKI Ichiro (Gofuku Campus) takasaki@eng	Education and research will be conducted on intractable chronic pain diseases such as postherpetic neuralgia, migraine, and cancer pain, and intractable chronic pruritic diseases such as atopic dermatitis, in order to elucidate their pathological mechanisms and to discover novel therapeutic agents.
Computational Drug Design and Mathematical Medicine Professor TAKAOKA Yutaka (Sugitani Campus) ytakaoka@med	Our aims to construct theoretical medicine, which has an analogous concept of theoretical physics in contrast with experimental physics. It is not easy to describe the human body, that is, a complex system, with a hard science which uses mathematical models in such field as physics or chemistry. Therefore, we utilize molecular simulation analyses to describe human body partially, and use this approach to predict the future disease treatments. It is a challenge to evolve the medical system as a science with accumulated logic for prediction from the one which emphasizes experiences and results. Our final goal is to enable a paradigm shift from "validation" to "prediction" in the system of medical science. It is important to note that we pay attention whether the mathematical model is applicable to the real world and do not aim for mathematical sophistication. In addition, we also study the themes for Kampo and Acupuncture, machine learning and natural language processing, and social medicine such as community medical policies, improvement of hospital function, and medical management as follows: ・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 genetic mutations resulting in amino acid substitutions ・Molecular mechanisms of therapeutic effects of acupuncture and moxibustion ・Application of AI technologies such as machine learning and natural language processing to improvement of hospital functions ・Population dynamics and the future prediction of community medicine
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)

Educational area Responsible teacher Contact address	Research contents
Anatomy and Neuroscience Professor ICHIJO Hiroyuki (Sugitani Campus) ichijo@med	We study structure, function, and evolution of neural circuits involved in animal behavior with taking advantage of in vivo and in silico methods. ・We investigate the structure and function of the habenula, which codes for aversive environments such as stress, in mice using anterior-posterior topography and maturation as clues. ・We investigate individual differences in neural circuits that respond to stress and their functional significance in mice. ・We investigate evolutionary mechanisms of innate attack and defense behaviors with using in silico individual-based models.
Molecular Brain Science Professor INOKUCHI Kaoru (Sugitani Campus) inokuchi@med	We aim to resolve mechanisms underlying memory formation and also roles played by idling brain in subconscious in mammals by making full use of molecular biology, biochemistry, cell biology, histochemistry, electrophysiology, behavioral pharmacology, optogenetics, and live-imaging. ・Research on the physical substance of engram ・Research on the dynamics of engram ・Research on idling brain functions
Systems Function and Morphology Professor ITO Tetsufumi (Sugitani Campus) itot@med	We employ multidisciplinary approach to investigate functional and morphological basis of the brain which allows the coding of sensory information, especially sounds, and the sensory perception. Followings are the examples of the approach. (1) By combining neurophysiological and neuroanatomical techniques, the organization of neuronal circuitry which enable a specific function will be clarified. (2) We will identify functional, morphological, and molecular details of neuronal cell types which constitute a neuronal circuitry to establish functional standpoint of each cell type. (3) By comparing non-model animals which have unique specializations for sensory behaviors with model animals, details of the functional organization of sensory neuronal circuitry and its evolution will be clarified. (4) By manipulating specific elements of a given neuronal circuitry, relationship between changes of activation patterns of the neuronal circuit and behavioral changes will be clarified.
Molecular Neuroscience Associate Professor YOSHIDA Tomoyuki (Sugitani Campus) toyoshid@med	・Research on molecular basis of higher brain functions such as cognition, emotion, and sociality with generation of novel genetically modified mouse models. ・Research on the development of novel molecular imaging methods in the brain. ・Research on molecular basis of neuro-immune interactions. ・Research on molecular mechanisms of central synapse formation ・Research on pathogenic mechanisms of neurodevelopmental disorders
Neuropsychiatry Professor TAKAHASHI Tsutomu (Sugitani Campus) tsutomu@med	・Brain imaging studies on pathophysiology of schizophrenia and their application to objective diagnosis of psychotic disorders ・Neurophysiological studies in schizophrenia and related disorders ・Pharmacotherapy to improve cognitive dysfunction in schizophrenia ・Mechanisms of symptom development and preventive strategies for schizophrenia ・Mechanisms of brain maturation, personality development, and sociality in adolescence ・Early diagnosis and intervention for dementia

