

Outline of G3 Research

The object of the “Life Science Materials, Devices and System” group (G3) is to create cutting-edge technologies for the elucidation of biological functions by utilizing advanced optical imaging, molecular structural analyses, and mathematical and information sciences. By complementarily developing information of biological functions and synthesis of biomolecules, we provide novel functional materials and devices contributing for life-innovation in the 21st century.



Main members and their research subjects



<Group Leader>

Prof.

Kuniharu IJIRO (RIES)

■Development of biomimetic nanofabrication method using molecular self-assembly

Keywords: Biomimetics, Nanomaterial, Self-assembly



<Planning and Promotion Leader>

Prof.

Tomomi NEMOTO (RIES)

■Cutting-edge optical imaging and cell physiology of neural and secretory activities

Keywords: Two-photon microscopy, Super-resolution microscopy, Molecular and cellular physiology



<Vice-Leader>

Prof.

Yoshinori NISHINO (RIES)

■Deep Nano-Imaging Using Synchrotron Radiation and X-ray Free-Electron Lasers

Keywords: Phase Imaging, Controlled Environment Imaging, Coherent X-rays



Assoc. Prof.

Hitoshi AONUMA (RIES)

■Understanding real time adaptability of animal behavior

Keywords: Neurobiology, Synthetic neuroethology, Neuro-robotics

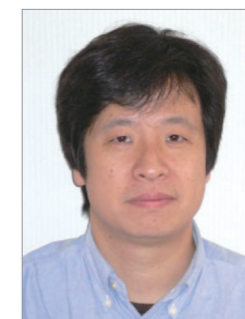


Prof.

Hiroshi UJII (RIES)

■Heterogeneous dynamics at mesoscopic scale will be investigated using super resolution (single molecule) fluorescence (Raman) microscopy. Particularly, biological issues will be mainly addressed.

Keywords: Single molecule, Heterogeneous dynamics, Nanoscopy



Prof.

Tamiki KOMATSUZAKI (RIES)

■Developments of data-driven mathematics and concepts in single molecule biology

Keywords: Single Molecule Biology, Multiscale Dynamics in Complex Systems, Molecular Data Science



Assoc. Prof.
Katsuhiko SATO (RIES)
■Role of mechanical forces in complex phenomena in biological systems
Keywords: Mechanical models, Morphogenesis, Rheology



Assoc. Prof.
Yuzuru SATO (RIES)
■Random dynamical systems approaches to nonlinear complex phenomena
Keywords: Complex systems, Chaos, Random dynamical systems, Time series analysis



Prof.
Satoshi TAKAHASHI (IMRAM)
■Dynamics of protein folding and function based on single molecule fluorescence spectroscopy
Keywords: Dynamics, Protein folding, Single Molecule Spectroscopy



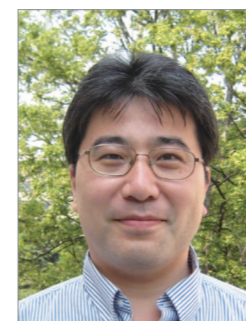
Prof.
Fumi NAGATSUGI (IMRAM)
■Development of the functional molecules for regulation of gene expression
Keywords: Antisense, Reactive oligonucleotide, miRNA



Prof.
Nobuyuki TAMAOKI (RIES)
■Synthesis of light-driven molecular machines
Keywords: Motor protein, Photochromic compound, Liquid crystal



Prof.
Toshiyuki NAKAGAKI (RIES)
■Ethology of single celled organism viewed from physical equation of motion
Keywords: Mathematical Modeling, Protozoa, Nonlinear dynamics, Biomechanics



Prof.
Akihide HIBARA (IMRAM)
■Nano-microfluidic analytical devices / microscopic techniques are investigated
Keywords: Nanofluidics, Microfluidics, Light scattering, Liquid interfaces



Prof.
Shin MIZUKAMI (IMRAM)
■Development of bioanalytical technology based on functional molecular probe design
Keywords: Bioimaging probes, Chemical biology, Photofunctional molecules



