



**SOPHIA UNIVERSITY**  
**FACULTY OF SCIENCE AND TECHNOLOGY**

**FACULTY MEMBERS AND  
THEIR FIELDS OF RESEARCH**

April, 2012 – March, 2013

**SOPHIA UNIVERSITY**

7-1 Kioi-cho, Chiyoda-ku, Tokyo, 102-8554, Japan

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# DEPARTMENT OF MATERIALS AND LIFE SCIENCES

AZUMA, Yoshiro (Professor)

Research field: Atomic and molecular physics

Main theme:

- Multi-electron photoexcitation of atoms and molecules
- Synchrotron radiation science

CHIBA, Atsuhiko (Associate Professor)

Research field: Behavioral Neuroscience

Main theme:

- Studies on the molecular basis and neuronal mechanism of the amphibian circadian clock
- Behavioral and neuroendocrinological studies of sexual odor preference in rodents

ENDO, Akira (Associate Professor)

Research field: Electrochemistry, Coordination Chemistry

Main theme:

- Synthesis and electrode reaction of dinuclear  $\beta$ -diketonato ruthenium complex
- Control of mixed-valence state by molecular recognition or light
- Electrochemical evaluation of SAM made by  $\beta$ -diketonato ruthenium complex

FUJITA, Masahiro (Assistant professor)

Research field: Polymer Chemistry, Organic Chemistry

Main theme:

- Synthesis and characterization of ion conductive polymers
- Ionic liquids as new solvents for polymerization

FUJIWARA, Makoto (Associate Professor)

Research field: Molecular Cell Biology, Plant Science

Main theme:

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

HASHIMOTO, Takeshi (Assistant Professor)

Research field: Analytical chemistry, Coordination chemistry

Main theme:

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

HAYASHI, Kensuke (Professor)

Research field: Cell Biology, Developmental Neuroscience

Main theme:

- Development of the axon and dendrites in mammalian neurons
- Cell migration during the neuronal development

HAYASHITA, Takashi (Professor)

Research field: Analytical Chemistry, Supramolecular Chemistry

Main theme:

- Development of novel sensing and separation systems for innovation in chemical analysis
- Design of supramolecular chemosensors for ion and molecule recognition in water
- Studies on synthesis, reaction and characteristic of the photo-functional and electro-functional metal complexes for molecular recognition

HOSHINO, Masamitsu (Associate Professor)

Research field: Atomic and Molecular Physics

Main theme:

- Excitation of atoms / molecules by low energy electron / positron / ion impact
- Core excitation of molecules by synchrotron radiation
- Negative ion formation from dissociative electron attachment

ITATANI, Kiyoshi (Professor)

Research field: Industrial Inorganic Chemistry, Biomaterials, Luminescence Materials, High-temperature Structural Ceramics

Main theme:

- Development of novel biomaterials (inorganic-organic composites)
- Luminescence properties of novel oxynitride materials
- Mechanical properties of non-oxide ceramics

KANZAWA, Nobuyuki (Associate Professor)

Research field: Biochemistry, Plant molecular biology

Main theme:

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

KIKAWADA, Yoshikazu (Associate Professor)

Research field: Geochemistry, Environmental Chemistry

Main theme:

- Geochemical monitoring of volcanic activity
- Chemical behavior of pollutants in the environment
- Mobility and distribution of trace elements in water-rock interaction

**KOBAYASHI, Ken-ichiro (Associate Professor)**

**Research field: Animal biochemistry, Environmental biology**

**Main theme:**

- Comparative biochemistry of Amphibia
- Adaptation of anurans to their environments

**KONDO, Jiro (Assistant Professor)**

**Research field: Biophysics, Structural Biology**

**Main theme:**

- Motion picture crystallography of DNA/RNA molecular switches
- Structure based drug design

**KUZE, Nobuhiko (Associate 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

**MAKINO, Osamu (Associate professor)**

**Research field: Molecular Genetics, Molecular Biology**

**Main theme:**

- Studies on translational control by RNA binding protein
- Replication mechanism of linear DNA with terminal protein
- Molecular mechanism of homologous recombination