Educational area Responsible teacher Contact address	Research contents
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. Lab members are expected to be engaged in research related to at least one of the following projects: 1) to examine the neurobiological mechanisms of biased cognitions towards emotional information; 2) to evaluate the efficacy of cognitive interventions including cognitive bias modification, cognitive training, and cognitive behavioral therapy for clinical and non-clinical population at high risk; and 3) to develop program tools to get the interventions easily accessible and doable. Participation in more than one project is encouraged.
Behavioral Physiology Professor TAKAO Keizo (Sugitani Campus) takao@cts	・Investigation of the physiological basis of learning, memory, emotion, and cognition ・Exploration and evaluation of mouse models of neuropsychiatric disorders using behavioral analyses ・Elucidation of the pathophysiology and development of therapies for neuropsychiatric disorders using mouse models ・Elucidation of the pathophysiology of psychiatric and neurological disorders using computational and information engineering methods ・Development of new genetically engineered mice ・Development of new reproductive technologies
System Emotional Science Professor NISHIMARU Hiroshi (Sugitani Campus) nishimar@med	・Neural mechanisms of emotion, learning/memory, and behavioral expression in the limbic system ・Neural mechanisms of social cognition and non-verbal communication ・Non-invasive functional brain mapping of human higher brain functions ・Central control of autonomic nervous functions ・Neural mechanism of sensory perception and cognition ・Neuronal mechanism of sensorimotor integration underlying emotional behavior ・Neuronal mechanism of value-based decision-making ・Development and application of machine-learning based behavior analysis methods for animal models of neuropsychiatric disorders.
Pathology and pathologyAssociate Associate Professor YAMAMOTO Seiji (Sugitani Campus) seiyama@med	・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 explorer and identify factors involved in disease progression, and promote research to develop novel treatment methods for patients.

Educational area Responsible teacher Contact address	Research contents
Computational Drug Design and Mathematical Medicine Professor TAKAOKA Yutaka (Sugitani Campus) ytakaoka@med	Our aims to construct theoretical medicine, which has an analogous concept of theoretical physics in contrast with experimental physics. It is not easy to describe the human body, that is, a complex system, with a hard science which uses mathematical models in such field as physics or chemistry. Therefore, we utilize molecular simulation analyses to describe human body partially, and use this approach to predict the future disease treatments. It is a challenge to evolve the medical system as a science with accumulated logic for prediction from the one which emphasizes experiences and results. Our final goal is to enable a paradigm shift from "validation" to "prediction" in the system of medical science. It is important to note that we pay attention whether the mathematical model is applicable to the real world and do not aim for mathematical sophistication. In addition, we also study the themes for Kampo and Acupuncture, machine learning and natural language processing, and social medicine such as community medical policies, improvement of hospital function, and medical management as follows: ・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 genetic mutations resulting in amino acid substitutions ・Molecular mechanisms of therapeutic effects of acupuncture and moxibustion ・Application of AI technologies such as machine learning and natural language processing to improvement of hospital functions ・Population dynamics and the future prediction of community medicine
Applied Pharmacology Professor KUME Toshiaki (Sugitani Campus) tkume@pha	・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
Molecular Neurobiology Associate Professor TABUCHI Akiko (Sugitani Campus) atabuchi@pha	・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
Pharmaceutical Therapy and Neuropharmacology Professor NITTA Atsumi (Sugitani Campus) nitta@pha	・Behavioral pharmacological, molecular biological and cell biological studies to clarify the function of the novel molecules for the psychiatric diseases ・Study for the clarification of the mechanisms of establishment of addiction of nicotine, THC and methamphetamine ・Establishment of addictive model mice ・Pharmaceutical studies and pharmaceutical educational methods