Prof.
Masaharu NAGAYAMA (RIES)
■Understanding of nonlinear phenomena using mathematical modeling
Keywords: Mathematical modeling, Reaction-diffusion system, Numerical simulation



Assoc. Prof.
Kenichi NIIKURA (RIES)
■Controlled nanoparticle assembly and their applications for drug delivery systems and vaccines
Keywords: Nanoparticle, Drug delivery, Vaccine



Prof.
Atsushi MOMOSE (IMRAM)
■Visualization of biomedical materials with X-ray phase imaging
Keywords: X-ray, Phase contrast, Tomography



Prof.
Takehiko WADA (IMRAM)
■Novel strategy for ischemia cell specific oligonucleotide therapeutics with intracellular environmental condition responsible artificial nucleic acid
Keywords: Oligonucleotide therapeutics, Active Control



Prof.
Vasudevan P. BIJU (RIES)
■Photonic molecules and nanomaterials for single-molecule detections, bio-imaging, and optical displays
Keywords: Photonic molecules, Single molecule fluorescence, Fluorescence sensors



<Vice-Leader>
Prof.
Masahiko TAKAHASHI (IMRAM)
■Towards investigation of the origins of molecular functions by developing methods to visualize electron motion in matter
Keywords: Electron Compton scattering, Electron momentum spectroscopy, Momentum space wave function



<Vice-Leader>
Prof.
Toru HISABORI (LCLS)
■Functional Analysis of Redox-Regulated Biological Systems
Keywords: Photosynthesis, Redox regulation, Bioenergetics, ATP synthase



Assoc. Prof.
Sousuke IMAMURA (LCLS)
■Biofuel production using microalgae
Keywords: Biofuel production, Microalga, Nitrogen signaling



Prof.
Kenji INABA (IMRAM)
■Structural and mechanistic basis of cellular systems involved in protein quality control
Keywords: Protein quality control, Redox, Molecular chaperone, X-ray crystal structure analysis



Prof.
Shunichi SATO (IMRAM)
■Laser application for material science
Keywords: Photonics, Vector beam, Intense laser



Prof.
Hiroshi UEDA (LCLS)
■Developing novel diagnostic systems by protein modification and split reactions
Keywords: Fluorescence Quenching, Luciferase, Protein-Protein Interaction



Prof.
Kan TANAKA (LCLS)
■Development of tetrapyrrole sensory devices toward the control of cell processes
Keywords: Tetrapyrrole, Organelle, Cell proliferation



Assoc. Prof.
Arihiro KANO (IMCE)
■ Studies on immunoregulatory factors secreted from cancer cells
Keywords: Cancer, Tumor, Immune suppression



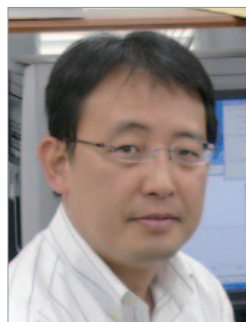
Prof.
Satoru KIDOAKI (IMCE)
■ Development of mechanobio-materials for cell manipulation
Keywords: Mechanobio-materials, Cell machanotaxis, Microelasticity patterning



Prof.
Mitsuru SHINDO (IMCE)
■ Design and synthesis of useful organic molecules for life science
Keywords: Organic synthesis, Chemical biology, Bioactive compounds



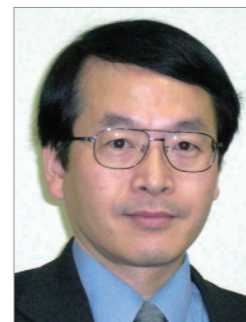
Prof.
Atsushi TAKAHARA (IMCE)
■ Precise structure control of soft interfaces for biomedical applications
Keywords: Soft Interfaces, Biointerface, Soft material



Prof.
Hiroyuki NAKAMURA (LCLS)
■Control of Biofunctions Using Photosensitizing Molecules and Application to Medicinal Chemsitry
Keywords:Protein modification, Photosensitizer, Anticancer drug design