MASUYAMA, Yoshiro (Professor)

Research field: Synthetic organic chemistry, Organometallic chemistry

Main theme:

- Homologation with homogeneous rhodium, iridium, and palladium complex catalysts
- Transformation with homogeneous rhodium, iridium, and palladium complex catalysts
- Heterogeneous catalysis of hydroxyapatite-supported rhodium, iridium, and palladium

NAGAO, Hirotaka (Professor)

Research field: Coordination Chemistry, Bioinorganic Chemistry

Main theme:

- Activation and conversion of nitrogen-containing compounds by transition metal complex
- Synthesis of novel transition metal complexes
- Regulation of geometry and reactivity around metal centers

NANBU, Shinkoh (Professor)

Research field: Theoretical Chemistry

Main theme:

- Theory-Aided Molecular Design
- Quantum Reaction Dynamics

OI, Takao (Professor)

Research field: Isotope Science and Technology

Main theme:

- Isotope separation by chemical methods
- Preparation and characterization of isotope-specific inorganic materials
- Isotope effects studied by molecular orbital calculations

**OKADA, Kunihiro (Associate 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
- Laser and microwave spectroscopy of trapped unstable nuclear ions

**RIKUKAWA, Masahiro (Professor)**

**Research field: Polymer Chemistry, Nano Science**

**Main theme:**

- Proton conducting polymer electrolytes and fuel cell applications
- Synthesis and applications to medical materials of biodegradable polymers
- Synthesis and applications to solar cells and EL devices of conducting polymers

**SAITO, Tamao (Associate Professor)**

**Research field: Environmental Molecular Biology, Biochemistry**

**Main theme:**

- Analysis of small molecules (especially “polyketides”) for communication and ecology
- Functional analysis of novel polyketide synthases found in the cellular slime mould
- Pattern formation of the cellular slime mould as a model system

**SUGIYAMA, Toru (Lecturer)**

**Research field: Organic Photochemistry, Organometallic Chemistry**

**Main theme:**

- Thermal and photochemical formation of sulfur containing compounds
- Formation and characterization of the metal sulfur bond
- Chemistry of molybdenum dithiolene complexes

SUZUKI, Noriyuki (Associate Professor)

Research field: Synthetic organic chemistry, Organometallic chemistry

Main theme:

- Synthesis of five-membered metallacyclic alkynes and allenes, and study on their reactivity
- Development of organic reactions using organozirconium compounds

TAKAHASHI, Kazuo (Associate Professor)

Research field: Physical Chemistry, Chemical Kinetics, Combustion Chemistry

Main theme:

- High-pressure autoignitions of gasoline components for HCCI engines
- Combustion chemistry of biomass fuels
- Computational chemistry using ab initio MO and DFT methods

TAKEOKA, Yuko (Associate Professor)

Research field: Polymer Chemistry

Main theme:

- Development of organic-inorganic hybrid
- Electrical and optical properties of polymer materials
- Synthesis and applications to medical materials of biodegradable polymers

TAMIYA, Toru (Professor)

Research field: Biochemistry, Molecular Biology

Main theme:

- Regulation mechanism of snake toxin gene expression
- Molecular evolution and diversification of snake toxin genes

TANAKA, Kunihiro (Assistant Professor)

Research field: Applied Physical Chemistry, Plasma Chemistry

Main theme:

- Surface treatment and thin film deposition by atmospheric pressure glow plasma discharge
- Plasma diagnostic of atmospheric pressure glow plasma

UCHIDA, Hiroshi (Associate Professor)

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

USUKI, Toyonobu (Assistant Professor)

Research field: Natural Product Chemistry, Organic Chemistry

Main theme:

- Bioorganic study of plant natural products
- Chemistry of enediyne antitumor antibiotic calicheamicin
- Structural elucidation of elastin peptides

YASUMASU, Shigeki (Professor)

Research field: Developmental Biology

Main theme:

- Differentiation of fish hatching gland cells
- Molecular evolution of hatching enzyme gene
- Mechanism of egg envelope digestion by hatching enzyme