Educational area Responsible teacher Contact address	Research contents
Pharma-Medical Informatics and AI Specially Appointed Professor SUGANO Aki (Sugitani Campus) sugano@pha	· 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 *in silico* drug repurposing
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
Regulatory Biology Professor MATSUDA Kouhei (Gofuku Campus) kmatsuda@sci	Rapid progress has been made in the functional analysis of various substances responsible for signaling pathway, such as physiologically active substances and their receptors, in the nervous, endocrine, and immune systems. I will conduct education and research on the modes and molecular basis of intercellular and intracellular transduction mechanisms in the central and peripheral regions.
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.
Artif icial 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.

※In addition to the above table, the following laboratories are also available.
Integrative Neuroscience

Table I-4 List of Research projects Conducted by Academic Advisors (Medical Design)

Educational area Responsible teacher Contact address	Research contents
Biological Information Processing Professor TABATA Toshihide (Gofuku Campus) ttabata@eng	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.
Computational Biophotonics Professor KATAGIRI Takashi (Gofuku Campus) katagiri@eng	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.
Mechanical Information and Instrumentation Professor SASAKI Tohru (Gofuku Campus) tsasaki@eng	We conduct research to make complex systems highly functional and multifunctional, to develop elements and systems that constitute efficient measurement and control systems, and to establish theories.
Human-Computer Interaction Professor NOZAWA Takayuki (Gofuku Campus) nozawa@eng	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.
Dynamical Systems and Robotics Associate Professor TODA Hideki (Gofuku Campus) toda@eng	We will establish various theories and technologies for the creation and application processes of excellent new materials and functional materials, and collaborate with molecular functional materials. Furthermore, we will conduct educational research on the industrial application of molding technology for metals and new materials.
Clinical Optical Information Engineering Specially Appointed Professor OSHIMA Yusuke (Gofuku Campus) oshima@eng	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.

Educational area Responsible teacher Contact address	Research contents
Medical Image Analysis, Bioinformatics Associate Professor TERABAYASHI Kenji (Gofuku Campus) tera@eng	・Image understanding of cells in blood for cancer patients ・Analysis of CT data for fracture fixation ・Understanding central nervous system disease based on proteomics
Medical Information Sensing Professor HASEGAWA Hideyuki (Gofuku Campus) hasegawa@eng Associate Professor NAGAOKA Ryo (Gofuku Campus) nryo@eng	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.
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.
Materials Plasticity Engineering Professor AIDA Tetsuo (Gofuku Campus) aida@sus	We will establish various theories and technologies for the creation and application processes of excellent new materials and functional materials, and collaborate with molecular functional materials. Furthermore, we will conduct educational research on the industrial application of molding technology for metals and new materials.
Behavioral Physiology Professor TAKAO Keizo (Sugitani Campus) takao@cts	・Investigation of the physiological basis of learning, memory, emotion, and cognition ・Exploration and evaluation of mouse models of neuropsychiatric disorders using behavioral analyses ・Elucidation of the pathophysiology and development of therapies for neuropsychiatric disorders using mouse models ・Elucidation of the pathophysiology of psychiatric and neurological disorders using computational and information engineering methods ・Development of new genetically engineered mice ・Development of new reproductive technologies

