

Research Subjects, Graduate School of Medical and Dental Sciences, Doctoral Program, Biomedical Sciences and Engineering Track

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No.	Code	Department	Supervisor	Research Subject	Classification
1	5020	Biomedical Devices and Instrumentation	MITSUBAYASHI Kohji	1. Basic and applied research on "BioMedical Sensing" (integration with various engineering technologies) 2. Wearable devices and artificial organs with MEMS-tech and biocompatible polymers 3. Bio-fluorometric sensing of disease-based breath chemicals 4. Real-time imaging of transcutaneous volatiles for metabolic evaluation 5. Surface plasmon technologies for monitoring of biological and environmental information	BM
2	5030	Biomedical Information	NAKAJIMA Yoshikazu	1. Fundamental and applied researches on bio-imaging. 2. Research on high-dimensionalization of medical images and data. 3. Research on computer analysis and diagnosis of medical data. 4. Research on description of biological information, human-body modeling, human-body simulation and their application for medicine. 5. Research on computer-integrated surgical assistance systems.	BM
3	5040	Bioelectronics Not recruiting this year	MIYAHARA Yuji Scheduled to retire in March 2022	1. Fundamental and applied research on bio-sensing engineering 2. Electrical detection of bio-molecules and cell functions 3. Chemical modification at solid/liquid interface for functional expression of bio-molecules and cells 4. Synthesis of intelligent polymers for blood glucose control 5. New sensing scheme based on nano- and micro- technologies	BM
4	3280	Biodesign	Under Selection		BM
5	5050	Material-Based Medical Engineering	KISHIDA Akio	1. Research on the materials and the engineering for tissue engineering and regenerative medicine 2. Research on the processing and high functionality of biological materials 3. Research on the novel method for evaluating inflammatory responses on medical materials in vitro 4. Research on the control technology of cellular functions by extracellular matrix-bounded nanovesicles 5. Research on the high selective cell capture devices for immunomodulation	BM
6	5060	Organic and Medicinal Chemistry	KAGECHIKA Hiroyuki	1. Medicinal Chemistry of Retinoid and Nuclear Receptors 2. Development of Novel Modulators of Gene Transcription or Signaling Pathway for Clinical Application toward Intractable Diseases 3. Development of Functional Fluorescent Molecules for Elucidation of Cellular Signaling Pathway 4. Aromatic architecture based on the amide conformational properties	BM
7	5070	Chemical Bioscience	HOSOYA Takamitsu	1. Drug seed development based on new synthetic methodologies 2. Development of new methods to connect molecules based on strained molecules 3. Probe synthesis for target protein identification of bioactive compounds 4. Probe design and synthesis for in vivo molecular imaging	BM
8	5080	Medicinal Chemistry	TAMAMURA Hirokazu	1. Development of bifunctional molecules using organic synthesis. 2. Development of peptidomimetics and drug discovery templates. 3. Development of antiviral agents and anti-cancer agents. 4. Development of bioprobes and chemical biology.	BM
9	5090	Metallic Biomaterials Not recruiting this year	HANAWA Takao	1. Development of zirconium alloys for minimizing MRI artifacts 2. Bio-functionalization of metals by electrochemical surface treatment and modification techniques 3. Strengthening of titanium alloys by severe working 4. Control of differentiation of stem cells on nanometer-level surface topography 5. Elucidation of interfacial reaction between materials and tissues	BM
10	5110	Organic Biomaterials Not recruiting this year	YUI Nobuhiko	1. Dynamic surfaces for modulating cellular functions 2. Biocleavable polyrotaxanes as therapeutics for intractable diseases 3. Supramolecular polyelectrolyte complexes of biomolecules to induce enhanced biological activities 4. Polyrotaxane-based three-dimensional architectures for supramolecular biomaterials	BM
11	5120	Biomechanics	Under Selection		BM
12	5360	Ceramic Biomaterials	YOKOI Taishi	1. Development of layered calcium phosphate based-materials for hard tissue regeneration 2. Development of ultra-tough artificial bone 3. Biomedical application of inorganic materials responding to biomolecules 4. Design of ceramic materials compatible with therapy and diagnosis 5. Development of ceramic micro/nano-particles for intra-arterial therapy of deep-seated cancer	BM
13	5370	Advanced Bio-molecular Design	MATSUMOTO Masahito	1. Development of mRNA therapeutics 2. Technology on cell fate determination 3. Molecular biology associated with applications of mRNA therapeutics 4. Molecular design for advanced nucleic acid medicine	BM
14	5130	Molecular Cell Biology	SHIBUYA Hiroshi	1. Molecular mechanism in cellular signaling of growth and differential factors 2. Molecular mechanism in the onset and progress of diseases 3. Molecular mechanism in the early development	MR

