

We are always one step ahead of the times.



#### Equilateral Quivering Tower

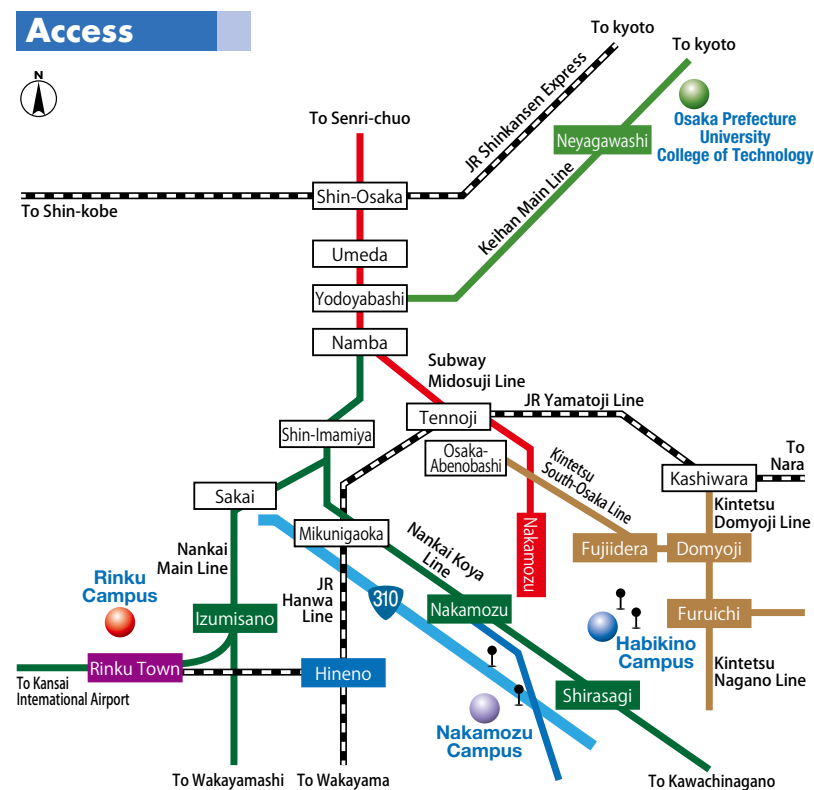
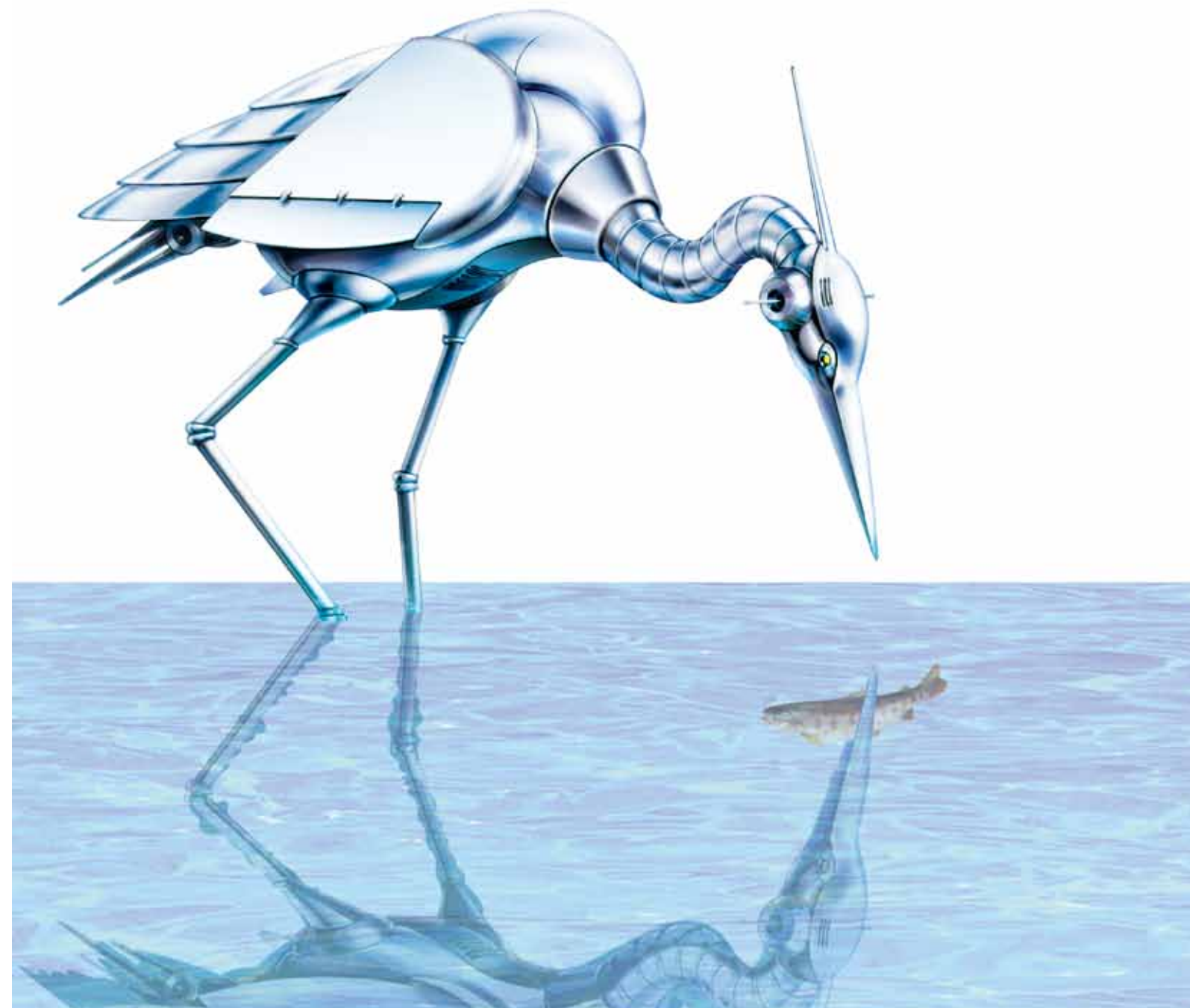
My concern is with nature in its most fundamental aspect: The patterns of forces in space. I call my sculptures "floating compression" structures. "Equilateral Quivering Tower" is unique among my column tower sculptures because the tension parts, wires, form equilateral triangles on its surface. The original model for this work was created in 1973.


