

# LIST OF THESIS ADVISORS FOR 2027 ENTRY

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For Ph.D. applicants:

The faculty with the following star symbol accepts Ph.D. students. Make sure to see if they are available for your intended semester.

☆ ..... Available for April, 2027 and September, 2027 entry

★ ..... Available only for April, 2027 entry

## MECHANICAL ENGINEERING

CAO, Wenjing (Associate Professor)

Research field: Control Theory and Control Engineering

Main theme:

- Optimal control of vehicle motion to improve fuel and/or time efficiency
- Optimal control of automobile powertrain to improve fuel economy, emission and/or drive comfort
- Autonomous driving and control of robots

DZIEMINSKA, Edyta (Associate Professor)

<http://pweb.cc.sophia.ac.jp/edyta/>

Research field: Combustion and Detonation, Shock Waves

Main theme:

- Deflagration-to-Detonation Transition problem
- Numerical simulation of detonation
- Flame propagation and shock waves
- Amphibious aircraft design

HISAMORI, Noriyuki (Professor) ☆

Research field: Biomaterial Science, Material Science and Engineering

Main theme:

- Bio-functional materials for advanced medical technology
- Metallic biomaterials and Bioactive materials
- Strength and fracture of materials
- New surface modification processes

ICHIYANAGI, Mitsuhsa (Professor) ☆

<https://researchmap.jp/ichiyanagi?lang=en>

Research field: Heat Transfer Engineering, Internal Combustion Engine,  
Detonation Engine

Main theme:

- Experimental study of gas flow in in-cylinder of CI engine using PIV
- Development of automotive engines using ammonia-blended fuel
- Development of rotating detonation engines using ammonia fuel

TAKAI, Kenichi (Professor) ☆

<http://pweb.cc.sophia.ac.jp/takai-k/>

Research field: Materials Science, Hydrogen Technology

Main theme:

- Hydrogen embrittlement mechanism of bcc, fcc and hcp metals
- Hydrogen trapping characteristic of metals measured by TDS
- Infrastructural material development for hydrogen energy society
- Interaction between hydrogen and lattice defects of metals

TAKEHARA, Shoichiro (Professor) ☆

Research field: Multibody Dynamics

Main theme:

- Motion analysis of Human body
- Motion and control of tethered system
- Design of Personal Mobility

TANAKA, Hidetake (Professor) ☆

Research field: Precision Engineering

Main theme:

- Development of novel machining technique for CFRP / Titanium
- Evaluation for surface texture and forming mechanism of burnishing
- Development of die-less forming technique for sheet metal and CFRTP on the basis of CAD
- Taguchi method for machining and plastic working

WATANABE, Mariko (Associate Professor)

Research field: Fluid Engineering

Main theme:

- Development of aftertreatment filters for gasoline engines
- Fluctuation of fire whirl
- Development of non-contact holder using airflow

YILMAZ, Emir (Associate Professor)

<https://yilmaz-emir.github.io>

Research field: Precision Engineering

Main theme:

- Tribology
- Surface Engineering
- Heat transfer

ZHANG, Yuelin (Associate Professor)

Research field: Biomechanics

Main theme:

- Mechanism of traumatic brain injury
- Viscoelastic property measurement
- 3D deformation Visualization of biological body using MR/CT images

## ELECTRICAL AND ELECTRONICS ENGINEERING

HAYASHI, Hitoshi (Professor) ☆

<https://researchmap.jp/7000002862?lang=en>

Research field: IoT/AI Networks, Blockchain, Circuits and Electronics

Main theme:

- Fundamental study of RFID and sensor networks
- Design of miniaturized and low-power microwave circuits/wireless systems

KIKUCHI, Akihiko (Professor) ★

Research field: Semiconductor Engineering, Optoelectronics, Nanotechnology

Main theme:

- Fabrication and device application of III-nitride semiconductor nanostructures
- Growth and device application of organic semiconductor single crystals
- Development and application of electrospray deposition system
- Development of photonic-crystal devices in visible light region
- Development of novel semiconductor materials and devices