## DEPARTMENT OF ENGINEERING AND APPLIED SCIENCES

EMA, Kazuhiro (Professor)

Research field: Optical Physics, Optical Properties of Solids, Photonics

Main theme:

- Excitonic optical properties of semiconductors, organic materials, and inorganic-organic hybrid materials
- Ultrafast dynamics of excited states in solids
- Optical properties of semiconductor nanostructures
- Generation and control of coherent phonons in wide-gap semiconductors
- Ultrafast optical pulse control and its application for optical communications

GOTO, Takayuki (Professor)

Research field: Low Temperature Condensed State Physics

This laboratory studies magnetic and superconducting properties of strongly-correlated electron systems at low temperatures by microscopic probes of nuclear magnetic resonance (NMR) and muon spin relaxation ( $\mu$ SR).

Main theme:

- The ground state and various quantum phase transitions in quantum spin systems
- The effect of the incoherent local structure to the superconductivity in high-T<sub>c</sub> superconductors
- Superconducting properties including the novel vortex state in organic complexes

**HISAMORI, Noriyuki (Associate professor)**

**Research field: Biomaterial Science, Material Science and Engineering**

**Main theme:**

- Bio-functional materials for advanced medical technology
- Bioactive metals: Preparation and properties
- Design of bioactive bone substitutes based on bio-mineralization process

**KIKUCHI Akihiko (Associate Professor)**

**Research field: Semiconductor Engineering, Nano technology**

**Main theme:**

- Growth of III-nitride semiconductors by molecular beam epitaxy
- Characterization of wide-band gap semiconductor epitaxial and nano crystals
- Development of high-performance nanocolumn LED and green laser diodes
- Development of novel quantum and nano size effect devices based on III-nitride semiconductor

**KISHINO, Katsumi (Professor)**

**Research field: Optoelectronics, Nano-technology, Wide-gap Semiconductors**

**Main theme:**

- Green light semiconductor lasers
- Wide-gap semiconductors and related optical devices
- Semiconductor nano-structure and nano-devices

**KUNUGITA, Hideyuki (Assistant 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:

- Raman scattering in magnetic materials
- Crystallography and magnetic measurements in magnetic 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

MIYATAKE, Masafumi (Associate Professor)

Research field: Electrical Energy Systems and Applications

Main theme:

- Maximum power point tracking control of renewable energy sources
- Minimum energy operation control of trains, electric vehicles, *etc.*
- Power supply for transportation systems with energy storage

MIZUGAI, Yoshihiro (Lecturer)

Research field: Applied optics, Simulation physics

Main theme:

- Interaction between materials and lasers
- Simulations of ionizing clusters by a laser field
- Soliton propagation in nonlinear materials

**MUTOH, Yasuhiko (Professor)**

**Research field: Control Engineering**

**Main theme:**

- Nonlinear Control
- Adaptive Control
- Multivariable Control Systems, etc.

**NAGASHIMA, Toshio (Professor)**

**Research field: Computational Mechanics, Structural Engineering**

**Main theme:**

- Meshfree method
- Extended FEM
- Crack propagation simulation

**NAKAMURA, Kazuya (Assistant Professor)**

**Research field: Applied superconductivity, Electric Power Application**

**Main theme:**

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

**NAKAOKA, Toshihiro (Associate Professor)**

**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 (Associate Professor)**

**Research field: Semiconductor engineering, Optoelectronics**

**Main theme:**

- Optical materials and devices
- II-VI compound semiconductors and their applications
- Green semiconductor laser diodes

**OHTSUKI, Tomi (Professor)**

**Research field: Solid State Physics (theory)**

**Main theme:**

- Anderson localization
- Quantum Hall and quantum spin Hall effects
- Quantum network model
- Light propagation in non-uniform media

For detail, <http://www.ph.sophia.ac.jp/~tomi/english.html>

**SAKAMA, Hiroshi (Professor)**

**Research field: Applied Physics, Surface Science.**

**Main theme:**

- Thin films: Nucleation and growth mechanism. Epitaxy. Structure and chemical composition. Sputtering. Pulsed-laser deposition
- Transition metal oxide thin films: Growth, micro-fabrication and physical property measurement. Charge and spin order
- Surface: Structure and physical properties of solid surfaces. Phase transitions. Electron diffraction
- Photocatalyst: Reaction mechanism. Electronic structure of photocatalyst