by Kenneth Snelson

# TECHNOVATION

Osaka Prefecture University  
College of Engineering, Graduate School of Engineering

Looking to a better future for us and the environment——



 **Osaka Prefecture University**  
College of Engineering,  
Graduate School of Engineering

1-1 Gakuen-cho, Naka-ku, Sakai, Osaka  
599-8531, JAPAN  
TEL +81-72-252-1161

<http://www.osakafu-u.ac.jp/english/index.html>

# CONCEPT

**Our goal is to produce top-level engineers and scientists of a global standard who contribute to the development of science and technology.**

'TECHNOVATION' represents the college of engineering and the graduate school of engineering with top-level staff and up-to-date facilities for advanced science and technology. This word is coined by 'technology' and 'innovation.'

## We are always one step ahead of the times



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### TECHNOVATION

**Prof. Masahiro TATSUMISAGO**

Dean, College of Engineering / Graduate School of Engineering



Advanced science and technology, founded on the academic discipline of Engineering aimed at enriching humanity's material life, have been actively promoted in Japan, a country limited in natural resources. Science and technology have thus made remarkable progress to the extent of making Japan a world leader in the fields. Upholding the goal of bringing about innovation to science and technology through education and research, we at the Graduate School of Engineering of Osaka Prefecture University have coined a new term as our slogan, Technovation, combining "technology" and "innovation." As a central component

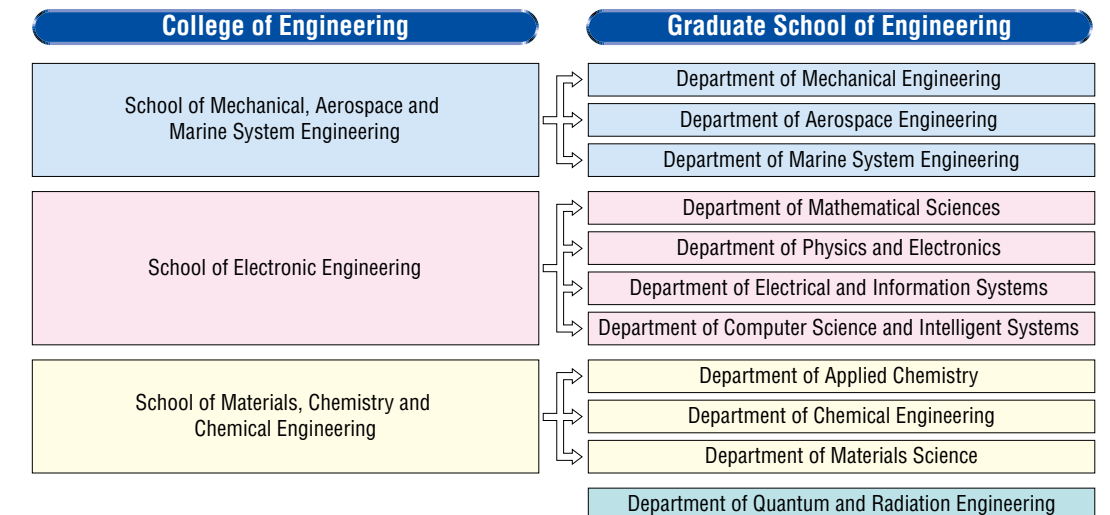
of an advanced research-oriented university serving as a regional center of reliability with global aspirations, which OPU envisions to be, the Graduate School of Engineering has been producing innovative research results, creative technologies, and quality researchers here in Osaka to benefit the whole world.

We believe that the University's missions are education, research, and contributing to society. The Graduate School of Engineering, with its over 200 diverse and excellent faculty members, offers advanced education while conducting cutting-edge research, true to its fundamental philosophy of valuing the quest for truth and knowledge, advancing science and technology that harmonize with the natural environment, and contributing to society's sustainable development and cultural creation, so as to find solutions to various problems facing today's society. Through our education and research in respective areas of specialization, we endeavor to train future engineers and researchers who are equipped with a broad perspective, solid academic competences, and the ability to think flexibly and capable of proactively responding to changing society and remarkably evolving science and technology and of fruitfully contributing to society. Our educational and research facilities are of excellent quality and are constantly being improved.