MIYATAKE, Masafumi (Professor) ☆

<https://miyatake.main.jp/>

Research field: Transportation Electrification and Smartification

Main theme:

- Energy-efficient timetabling with less passenger disutility for railway systems
- Energy-efficient design of speed profiles based on optimal control for rail and road vehicles
- Applications of renewable energy and energy storage to transportation systems

NAKAMURA, Kazuya (Professor) ☆

Research field: Applied Superconductivity, Electric Power Application

Main theme:

- Fusion magnet technology
- Accelerator magnet technology
- Advanced cryogenic materials for magnets

NAKAOKA, Toshihiro (Professor) ☆

<http://pweb.sophia.ac.jp/nakaoka/nakaoka.html>

Research field: Nano Electronics, Semiconductor Physics

Main theme:

- Quantum optoelectronic devices
- Single electron / photon devices
- Transport phenomena and optical spectroscopy in semiconductor nanostructures

NOMURA, Ichirou (Professor) ☆

Research field: Semiconductor Engineering, Optoelectronics

Main theme:

- Molecular beam epitaxy of compound semiconductors
- II-VI compound semiconductors and devices
- Visible light emitting diodes and laser diodes

OGAWA, Masakatsu (Professor) ☆

Research field: Wireless Sensing, Smart IoT Systems, Wireless Communication Systems,  
Network Systems

Main theme:

- WLAN sensing (Object detection, Human activity detection, Location detection)
- Smart IoT system development.
- Wireless communication protocol (Access control, Packet scheduling, Power saving control)

SAKAMOTO, Ori (Associate Professor) ☆

Research field: Power System Engineering

Main theme:

- Analysis and control of power systems
- Modeling of synchronous generators and induction machines
- Stabilizing control of power systems with variable renewable energies

TOGASHI, Rie (Associate Professor)

Research field: Semiconductor Engineering, Crystal Growth

Main theme:

- Growth of III-nitride and oxide semiconductors
- Thermodynamic analysis for growth of semiconductor materials

YAGAI, Tsuyoshi (Professor) ☆

Research field: Superconducting Power Application

Main theme:

- Design DC micro grid with renewable energy resources
- Development of DC power supply system for IT devices
- Development of new energy resource use
- Stability analysis of CIC conductor for large scale magnet

## APPLIED CHEMISTRY

FUJITA, Masahiro (Professor) ☆

<http://www.mls.sophia.ac.jp/~polymer/index.html>

Research field: Polymer Chemistry, Organic Chemistry

Main theme:

- Synthesis and characterization of ion conductive polymers
- Development of functional ionic liquids for rechargeable batteries
- Synthesis of organic ionic plastic crystals and their electrochemical properties
- Synthesis of cellulose derivatives by using ionic liquids

HARADA, Shinji (Associate Professor)

Research field: Synthetic Organic Chemistry

Main theme:

- Development of next-generation catalysts using rare earth metals
- Development of novel reactions that improve the efficiency of pharmaceutical and functional material synthetic processes
- Synergistic approaches in synthetic organic chemistry and computational chemistry

HORIKOSHI, Satoshi (Professor) ☆

<http://pweb.cc.sophia.ac.jp/horikosi/>

Research field: Green Chemistry, Energy & Fuel Chemistry

Main theme:

- Environmental protection with photocatalyst
- Organic synthesis in microwave green chemistry
- Hydrogen storage with novel microwave catalyst

TAKEOKA, Yuko (Professor) ☆

<http://www.mls.sophia.ac.jp/~polymer/index.html>

Research field: Polymer Chemistry, Organic-inorganic Hybrids, Material Chemistry

Main theme:

- Development of organic-inorganic hybrids for optical devices such as photovoltaic cells
- Electrical and optical properties of polymer materials
- Synthesis and applications to medical materials of biodegradable polymers
- Bio-sensing application using  $\pi$ -conjugated polymers

UCHIDA, Hiroshi (Professor) ☆

<http://pweb.cc.sophia.ac.jp/h-uchida>

Research field: Material Science (Inorganic), Chemical Processing

Main theme:

- Thin film processing using metal-organic precursors
- Pb-free dielectric/ferroelectric materials with large polarization properties
- Material synthesis using supercritical fluid