**SAKAMOTO, Haruhisa (Associate Professor)**

**Research field: Precision machining, Micro machining**

**Main theme:**

- Development of advanced machining technology for high-quality surface generation
- Environmental impact reduction in precision machining
- Development and improvement of laser micro-machining technology for three-dimensional mechanical parts

**SATOH, Yoshihiro (Associate Professor)**

**Research field: Mechanical Engineering**

**Main theme:**

- Analysis of energy dissipation mechanism in vibration damping materials
- Development of vibration damping devices
- Dynamics of rubbers

**SEKINE, Tomoyuki (Professor)**

**Research field: Solid State Physics (Experimental Physics)**

**Main theme:**

- Magnetic and optical properties in low-dimensional quantum spin systems
- Optical properties and transport phenomena in semiconductor nanostructures

**SHEN, Tielong (Professor)**

**Research field: Control Theory and Applications**

**Main theme:**

- Robust control of nonlinear systems
- Mechanical system control
- Modeling and control of automotive systems

**SHIMIZU, Shinji (Professor)**

**Research field: Machine tool technology, Mechanical design**

**Main theme:**

- Evaluation of performance of machine tools and precision machines
- Development and evaluation of tool interface for ultra high-speed spindle
- Evaluation and improvement of contact characteristics of joint in machine tools and precision machines
- Evaluation of thermal characteristics of machine tools and their improvement

**SHIMOMURA, Kazuhiko (Professor)**

**Research field: Optoelectronics, Photonic Devices, Nano Structure, Semiconductor Crystal Growth**

**Main theme:**

- Photonic Integrated Circuits: Integration of various functional photonic devices
- Optical devices for photonic systems, such as optical switch and modulator, arrayed waveguide grating
- Quantum-dots structure for laser, SOA, switch, and nonlinear photonic devices
- Optical interconnection technology
- Selective area growth using Metal-Organic Vapor Phase Epitaxy for the control of in-plane bandgap of epitaxial layers and integration of photonic devices

**SUEMASU, Hiroshi (Professor)**

**Research fields: Structural Mechanics, Engineering of Composite Materials**

**Main theme:**

- Structural and fracture mechanical study of damaged composite structures and structural elements
- Testing methods of composite materials
- Fracture mechanical study on adhesive structures such as joints and repairs

SUZUKI, Hiroshi (Assistant Professor)

Research field: Materials Science

Main theme:

- Modeling and simulation of deformation, fracture and diffusion kinetics of materials
- Effect of hydrogen on behavior of metallic materials

SUZUKI, Takashi (Associate Professor)

Research field: Internal combustion engine, Heat transfer

Main theme:

- Heat flow of SI engine for control
- Energy flow analysis of hybrid engine system

TAKAI, Kenichi (Professor)

Research field: Materials Science, Hydrogen Technology

Main theme:

- Hydrogen degradation mechanism of bcc, fcc and hcp metals
- Hydrogen trapping characteristic of metals measured by TDS
- Infrastructural material development for hydrogen energy society
- Metallic separator materials for fuel cell
- Hydrogen storage metals for fuel cell vehicle

TAKAO, Tomoaki (Professor)

Research field: Electric energy, Applied superconductivity

Main theme:

- Superconducting magnet technology
- YBCO and Bi-2223 tapes
- Advanced cryogenic materials for magnets
- Magnetic levitation system
- Some relating technologies on superconductivity

**TAKAYANAGI, Kazuo (Professor)**

**Research field: Quantum Many-Body Problems, Condensed Matter Physics, Nuclear Physics**

**Main theme:**

- Short range correlation and its realization as an effective interaction in electron systems and in nuclei
- Long range correlation, collective excitation and its softening, and quantum phase transitions