Educational area Responsible teacher Contact address	Research contents
Cardiology and Nephrology Professor KINUGAWA Koichiro (Sugitani Campus) kinugawa@med	・Establishment of optimization protocol for the treatment of heart failure using various biomarkers ・Development of non-invasive home tele-monitoring system in order to minimization of re-hospitalization by heart failure ・Mechanisms of sympathetic nerve inhibition by non-pharmacological therapy for heart failure ・Introduction of novel staging of heart failure by cardiopulmonary function ・Development of novel strategy for heart failure to alter cardiac-specific gene ・expression ・Investigation of relationship between beta-adrenergic receptors and reversibility of myocardial remodeling ・Exploitation of factors to determine the viability of renal collecting tubules ・Effect of renal denervation on autonomic disorders in heart failure model ・Mechanisms of onset of atrial fibrillation
Urology Professor KITAMURA Hiroshi (Sugitani Campus) hkitamur@med	・Biomarker research on urological cancers ・Development of immunotherapy for urological cancers ・Cancer stem cell research on urologic cancers ・Growth factor research on prostate cancer ・Basic research on impaired spermatogenesis ・Research on vascular epithelial cells in erectile dysfunction ・Research on Heat Shock Protein in acute/chronic rejection after renal transplantation
Cardiothoracic Surgery Professor TSUCHIYA Tomoshi (Sugitani Campus) ytakaoka@med	Through our transplantation and tissue engineering research, we have established a network with domestic and international research institutions to promote human exchange, joint research, and study abroad programs. (Collaborating institutions: Department of Biomedical Engineering at Yale University, Cincinnati University, RIKEN, Institute of Quantum Beam Science, Nagasaki University, Nagoya University, Department of Surgery for Organ Replacement and Xenotransplantation at Kagoshima University) The following is a list of major research projects. (Ref；https://www.organengineering.com/) ・Research on organ engineering using decellularized tissue skeletons ・Development of disease models using regenerated organs ・Development of disease models using lung organoids ・Induction of immune tolerance by cell therapy in lung transplantation models 　～Cell therapy using regulatory T cells (Treg cells) 　～Cell therapy using mesenchymal stem cells ・Research on development and disease control of lung mucinous adenocarcinoma ・Prediction of pleural invasion by intraoperative imaging using artificial intelligence
Hematology Professor SATO Tsutomu (Sugitani Campus) tsutomus@med	・Development of new drugs for multiple myeloma ・Exploratory research into molecularly-targeted therapy for T-cell lymphoma ・Prevention of bone mineral density reduction during lymphoma therapy ・Effects of osteoporosis on hematopoietic stem cells

Educational area Responsible teacher Contact address	Research contents
Comprehensive Oral Sciences Professor YAMADA Shin-ichi (Sugitani Campus) shinshin@med	・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.
Computational Drug Design and Mathematical Medicine Professor TAKAOKA Yutaka (Sugitani Campus) ytakaoka@med	Our aims to construct theoretical medicine, which has an analogous concept of theoretical physics in contrast with experimental physics. It is not easy to describe the human body, that is, a complex system, with a hard science which uses mathematical models in such field as physics or chemistry. Therefore, we utilize molecular simulation analyses to describe human body partially, and use this approach to predict the future disease treatments. It is a challenge to evolve the medical system as a science with accumulated logic for prediction from the one which emphasizes experiences and results. Our final goal is to enable a paradigm shift from "validation" to "prediction" in the system of medical science. It is important to note that we pay attention whether the mathematical model is applicable to the real world and do not aim for mathematical sophistication. In addition, we also study the themes for Kampo and Acupuncture, machine learning and natural language processing, and social medicine such as community medical policies, improvement of hospital function, and medical management as follows: ・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 genetic mutations resulting in amino acid substitutions ・Molecular mechanisms of therapeutic effects of acupuncture and moxibustion ・Application of AI technologies such as machine learning and natural language processing to improvement of hospital functions ・Population dynamics and the future prediction of community medicine

※In addition to the above table, the following laboratories are also available.　　Biomechanics
・The (Gofuku Campus), (Sugitani Campus) and (Takaoka Campus) in the contact information indicate the campus where the teacher's laboratory is located.
・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