YOKOTA, Yukie (Associate Professor)

[https://rscdb-i.cc.sophia.ac.jp/tmp/1909/prof\\_e.html](https://rscdb-i.cc.sophia.ac.jp/tmp/1909/prof_e.html)

Research field: Plasmonics, Metamaterials

Main theme:

- Development of plasmonic optical functional materials
- Development of Photochemical Functional Materials Using Metal Nano Structures

## CHEMISTRY

FUYUTSUKI, Seba (Professor) ☆

<http://www.seba-ken.com/>

Research field: Atmospheric Chemistry

Main theme:

- Atmospheric modeling of contemporary and Archean atmospheres
- Theoretical calculations of molecular spectral properties
- Spectral measurements of ultraviolet absorption properties
- Application of stable isotopes to atmospheric systems

HASHIMOTO, Takeshi (Professor) ☆

<http://www.mls.sophia.ac.jp/~analysis/>

Research field: Analytical Chemistry, Coordination Chemistry, Supramolecular Chemistry

Main theme:

- Ion and molecule recognition based on metal complexes and cyclodextrin chemistry
- Electrochemical studies for ( $\beta$ -diketonato) ruthenium complexes
- Design of supramolecular chemosensors for molecule, bacteria recognition in water

KIKAWADA, Yoshikazu (Professor) ☆

Research field: Chemical Volcanology, Geochemistry

Main theme:

- Geochemical monitoring of volcanic activity
- Risk assessment of volcanic activity from a geochemical point of view
- Mobility and distribution of trace elements in water-rock interaction

KUZE, Nobuhiko (Professor) ☆

Research field: Physical Chemistry, Molecular Science

Main theme:

- Molecular spectroscopy (rotational and vibrational) in the gas-phase
- Structural determination by gas-electron diffraction
- Computational chemistry

MISAWA, Tomoyo (Associate Professor)

Research field: Coordination Chemistry

Main theme:

- Syntheses of multi-nuclear transition metal complexes
- Molecular conversion on multi-nuclear complexes in homogeneous systems
- Electrochemical and spectroscopic studies on reactivity of complexes

NANBU, Shinkoh (Professor) ★

[http://pweb.cc.sophia.ac.jp/nanbu\\_lab/index.html](http://pweb.cc.sophia.ac.jp/nanbu_lab/index.html)

Research field: Theoretical Chemistry, Computational Chemistry

Main theme:

- Photochemistry of 6-Azauracil, 3,5-dimethylisoxazole and so on.
- *ab initio* MD simulation with trajectory surface hopping (TSH) by Zhu-Nakamura formula
- Internal Conversion (IC) and Intersystem Crossing reaction (ISC)
- on-the-fly nonadiabatic ONIOM MD simulation with particle mesh Ewald method

SUZUKI, Yumiko (Professor) ☆

[http://www.mls.sophia.ac.jp/~yumiko\\_suzuki/](http://www.mls.sophia.ac.jp/~yumiko_suzuki/)

Research field: Synthetic Organic Chemistry, Medicinal Chemistry

Main theme:

- Design and Development of New Methodologies in Organocatalysis
- Synthesis of Functional Materials and Bioactive Compounds

USUKI, Toyonobu (Professor) ☆

<http://www.pweb.cc.sophia.ac.jp/usuki/>

Research field: Natural Product Chemistry, Organic Chemistry,  
Elastin/Collagen Chemistry

Main theme:

- Chemical synthesis and analysis of elastin and collagen crosslinking amino acids
- Deep eutectic solvents-mediated extraction and isolation of natural products
- Total synthesis of biologically active natural products

## MATHEMATICS

GOMI, Yasushi (Associate Professor)

<http://pweb.sophia.ac.jp/y-gomi/en/>

Research field: Algebra

Main theme:

- Representation theory of algebraic groups and Hecke algebras

GOTO, Satoshi (Assistant Professor)

Research field: Operator Algebras

Main theme:

- Jones index theory of subfactors in the theory of operator algebras
- Algebraic/combinatorial aspects of subfactor theory (graphs, fusion algebras etc.) and its relation to other fields in mathematics and mathematical physics such as quantum groups, solvable lattice models, topological quantum field theory (3-dimensional topology) and rational conformal field theory

KIMURA, Akitoshi (Assistant Professor)

Research field: Mathematical Statistics, High frequency data analysis

Main theme:

- Stochastic Process
- Time Series Analysis

NAKASHIMA, Toshiki (Professor) ★

<http://pweb.cc.sophia.ac.jp/toshiki/>

Research field: Quantum Groups, Representation Theory

Main theme:

- Crystal Bases and Geometric Crystals
- Quantum groups at roots of unity
- q-boson Kashiwara algebras

NAKASUJI, Maki (Professor) ☆

<http://pweb.sophia.ac.jp/nakasuji/>

Research field: Analytic Number Theory, Representation Theory

Main theme:

- Multiple Dirichlet series, Multiple zeta functions
- Automorphic forms and L-functions
- Selberg zeta functions and the spectral theory
- Iwahori Whittaker functions

OSHIRO, Kanako (Associate Professor)

<http://pweb.sophia.ac.jp/oshirok/>

Research field: Topology, Knot Theory

Main theme:

- Surface-knot theory
- Quandle algebra

TRIHAN, Fabien Benoit (Associate Professor)

Research field: Algebraic Geometry

Main theme:

- Geometric Iwasawa Theory

TSUNOGAI, Hiroshi (Professor) ☆

<http://pweb.cc.sophia.ac.jp/tsunogai/index.html>

Research field: Mathematics, Number Theory

Main theme:

- Constructive Galois theory, Noether's Problem and its variants
- Galois representation attached to arithmetic fundamental groups
- Moduli spaces of projective lines with marked points

TSUZUKI, Masao (Professor) ☆

Research field: Number Theory

Main Theme:

- Modular forms and related L-functions
- Selberg zeta functions and trace formulas

## PHYSICS

ADACHI, Tadashi (Professor) ☆

Research field: Superconductivity, New Functional Materials

Main theme:

- Muon-spin-relaxation study of the spin dynamics in Cu-based and Fe-based high-  $T_c$  superconductors
- Novel charge-spin order/fluctuation studied by transport, thermal and magnetic properties in high magnetic fields
- Synthesis of novel functional materials by the floating-zone and flux crystal growths, the solid-state reaction and soft-chemical techniques

HIRANO, Tetsufumi (Professor) ☆

Research field: Hadron Physics (theory)

Main theme:

- Quark gluon plasma
- High energy nuclear collision
- Relativistic hydrodynamics

HOSHINO, Masamitsu (Professor) ☆

Research field: Atomic and Molecular Physics

Main theme:

- Excitations of atoms / molecules / liquid / surfaces by low-energy electrons
- Photoabsorption and photoelectron spectroscopy with synchrotron radiation
- Negative ion formation from dissociative electron attachment
- Surface interactions by ion impacts
- Atomic and Molecular Data

KUNUGITA, Hideyuki (Professor) ☆

Research field: Optical Physics, Optical Properties of Solids

Main theme:

- Ultrafast spectroscopy
- Excitonic optical properties of solids
- Generation and control of coherent phonons in wide-gap semiconductors
- Carrier dynamics in photocatalytic materials

KUROE, Haruhiko (Associate Professor) ☆

Research field: Solid-State Physics, Magnetism

Main theme:

- Synthetic of photocatalytic titanium dioxide from aqueous solution
- Raman scattering in magnetic materials under multi-extreme condition
- Magnetic and dielectric properties in multiferroic materials

KUWAHARA, Hideki (Professor) ★

Research field: Materials Science, Solid State Physics

Main theme:

- Exploration for novel spintronic (spin-based electronic) and multiferroic materials, e.g., giant magnetoresistive and gigantic magnetoelectric oxides
- External field control of electronic phases in strongly correlated materials:  
Magnetic(Electric) field control of electric-polarization or resistivity (magnetization) for next-generation high-density memories
- Design and synthesis for A-site ordered perovskite-type oxides with high phase-transition temperatures for future electronic devices
- Transport (resistivity, Hall effect, thermopower, specific heat, etc.) and magnetic properties near the Mott insulator-metal phase boundary in band-width and/or band-filling controlled systems with strong electron correlation