**TERUMICHI, Yoshiaki (Professor)**

**Research field: Multibody Dynamics**

**Main theme:**

- Motion analysis of high speed train
- Contact mechanics between rail and wheel
- Pattern formation phenomena due to machine vibration
- Motion and control of tethered system

**TSUKIJI, Tetsuhiro (Professor)**

**Research field: Fluid Engineering**

**Main theme:**

- Development of micro motor and pump using functional fluids
- Flow analyses in hydraulic control valves and pump
- Flow analyses around a bluff body and a jet flow using CFD
- Flow measurement around a body in a wind tunnel
- Flow-induced vibration
- Device using pneumatic technology

YAGAI, Tsuyoshi (Associate 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

## DEPARTMENT OF INFORMATION AND COMMUNICATION SCIENCES

ARAI, Takayuki (Professor)

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 (Associate Professor)

Research field: Computer Networks

Main theme:

- Network systems (wireless networks, ad hoc networks and sensor networks)
- Network protocols (medium access control, routing, transport protocols)
- Network applications

FUJII, Mamiko (Associate Professor)

Research field: Bio-medical optics, Bio-medical engineering

Main theme:

- Application of bio-medical optics: Development for depth-selective Diffuse Optical Topography
- Fundamental study of bio-medical optics: Theoretical and experimental study of tissue characterization
- Biomedical Instrumentation: Application of electrical impedance

GOMI, Yasushi (Lecturer)

Research field: Algebra

Main theme:

- Representation theory of algebraic groups and Hecke algebras

**GONSALVES, Tad (Associate Professor)**

**Research field: Computational Intelligence, Computer Simulation, Knowledge Engineering**

**Main theme:**

- Simulation Optimization Meta-heuristics
- Knowledge Management & Design of Expert Systems
- Ontology and Semantic Web

**GOTO, Satoshi (Lecturer)**

**Research field: Analysis and Mathematical Physics**

**Main theme:**

- The Jones index theory of subfactors in the theory of operator algebras
- Ocneanu's paragroup theory 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

**HIRATA, Hitoshi (Lecturer)**

**Research field: Analysis, Applied Analysis**

**Main theme:**

- Nonlinear Schroedinger Equations
- Nonlinear Waves
- Biological Mathematics

**IROHARA, Takashi (Professor)**

**Research field: Manufacturing Systems Engineering**

**Main theme:**

- Facility layout and Material handling
- Production scheduling and its optimization
- Logistics problem and its optimization

**ISHIDA, Masashi (Associate Professor)**

**Research Field: Geometry**

**Main theme:**

- Einstein metrics on 4-manifolds
- Ricci flow on 4-manifolds
- Seiberg-Witten invariants

**ITOH, Kiyoshi (Professor)**

**Research field: Software and Systems Engineering, Knowledge Engineering**

**Main theme:**

- Methodology and tool for software and systems engineering
- Evaluation system for systems improvement
- Domain analysis and modeling

**KATO, Masahide (Professor)**

**Research field: Mathematics, Geometry, Complex Manifolds**

**Main theme:**

- Extension of holomorphic maps into compact complex manifolds
- Kleinian groups in higher dimensions
- Classification of compact non-Kaehler surfaces

**KAWABATA, Ryo (Associate Professor)**

**Research field: Software Engineering**

**Main theme:**

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

**KAWANAKA, Akira (Professor)**

**Research field: Signal Processing, Image Information Processing**

**Main theme:**

- Multidimensional signal processing
- Data compression for still pictures, moving pictures, and texture information for CG
- Representation and modeling of three dimensional objects for realistic image synthesis

**KUDOH, Teruhiko (Lecturer)**

**Research field: Optical communication system, communication system**

**Main theme:**

- Optical fiber transmission with Polarization mode dispersion
- Multi wavelength fiber transmission in communication system
- Construction of Optical network system

**MIYAMOTO, Yuichiro (Assistant Professor)**

**Research field: Combinatorial Optimization, Mathematical Programming**

**Main theme:**

- Approximation algorithms
- Graph coloring problem and perfect graphs
- Network design and network flows

**NAKASHIMA, Toshiki (Professor)**

**Research field: Quantum Groups, Representation Theory**

**Main theme:**

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

SASAKAWA, Nobuyuki (Professor)