Our academic system is efficiently structured. The College of Engineering comprises three learning fields: School of Electrical and Electronic Engineering; School of Materials, Chemistry and Chemical Engineering; and School of Mechanical, Aerospace and Marine-System Engineering. The students choose one of the three fields to study during their first year to acquire the basics of science and engineering on which they will later develop innovative or fundamental research. After this interdisciplinary initial year, they pursue more specialized studies in one of ten courses. The Graduate School of Engineering offers six courses: Mechanical Engineering; Aerospace and Marine-System Engineering; Electronics, Mathematics and Physics; Electrical Engineering and Information Science; Materials Science and Engineering; and Quantum and Radiation Engineering. These six courses are divided into a total of eleven departments: ten linked with the ten courses of study in the College of Engineering and one independent department. This system enables integrated education in an area of specialization that seamlessly connects undergraduate and graduate studies.

Many former students who studied at the Graduate School of Engineering actively work in diverse sectors of society, greatly contributing to technological innovation in their respective fields. Thanks to them, strong ties have been formed between the Graduate School and the industrial world in terms of human resource procurement and research collaboration. The Graduate School has been a main promoter of the integrated five-year degree program called Graduate Course for System-inspired Leaders in Materials Science (SiMS). The focus of this course is training future global researchers who will lead major research teams in the industrial world with mono-to-koto shift in structure (switching from mere mono-zukuri [making of material objects] to a new style mono-zukuri into which koto-zukuri [development of systems and services] is integrated). We look forward to highly motivated new students full of intellectual curiosity and enthusiasm.

### Organizations





## Department of Mechanical Engineering



● Combustion experiments in micro-gravity.

### Frontier machines — intelligent mechanical systems and environmentally-friendly energy systems.

The mission of the Department of Mechanical Engineering is to be a leader in education and research. The department seeks to produce future leaders for industry, academia, government, and society. We provide: the education system for careers involving technological innovation and leadership; and the attractive research environment for advanced technology and science by combining the basic knowledge with the innovative application of mechanical engineering.

In the education system, the lectures start with the fundamental subjects regarding mechanical engineering and provide special subjects corresponding to intelligent mechanical systems and environmentally-friendly integrated energy systems. The education curriculum covers all of the core disciplinary areas of mechanical engineering including materials, solid mechanics, measurements, controls, mechanical dynamics, heat transfer, thermo dynamics, fluid dynamics, energy systems, environmental analysis and

protection, design, and manufacturing.

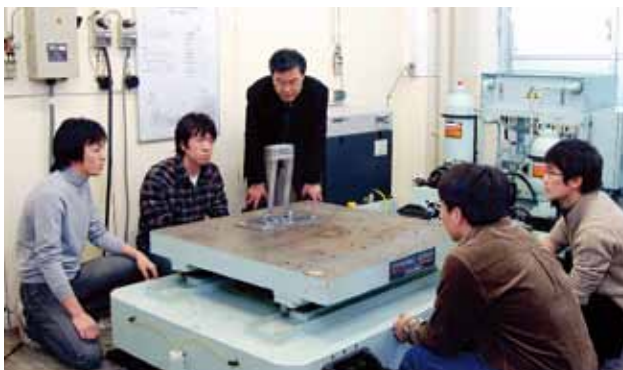
Four sub-departments are devoted to research in the fundamentals and applied fields of mechanical engineering. Their major research fields are summarized in the following.

**Fundamental Mechanical Engineering:** solid mechanics, impact engineering, composite and smart materials, material and structural design, manufacturing systems, CAD/CAM.

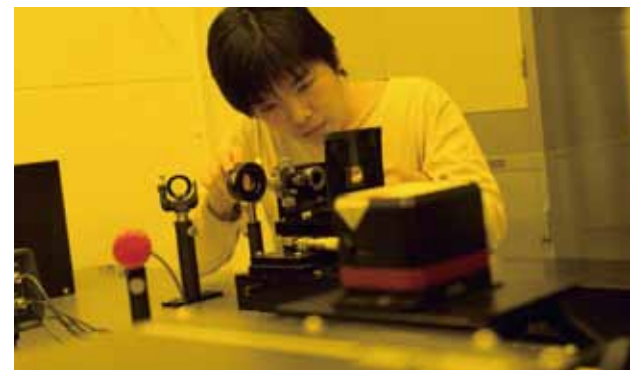
**Intelligent Mechanical Systems:** mechanical measurement, micro- and nano-structure, control design, robotics, mechanical vibrations, fluid-structure interaction, seismic engineering.

**Thermo- and Fluid- Dynamics and Power Engineering:** heat transfer, plasma, engine, combustion, fuel, fluid mechanics, cavitation and bubble dynamics.

**Energy and Environmental Engineering:** dispersed energy systems, optimal planning, thermal environment, air pollution, environmental protection, non thermal plasma.



● Seismic excitation test for a high-performance granular damper.



● Ultraviolet laser interferometer for fabrication of nano-surface structure.