ODAGIRI, Takeshi (Professor) ☆

<http://sephiroth.mls.sophia.ac.jp/teacher/archives/000086.html>

Research field: Atomic and molecular physics

Main theme:

- Spectroscopy and dynamics of short-lived molecular resonance states
- An entangled atom pair formation in photodissociation of molecular hydrogen

OKADA, Kunihiro (Professor) ☆

Research field: Atomic and Molecular Physics, Quantum Electronics

Main theme:

- Gas-phase ion-molecule reactions at very low temperatures
- Production of ion Coulomb crystals and cold molecular ions
- Resonance-enhanced multiphoton ionization spectroscopy of molecules

SAKAI, Shiro (Associate Professor)

Research field: Condensed Matter Theory

Main theme:

- Quasicrystals
- Hyperuniformity
- Strongly Correlated Electron Systems

## BIOLOGICAL SCIENCE

FUJIWARA, Makoto (Professor) ☆

<https://researchmap.jp/read0206818?lang=en>

Research field: Molecular Cell Biology, Plant Science

Main theme:

- Genetic control of chloroplast division
- Live imaging of plant cell organelles

KANZAWA, Nobuyuki (Professor) ☆

<http://www.mls.sophia.ac.jp/~kanzawa/home/index-e.php>

Research field: Biochemistry, Plant Molecular Biology

Main theme:

- Regulatory mechanism of the seismonastic movement of Mimosa plant
- Biochemical characterization of a novel invertebrate enzyme
- Biochemical engineering of an advanced bioceramics

KAWAGUCHI, Mari (Professor) ☆

Research field: Molecular Evolutionary Biology

Main theme:

- Evolution of reproductive strategy of fishes
- Molecular evolution of brood pouch from seahorses and pipefishes
- Mechanism of sub-functionalization of duplicated genes during evolution

KONDO, Jiro (Professor) ☆

<https://jkondo.wixsite.com/sophia-biophysics/english>

Research field: Biophysics, Structural Biology

Main theme:

- Structure-based design of nucleic acid therapeutics
- Structure-based design of small molecule drugs targeting nucleic acids
- Structural DNA nanotechnology

KURABAYASHI, Nobuhiro (Associate Professor)

Research field: Developmental neurobiology

Main theme:

- Molecular mechanisms of stress-driven neuronal circuit remodeling
- Molecular mechanisms of functional and developmental brain abnormalities in psychiatric disease models

NIIKURA, Takako (Professor) ★

Research field: Neuroscience

Main theme:

- Neurodegeneration
- Aging

OTSUBO, Yoko (Associate Professor)

Research field: Molecular Biology

Main theme:

- TOR kinase-mediated stress responses
- Cellular responses to combined stress induced by plasma irradiation

SUZUKI, Nobuhiro (Associate Professor)

Research field: Plant Molecular Biology, Plant Physiology

Main theme:

- Molecular mechanisms regulating different types of heat stress response in plants
- Response of plants to stress combinations

YASUGI, Tetsuo (Associate Professor)

Research field: Developmental Biology, Neural Development

Main theme:

- Proliferation and differentiation of neural progenitor cells
- Organ size regulation

## INFORMATION SCIENCE

ARAI, Takayuki (Professor) ☆

<https://splab.net/>

Research field: Speech Communication

Main theme:

- Education in acoustics, acoustic phonetics, and speech analysis
- Speech science (incl. production), hearing science (incl. perception)
- Speech signal processing for people with communication disorders

BANDAI, Masaki (Professor) ☆

<https://bandailab.jp>

Research field: Computer Networks

Main theme:

- Network computing
- Network protocol
- Application

GONSALVES, Tad (Professor) ★

<https://www.gonken.tokyo/>

Research fields: Machine Learning, AI applications, Evolutionary Computation,  
Bio-inspired Computation, Expert Systems.