Prof.
Nobuhiro NISHIYAMA (LCLS)
■Development of smart diagnostic and therapeutic systems based on synthetic functional polymers
Keywords:DDS, Nanomedicine, Functional polymer, Imaging



Prof.
Hiroaki SASAI (ISIR)
■Development of Novel Enantioselective Reactions
Keywords:Multi-functional Catalyst, Enantioselective Catalyst, Domino Reaction, Helicenes



Assoc. Prof.
Takeyuki SUZUKI (ISIR)
■Development of environmentally benign oxidation for the catalytic asymmetric synthesis
Keywords:Iridium catalyst, Hydrogen transfer, Oxidation



Prof.
Masaaki FUJII (LCLS)
■Functional Analysis of Molecular Building Blocks by Advanced Laser Spectroscopy
Keywords:Molecular Recognition, Laser Spectroscopy, Intermolecular Interaction



Assoc. Prof.
Shinichiro FUSE (LCLS)
■Natural product science based on micro-flow synthesis
Keywords:Micro-flow, Natural product, Medicinal Chemistry



Prof.
Masateru TANIGUCHI (ISIR)
■Development of bio-nanodevices using single-molecule analysis
Keywords:Single Molecular Science, Single Molecule Analysis, Biomolecules



Prof.
Takeharu NAGAI (ISIR)
■Development and application of fluorescent and chemiluminescent protein for bioscience research
Keywords:Fluorescent protein, Chemiluminescent protein Bioimaging



Assoc. Prof.
Michito YOSHIZAWA (LCLS)
■Functional molecular capsules with polyaromatic panels
Keywords:Assembly, Capsule, Polyaromatic, Recognition



Assoc. Prof.
Ken-ichi WAKABAYASHI (LCLS)
■Photomovement in the green algae: from photoreception to flagellar regulation
Keywords:Chlamydomonas, Volvox, Flagella, Channelrhopsin



Prof.
Kazuhiko NAKATANI (ISIR)
■Studies on interaction of small molecules to nucleic acids
Keywords:Micro RNA, Riboswitch, Regulation of gene expression



Prof.
Masayuki NUMAO (ISIR)
■Artificial intelligence and visualization for the diagnosis of fuel cells and rechargeable batteries
Keywords:Machine learning, Acoustic emission, Fuel cell



<Vice-Leader>
Prof.
Kunihiko NISHINO (ISIR)
■Development of new strategies to tackle infectious diseases
Keywords:Multidrug resistance, Antimicrobial chemotherapy, Systems biology



Prof.
Nobuo KATO (ISIR)
■Modulation of intracellular signaling and visual identification of virus genome
Keywords:14-3-3 proteins, Anti-cancer agents, Peptide nucleic acid, Dengue virus



Assoc. Prof.
Yasushi MAKIHARA (ISIR)
■iNPH diagnosis support based on gait image analysis
Keywords:Gait, Computer vision, iNPH



Specially Appointed Prof.
Akihito YAMAGUCHI (ISIR)
■Studies on the structural basis of bacterial multidrug efflux transport
Keywords:Multidrug efflux, Multidrug resistance, X-ray crystallography



Prof.
Shun'ichi KURODA (ISIR)
■Development of In Vivo Pinpoint Drug Delivery System Inspired by the Viral Infection Machinery
Keywords:Virus, Nanocarrier, DDS



Prof.
Kazunori KOMATANI (ISIR)
■Robot dialogue system based on speech information processing technology
Keywords:Speech recognition, Dialogue system, Humanoid robot, Ontology



<Vice-Leader>
Prof.
Masaru TANAKA (IMCE)
■Design of biocompatible soft-biomaterials for medical devices
Keywords:Biocompatibility, Cell adhesion, Bio-interfaces, Water structure



Assoc. Prof.
Hirohiko ISE (IMCE)
■Development of medical devices using carbohydrate-bearing polymers
Keywords:Carbohydrates, Biomaterials, Cell biology