#### RESEARCH AREAS

Mechanics of Materials, Applied Mechanics, Manufacturing Engineering, Measurements Engineering, Systems and Control, Mechanical Dynamics, Heat Transfer, Engine System and Combustion Engineering, Fluid Mechanics, Energy Systems Analysis, Environmental Analysis and Urban Engineering, Environmental Protection Engineering

## Department of Aerospace Engineering



● The 1-kilogram nanosatellite being developed by the OPU student team will be launched by the H-IIA launch vehicle in 2014.

### "Dream, challenge and success in aerospace engineering"

Aerospace Engineering is concerned with the design, development and manufacture of aircraft and space vehicles to perform a variety of specified missions. The objective of the education in this department is to provide a strong foundation in the basic principles of aeronautics and astronautics. On this foundation, students are educated to acquire excellent ability to perform a variety of activities in research, development, and operation of aerospace vehicles. This ability can also be applied to other related areas of engineering. Our department

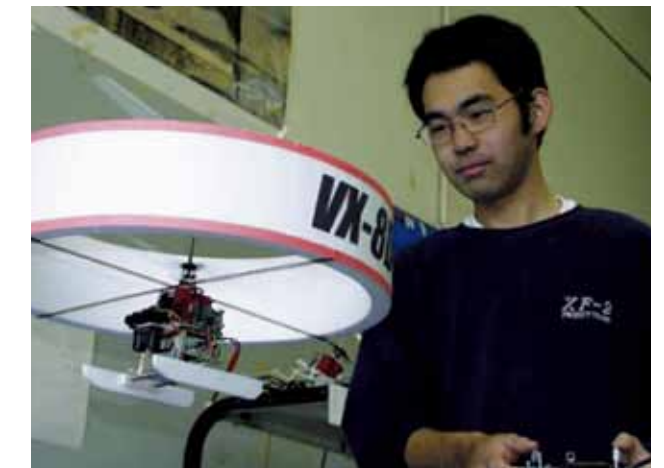
consists of the following two sub-departments :

"Aerospace Sciences" deals with fundamental and applied sciences of aerospace engineering, and its education and research spread over a wide area of subjects such as aerodynamics, structures engineering and propulsion engineering ;

"Aerospace Systems" emphasizes application and integration of fundamental principles of aerospace engineering, and its education and research cover subjects such as dynamics, control, system engineering, astro dynamics, and space utilization engineering.



● Performance test of a non-combustion engine.



● Development of a remote-controlled unmanned small VTOL aircraft.

#### RESEARCH AREAS

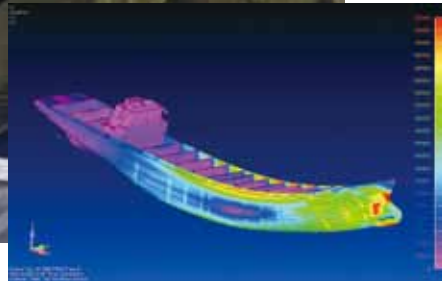
Aerodynamics and Flow Control, Theoretical and Numerical Fluid Dynamics, Inflatable Membrane Structure, Developing a Small, Lightweight Helicopter for Environmental Measurements, High Efficiency Energy Conversion by an Innovative Cycle, Remote Sensing from Space, Remote Sensing and Atmospheric Research, Structural Reliability and Optimum Design, Dynamics and Control of Aerospace Systems, Analysis and Synthesis of Control Systems, Space Environmental Utilization



## Department of Marine System Engineering



●Preparation of high-speed planing boat performance test.



●Stress distribution of a container ship in slamming condition.

### To be with the ocean for our future and our aqua planet!

The Marine System Engineering is a discipline aiming for the harmony between human activity and ocean. The Earth is sometimes called "Water Planet", and the ocean has provided benefits to humans since the creation of life. Japan is surrounded by the oceans and depends on import for major portion of the resources. For the economy and society of Japan, it is essential to secure the development and use of the marine resources, the safety of the maritime transport and others as well as to maintain the order in the oceans. Every single human being has a duty to protect the marine environment and save marine resources for the future. Think about, how can we maintain marine resources and utilize them effectively in the Department of Marine System Engineering of Osaka Prefecture University.

The department offers advanced education and research programs concerning the following 5 major fields, the marine system planning, the marine environment, the marine transportation, the marine resources development, and the ocean space utilization. These programs include the fundamental subjects of hydrodynamics, structural engineering, computer science and system engineering, and the relevant technical and other special subjects of Marine System Engineering. Through these education and research activities, highly-developed maritime transportation and logistics, new concept of ocean structure and ocean utilization, sustainable use of marine resource and renewable energy, preservation and renovation of marine environment, planning of future human activities in the sea and so on would be achieved.



●MAG welding robot system.



●Sensor installation on board of RV MIRAI.

●Autonomous Underwater Glider, SOARER.