Main themes:

- Deep Learning Algorithms for business applications
- Computer vision, and Image & Material Recognition
- Digital art and speech synthesis
- Self-driving cars and drones
- Natural Language Processing for English, Japanese and Spanish
- PC games and puzzles
- Multi-GPU networked computation using Nvidia P100, Titan RTX, Jetson TX2, etc.
- Simulation Optimization Meta-heuristics
- Swarm Intelligence and hybrid algorithms
- Knowledge Management & Design of Expert Systems

IROHARA, Takashi (Professor) ☆

<https://researchmap.jp/irohara>

Research field: Industrial and Systems Engineering

Main theme:

- Facility logistics / Warehouse management / Material handling
- Supply chain optimization/ Inventory management/ Production scheduling
- Other industrial engineering topics related to manufacturing/logistics

ISHIZUKA, Hiroki (Associate Professor)

<https://t.co/9z3PTk8Q4f>

Research field: Soft Robotics, Haptics, Virtual Reality

Main theme:

- Soft sensors and Actuators
- Self-healing Soft Robots
- Tactile/Haptic Displays

KAMEDA, Yusuke (Associate Professor)

[https://researchmap.jp/yusuke\\_kameda?lang=en](https://researchmap.jp/yusuke_kameda?lang=en)

Research field: Visual information processing, Video coding, Image sensing,  
3D video processing, Numerical analysis

Main theme:

- Velocity field /flow / registration / motion estimation from images

KAWABATA, Ryo (Associate Professor)

<http://lise-sophia.net/sinfosys/>

Research field: Information Systems Engineering, Software Engineering

Main theme:

- Knowledge Base for Systems Analysis
- Reusing Diagrams for Systems Specification

MIYAMOTO, Yuichiro (Associate Professor)

<http://www.ics.sophia.ac.jp/miyamoto/>

Research field: Combinatorial Optimization, Mathematical Programming

Main theme:

- Approximation algorithms
- Exact algorithms
- Heuristics

SHIBUYA, Tomoharu (Professor) ☆

<http://www.ts-lab.net>

Research field: Coding Theory, Information Security, Information Theory,  
Applied Mathematics

Main theme:

We study various coding techniques to realize reliable and secure digital communication. This includes design of error correcting codes suitable for various channels, analysis of the performance of error correcting codes, development of secure multi-party protocols, study on secret sharing schemes and their applications, and so on.

SUMI, Chikayoshi (Associate Professor)

<http://www13.plala.or.jp/Sumi-lab/>

Research field: Biomedical Engineering, Medical Imaging, Medical AI, Remote Sensing,  
Measurement System Engineering, Visualization

Main theme:

- Techniques of diagnosis/therapy/culture for human diseases and various functional disorders (bioelectromagnetics, biomechanics, biothermodynamics, nanomedicine, ultrasound, photoacoustics, etc.)
- Techniques of nondestructive evaluations of structures/materials for environment
- Reconstructions using functional, stochastics, optimization (signal, image, function, etc.)

TAKAOKA, Eiko (Professor) ☆

<https://www.etlab-sophia.net/>

Research Field: Informatics and Applied Computing

Main theme:

- Natural Language Processing
- Education and Computing
- Medical Informatics

YAIRI, Ikuko (Professor) ☆

<http://www.yairilab.net/>

Research field: Informatics, Media and Communication Science and Technology

Main theme:

Applied research:

- Barrier-free ubiquitous mobility support system
- Geographic information system for disabled pedestrian navigation
- Universal-designed interactive map contents and interfaces, etc.

Basic research:

- Spatial and graphic information representation method with sound and touch without vision
- Interactive interface design for the aged, the disabled and children
- Community support for offering spatial information, etc.

YAMANAKA, Takao (Associate Professor)

<http://pweb.cc.sophia.ac.jp/takao-y/>

Research field: Sensory Information Processing, Computer Vision

Main theme:

- Automatic understanding of image contents
- Object recognition / Object detection
- Saliency detection
- Palmprint recognition for biometrics

YAMASHITA, Haruka (Associate Professor)

Research Field: Applied Statistics, Machine Learning

Main theme:

- Business analytics
- Statistical quality control
- Big data analysis
- Sports data analysis