Research field: Pharmacology, Neuroscience

Main theme:

- Spatial and temporal regulation of neurotransmitter release by physiologically active substances
- Functional roles of inositol pentakis- and hexakisphosphates in neuronal cells

SHIBUYA, Tomoharu (Associate Professor)

Research field: Coding Theory, Communication Theory, Information Theory

Main theme:

We study various coding techniques for realizing reliable digital communication. This includes an analysis of behavior of the iterative decoding algorithm, design of codes suitable for the iterative decoding algorithm, estimation of parameters of linear codes, and so on.

SHINODA, Ken-ichi (Professor)

Research field: Mathematics, Algebra

Main theme:

- Representation of algebraic groups and finite groups  
We particularly study Gelfand-Graev representations and the character table of its endomorphism algebra. The character value has strong connection with some special functions over finite fields, like Gauss sums, Klooster sums and unitary Kloosterman sums, which also are the objects of our research.
- Enumerative combinatorics relating with finite groups  
We showed that some counting problems in finite classical groups are related with the famous identities of Euler. This is an important example showing relations with groups and combinatorics, and we study combinatorics relating with finite groups.

SUMI, Chikayoshi (Associate Professor)

Research field: Biomedical engineering, Measurement system engineering, Visualization

Main theme:

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

TAHARA, Hidetoshi (Professor)

Research field: Mathematical Analysis

Main theme:

- Differential equations in the complex domain
- Complex analysis

TAKAOKA, Eiko (Associate Professor)

Research Field: Database, Web Application Development, Programming Language Education

Main theme:

- Development of model applications using sensing data for education, the environment, and disaster prevention
- Analysis of local weather data
- Design of sensor database for efficient data retrieval
- Development of scalable video streaming systems
- Study on viewing web pages
- Study on programming language education

**TAMURA, Yasuhisa (Associate Professor)**

**Research Field: Learning Technology**

**Main theme:**

- Natural language processing utilization for e-Learning
- Semantic Web utilization for e-Learning
- Material and learner information repository with Web Services

**TANAKA, Mamoru (Professor)**

**Research field: Circuits and Systems, Neural Networks**

**Main theme:**

- Analysis of a large scale of networks
- Architectures of new LSI computers
- Analysis and synthesis of data mining by Cellular Neural Networks

**TANAKA, Shoji (Professor)**

**Research Field: Brain Science and Psychiatry Informatics**

**Main theme:**

- Neuroscience - Circuit dynamics for brain cognitive functions, through mathematical analyses and computer simulations
- Psychiatry - Circuit theory of cognitive dysfunctions in schizophrenia and other psychiatric diseases
- Neuropsychopharmacology - Modeling and simulations towards the development of new drugs for mental illness

**TSUJI, Hajime (Professor)**

**Reserch field: Algebraic Geometry, Several Complex Variables**

**Main theme:**

- Abundance of canonical line bundles
- Study of pluricanonical systems
- Covexity and semipositivity of family of projective varieties

**TSUNOGAI, Hiroshi (Associate Professor)**

**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 (Associate Professor)**

**Research field: Number Theory**

**Main Theme:**

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

**WAHO, Takao (Professor)**

**Research field: Analog Circuit Design, Semiconductor Devices**

**Main theme:**

- Design of low-power and high-speed analog-to-digital converters
- Circuit applications of emerging devices
- Signal processing based on multiple-valued logic

**YAMANAKA, Takao (Associate Professor)**

**Research field: Intelligent Sensors, Neuromorphic Engineering**

**Main theme:**

- Odor sensing systems (Machine olfaction)
- Hardware implementation of neural-network models
- Applications of pattern recognition

YAIRI, Ikuko (Associate Professor)

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 interface, 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.

YOKOYAMA, Kazuo (Associate Professor)

Research field: Topology

Main theme:

- Classification of 3-dimensional manifolds represented by DS (Dehn-Sfeifert)-diagram
- Dehn's surgery of links
- The research of the relations among the group actions on 2-manifolds or 3-manifolds and their branched covering space