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15	5140	Developmental and Regenerative Biology	NISHINA Hiroshi	1. Study on signaling pathways that regulate cell survival and death 2. Study on signaling pathways that regulate embryonic stem cell proliferation and differentiation 3. Study on liver formation and regeneration using mice and fish 4. Study on molecular mechanisms regulating circadian clock	MR
16	5150	Immunology	TSUBATA Takeshi Scheduled to retire in March 2022	1. Study on the regulatory mechanisms for autoantibody production in SLE and Guillain-Barre syndrome 2. Study on organelle signaling in B lymphocyte activation 3. Study on glycan signals that regulate antibody production 4. Development of novel drugs for multiple sclerosis and type 1 diabetes that regulate regulatory B cells. 5. Development of novel cancer immunotherapy	MR
17	5160	Epigenetics	Under Selection	1. Genomic imprinting in mammalian development and its relations to human diseases 2. Mammalian reproductive mechanism and epigenetic reprogramming 3. Mammalian evolution by acquired genes from retroelements	MR
18	5170	Structural Biology	ITO Nobutoshi	1. Structural biology by X-ray crystallography and cryo-electron microscopy 2. Structural and kinetic analyses of protein-protein interactions 3. Molecular recognition of small-molecule ligands (drugs) by proteins 4. Computational biology of biological macromolecules using structural information	MR
19	5180	Neuroscience	Under Selection	1. The pathophysiology of major mental illness 2. The pathophysiology of neurodegenerative diseases 3. The role of neurotransmitters in brain development 4. The role of glial cells in brain function 5. Generation of animal models for neuropsychiatric disorders using genome editing tools	MR
20	5190	Bio-informational Pharmacology	TAKEUCHI Jun	1. Understanding the molecular mechanisms of the transcriptional and epigenetic regulators for cardiac development and differentiation 2. Generating the mouse model to understand congenital heart diseases with novel methods 3. Epigenome and proteome analysis during the heart regeneration 4. Bioinformatics analysis in cardiovascular development 5. Reprogramming/transdifferentiation in development	MR
21	5200	Molecular Genetics	NAKANISHI Akira	1. Molecular mechanism of carcinogenesis 2. Mass spectrometry-based proteomics of cancer-associated proteins 3. Regulatory mechanism of centrosome cycle 4. Analysis of DNA topology regulatory elements	MR
22	5210	Epigenetic Epidemiology Not recruiting this year	SATO Noriko	1. Effects of intrauterine environment on neonate epigenome 2. The molecular mechanisms underpin DOHaD phenomena (animal experiment) 3. Gene-environment interaction in common diseases 4. Integrated personal disease risk assessment system	MR
23	5370	Functional Genome Informatics	NIKAIDO Itoshi	1. Development of data science technologies for large-scale genome analysis using machine learning and computer science 2. Development of new experimental techniques for large-scale genome science 3. Study of the development of regenerative medicine and drug discovery using large-scale genome analysis	MR
24	5500	Medical Chemistry	SEGAWA Katsumori	1. Identification of factors responsible for cellular membrane dynamics. 2. Aberrant membrane dynamics and associated diseases. 3. Identification of factors responsible for cellular homeostasis.	MR
25	5220	RIKEN Molecular and Chemical Somatology	TANIUCHI Ichiro SODEOKA Mikiko WATANABE Nobumoto TANAKA Motomasa TANAKA Katsunori HAGIHARA Shinya	1. Regulatory mechanisms for the lymphocyte development (Ichiro Taniuchi) 2. Design and synthesis of bioactive molecules based on synthetic organic chemistry and chemical biology research (Mikiko Sodeoka) 3. Discovery, target identification and analyses of mechanism of action of bioactive compounds that regulate biological function (Nobumoto Watanabe) 4. Molecular basis of psychiatric diseases and neurodegenerative disorders (Motomasa Tanaka) 5. Advances in in vivo synthetic chemistry: New modality in medicinal chemistry and therapeutics (Katsunori Tanaka) 6. Regulation of physiological function of plants with synthetic molecules (HAGIHARA Shinya)	※ 1
26	5230	NCC Cancer Science	ARAKAWA Hirofumi MASUTOMI Kenkichi HAMAMOTO Ryuji YASUNAGA Masahiro KOGA Yoshikatsu UEMURA Yasushi	1. Carcinogenesis and molecular mechanism 2. Functions of cancer-associated genes and their alterations 3. Genomic, epigenomic and proteomic analysis of cancer and personalized medicine 4. Tumor microenvironment/cancer stem cells/non-coding RNA/signaling pathway 5. Molecular target/drug delivery/diagnosis and therapy	※ 2
27	5240	Cellular and Molecular Medicine	SASAKI Jumko	1. Molecular mechanism of sex reversal induced by lipid metabolism 2. Malignant tumor and lipid metabolism 3. Biological significance of phospholipid acyl-chain composition	MR
28	5390	Interdisciplinary Sciences	HATTORI Atsuhiko NARA Masayuki TOKUNAGA Shin-ichi	1. Circadian clock and learning and memory mechanism 2. Space biology and energy metabolism 3. Spectroscopic analysis for molecules of life 4. Problems of graph theory as the basis of network structure in life science	