#### RESEARCH AREAS

Marine Environmental Monitoring, Human Environments Planning, Marine Environments, Marine Hydrodynamics, Marine System Design, System Optimization, Marine Transportation Engineering, Naval Hydrodynamics, Marine Resources Engineering, Marine Bio-engineering, Marine Space Utilization Technology, Marine Structural Engineering

## Department of Mathematical Sciences

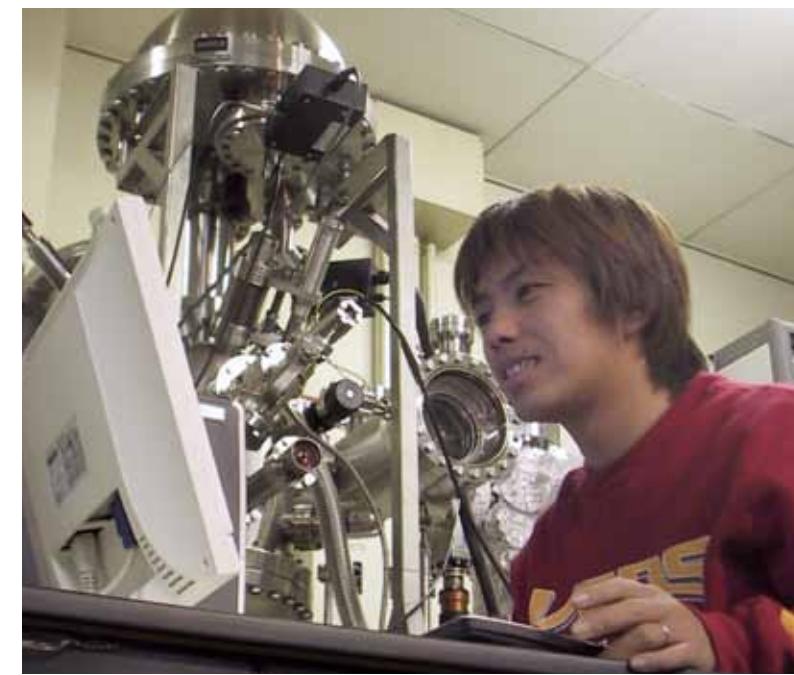


●seminar

### Elucidation of various natural and social phenomena in terms of mathematical and physical methods.

Recent development of technology requires students to have knowledge of new phenomena in a field of natural science. It is not too much to say that fundamental mathematics and physics are of importance to understand natural phenomena. The courses of Mathematical Sciences provide various practical exercises which enhance mathematical and physical ways of thinking to solve problems and help students to integrate their insight. Through the courses such as mathematics, theoretical and experimental physics, and information sciences, students can learn how to apply mathematical and physical theories to various practical problems.

The department is composed of the following two subdepartments: "Mathematical Analysis" deals with fundamental mathematical problems and abstract mathematical expressions. The educational and research activities cover the subjects such as applied analysis, mathematical statistics, applied mathematics and discrete mathematics; "Mathematical Physics" puts emphasis on elucidating practical problems from the viewpoint of theoretical and/or experimental physics. For the purpose of education and research, the subdepartment offers programs in the field of nonlinear dynamics, quantum physics and solid state physics.



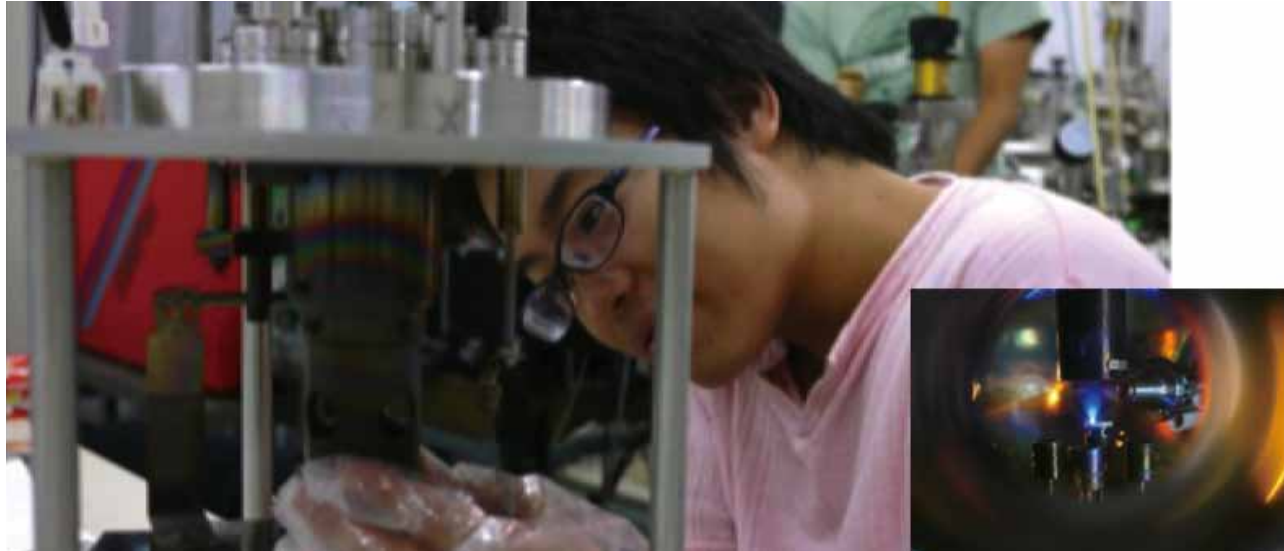
●Photoemission and inverse photoemission spectroscopy.