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29	5400	Data Science Algorithm Design and Analysis	BANNAI Hideo	1. Algorithms and data structures for matching, searching, and discovering patterns 2. Algorithms and data structures for compression and compressed data processing 3. combinatorics on strings	DS
30	5410	AI Technology Development	PARK Heewon	1. Statistical theory and data-analytic approaches 2. Explanable AI technologies for systematic understanding of diseases 3. Analysis of omics data for healthcare 4. Network biology for uncovering gene regulatory networks	DS
31	5270	Anatomical Science	HOSHI Osamu	1. Application of atomic force microscopy to biological fields. 2. Analysis of high-order structure of human chromosomes. 3. Analysis of dynamics of growth cones of neuron.	MT
32	5250	Biochemistry and Biophysics	SUMI Yuki (concurrently assigned)	1. Molecular Biology of Stem Cells 2. Human Resouse Development of Regeneration Medicine	MT
33	5260	Molecular and Cellular Biology	SUZUKI Nobuharu	1. Elucidation of the mechanisms of myelination and axon maintenance in the CNS and identification of novel molecular markers 2. Analyses of murine models and molecular structures related to neurological and mental disorders 3. Study of the regulation of cell functions by extracellular matrix and the development of novel substrates for cell culture	MT
34	5340	Molecular Pathology	SAWABE Motoji Scheduled to retire in March 2022	1. Immunohistochemical analysis of human and murine cardiac conduction system 2. Proteomic analysis of human cardiac aging 3. Molecular pathological study of hepatobiliary tumors 4. Molecular epidemiologic study of Lipoprotein(a)	MT
35	5300	Biophysical System Engineering	ITO Minami	1. Mathematical models for context dependent visual information processing 2. Neural mechanisms underlying context dependent visual information processing 3. Developing methods to monitor vital information with aid of mathematical models	MT
36	5280	Respiratory and Nervous System Science	SUMI Yuki	1. Pathogenic mechanisms of bronchial asthma, COPD, interstitial pneumonia 2. Gene therapy and immunotherapy for lung diseases 3. Pathogenesis of neuropsychiatric disease using non-invasive brain function tests and image analyses 4. Investigation of epilepsy using EEG 5. Evaluation of brain function using the event-related potential analysys	MT
37	5290	Clinical and Diagnostic Laboratory Science	KAKINUMA Sei	1. Development of novel disease models using human iPS cells to elucidate the pathophysiology of hepatobiliary diseases 2. Analysis of cell-to-cell interaction regulating development and progression of hepatobiliary diseases 3. Development of hepatobiliary and pancreatic disease models using organoid culture system 4. Molecular mechanisms regulating homeostasis of stem/progenitor cells in hepatobiliary and pancreatic tissues 5. Research on molecular mechanisms regulating liver regeneration and hepatic fibrosis	MT
38	5310	Analytical Laboratory Chemistry	OHKAWA Ryunosuke	1. Development of a new biomarker to estimate residual risk for cardiovascular disease 2. Mechanism of HDL diversification and its effect on the character and function 3. Molecular mechanism of red blood cell-related lipids metabolism	MT
39	5350	Laboratory Molecular Genetics of Hematology	NISHIO Miwako	1. Laboratory molecular and genetic analyses on hematologic neoplasms 2. Epstein-Barr virus positive T- or NK-cell neoplasms: Clarification of the onset mechanisms and development of the new treatment strategies 3. Development of brown adipocytes detection method using human ES / iPS cells	MT
40	5320	Immunopathology	Under Selection		MT
41	5330	Molecular Microbiology	SAITO Ryoichi	1. Mechanism of antimicrobial resistance in bacteria 2. Regulation of bacterial virulence 3. Molecular epidemiology in bacteria	MT

BM : Institute of Biomaterials and Bioengineering

MR : Medical Research Institute

MT : Biomedical Laboratory Sciences

DS:M&D Data Science Center

※ 1 : Institute of Physical and Chemical Research (Riken)

※ 2 : National Cancer Center