#### RESEARCH AREAS

Applied Analysis, Mathematical Statistics, Applied Mathematics, Nonlinear Dynamics, Quantum Physics, Solid State Physics, Discrete Mathematical Sciences



## Department of Physics and Electronics



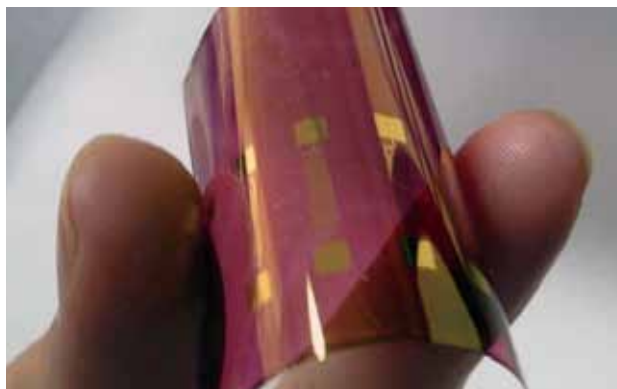
●Laser ablation system for thin film metal-oxides.

### Quest for the spirit of nanosciences and nanotechnologies for contributing to a highly industrialized global society of the 21st century.

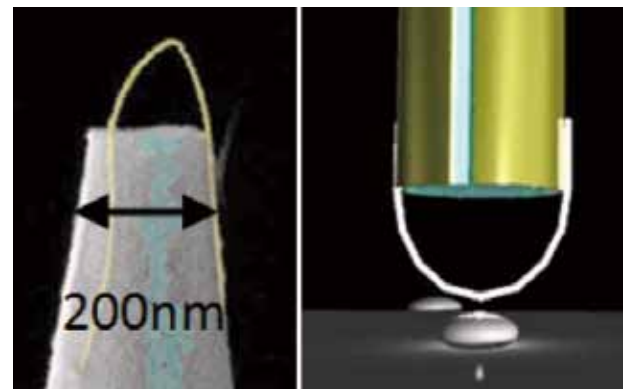
The department provides detailed assistance to the comprehensive teachings and research of physics and electronics to its students. The curricula cover not only the fundamentals of solid-state physics (quantum mechanics, statistical physics, semiconductor physics, electrodynamics, etc) but also their applications (electronics circuit, electronic devices, quantum devices, photo-electronics, etc) so as to encourage the students to work in the diversity of frontiers in the industrial and academic communities. The experimental and creative exercises are of special importance in the teaching program to develop incentives to the students. The graduates from this department are well received in the top-ranking companies as well as in the distinguished research institutes because they are recognized to be highly motivated for becoming professionals.

There are seven research groups in this department: (1) the quantum physics of condensed matter group deals with the superconductivity, the magnetism, and

the related nanotechnologies and sciences; (2) the nano-optical physics of materials group studies laser manipulation, nonlinear optics, crystal growth, and the optical properties of multinary compounds; (3) the physics of organic semiconductors group investigates the photoelectric properties and the pattern formation of soft matters such as conjugated polymers and liquid crystals; (4) the interface physics of the solids group is active in nanoscience and nanotechnology based on low dimensional electronic materials such as carbon nanotubes and related materials; (5) the semiconductor processing group carries out research on microfabrication technology; (6) the optical device physics group is engaged in the development and investigation of quantum and optical devices; (7) the physics of novel devices group focuses on material and device designs and the development of novel semiconductor devices using ferroelectric, piezoelectric and magnetic materials.



●Flexible thin film transistor.



●Nanoscale filament lamp.

#### RESEARCH AREAS

Quantum Physics of Condensed Matter, Nano-optical Physics of Materials, Physics of Organic Semiconductors, Interface Physics of Solids, Semiconductor Processing, Physics of Quantum and Optical Devices, Physics of Novel Devices

## Department of Electrical and Information Systems



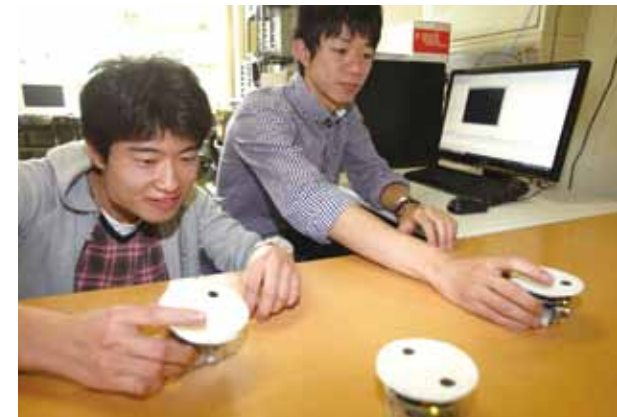
●Electric vehicle.

### Leading technology of electrical and information systems — hard and soft in one !

The Department of Electrical and Information Systems is organized to give the students the sufficient academic background and effective problem-solving skills in the basic electrical systems engineering, communication and information systems engineering, and industrial and systems engineering. Such academic fields are important in the coming age of human-centered, earth-saving and information-oriented global society. The department is creating the next-generation technologies covering wide areas of electrical, communication and information systems for supporting comfortable daily life, which includes environment-friendly power generation systems and eco-friendly cars, the robots which move smoothly like a human being, optical networks and multimedia application systems which transmit vast amounts of information instantly, cellular-phones which can be used anywhere,

and production systems to produce and deliver various products efficiently and timely within the supply chain.

The department consists of 2 major Laboratories: the Electrical Systems Laboratory and the Communication and Information Systems Laboratory. In the former Laboratory, motor drive systems, power electronics, power systems engineering, electrical control engineering and production management systems are investigated. In the latter Laboratory, multimedia networking over WDM, optical communication engineering, optical fiber technology, microwave engineering, digital communication, wireless communication, and signal processing in communication systems are, in turn, investigated. The two Laboratories provide a wide variety of options for students to select so as to meet their demands.



●Cooperative Control of Mobile Robots.



●Packet Transmission Experiment in IP-over-WDM Network.

#### RESEARCH AREAS

Motor Drive Systems, Power Electronics, Power Systems Engineering, Control Engineering, Production Management Systems, Operations Research, Multimedia Networking Over WDM, Optical Communication Engineering, Optical Fiber Technology, Microwave Engineering, Digital Communication, Wireless Communication, Signal Processing in Communication Systems



## Department of Computer Science and Intelligent Systems



●RoboCup Soccer simulation.

### We contribute to the development of an intelligent society with information technologies based on mathematical thinking.

Fast developing information technologies such as knowledge information processing systems, intelligent systems, and information communication network systems are bringing about substantial changes in social structures and individual lifestyles. In order to develop advanced technologies for highly utilizing information and assure the bright future of the intelligent society, the Department of Computer Science and Intelligent Systems offers the education of fundamental skills about information processing technologies, hardware implementation, and their applications.

The department aims at training young engineers and researchers along with cultivating deep humanity and morality. The department provides students with the fundamentals for developing their abilities in mathematics and physics as well as providing basic knowledge about information science and intelligence science such as information circuit, logic design, information theory, and signal processing theory. With

these foundations, students acquire special knowledge about computers, such as data structure, computer architecture, database, information system, software engineering, and programming language. They also learn special knowledge about applied technologies of information processing such as system engineering, optimization theory, media information processing, artificial intelligence, recognition engineering, and computational intelligence. This curriculum is organized to train creative and independent engineers and researchers who can find and resolve problems by themselves.

The department is presently composed of eight research groups, whose main research areas include software engineering, pattern recognition, intelligent systems, computer network, coding theory, signal processing, optimization theory, human-machine systems, computational intelligence, data mining, knowledge management systems, and e-commerce.



●Real-time document image retrieval.

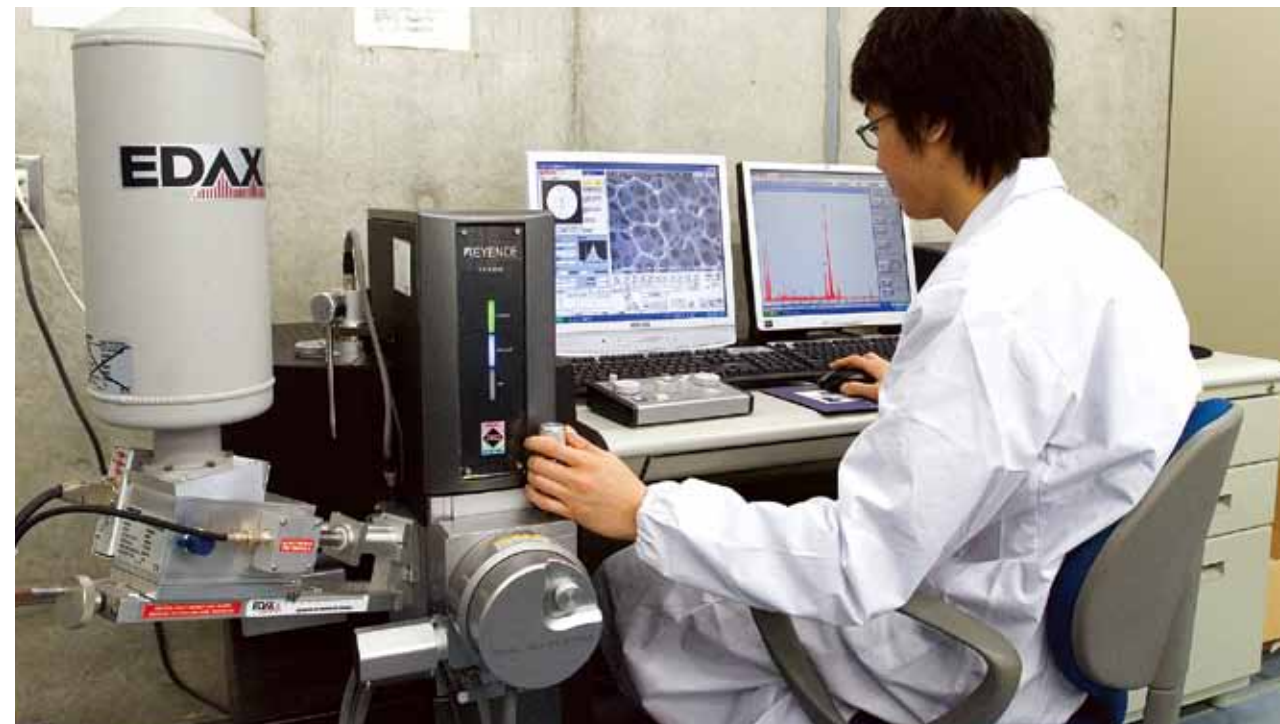


●Decision Support through Word-of-Mouth Travel Navigator.

#### RESEARCH AREAS

Software System, Information System, Intelligent Media Processing, Signal Processing, Foundations of Information Science, Human-Information Systems, Computational Intelligence, Management Information Systems

## Department of Applied Chemistry



●Surface observation and composition analyses of electrode materials with a scanning electron microscope.

### Weaving atoms and molecules into a better future.

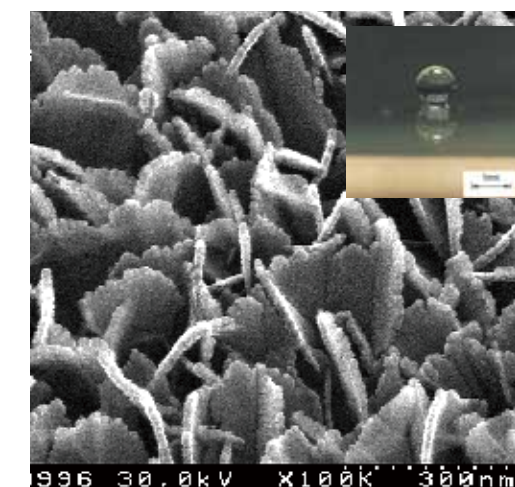
Applied chemistry plays a vital role in the development of advanced science and technology for the efficient use of natural resources as well as the development of new materials through fundamental research. This involves the understanding and characterization of the chemical properties, structures and reactivities of various materials and processes at the atomic and molecular levels.

The Department of Applied Chemistry is at the forefront of research in the following twelve fields: analytical chemistry; syntheses of advanced inorganic materials; surface photochemistry, catalysis and photocatalysis; electrochemistry and electrochemical energy conversion; the reactions, syntheses and

properties of organic molecular compounds; syntheses of organic functional materials; syntheses of functional polymers; organometallic chemistry and bioorganic chemistry; polymer physics and biopolymer chemistry; environmental chemistry; molecular recognition, colloid and interface chemistry; environmental multi-phase chemistry. Our education and research curricula not only involve efforts to meet many challenges facing the world today, such as decreasing energy consumption, uses of natural resources and pollution caused by environmental toxins, but also the training of individuals who, through the knowledge and experience acquired here, will contribute to the betterment of the world.



●Synthesis of novel organic compounds using an automated equipment.



●Nanocrystalline Bemite (AlO(OH)) thin film having ultra water-repelling property prepared by a sol-gel method.

#### RESEARCH AREAS

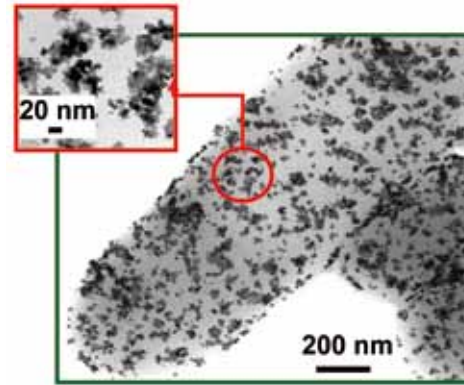
Analytical Chemistry, Inorganic Chemistry, Physical Chemistry, Electrochemistry, Material Creation Chemistry, Organic Functional Materials Chemistry, Polymer Chemistry, Synthetic Organic Chemistry, Biopolymer Chemistry, Environmental Chemistry, Molecular Recognition Chemistry, Environmental Materials Chemistry



## Department of Chemical Engineering



●Design of medical and pharmaceutical products and development of manufacturing equipment.



●Biogenic palladium nanoparticles on the microbial cells at room temperature.

### Chemical engineering holds the key to the success of advanced manufacturing processes and a recycling-oriented society.

The research programs in the department are mainly concerned with powder technology, separation and recovery of useful ingredients from a mixture, development of chemical reactors and bioreactors, and design of process control systems. There are seven research groups, whose current research interests are as follows.

**Particle science and technology:** (1) Shape and size control of inorganic nanoparticles; (2) Microbial synthesis of inorganic nanoparticles; (3) Transport and adhesion of bio-particles (microbial cells) at interfaces.

**Resources engineering:** (1) Theoretical analysis of solid/liquid separations; (2) Analysis of electroosmotic flow in separation processes; (3) Development of novel techniques that utilize gelation reaction to separate solids from liquid; (4) Analysis of dynamics of flocculation process.

**Process systems engineering:** (1) Measurement, control, scaling-up and optimization of powder handling processes; (2) Synthesis of intelligent fine particulate materials; (3) Design and control of powder functionalities and surface properties; (4) Development of Drug Delivery System (DDS) based on nano-particles; and (5) Numerical modeling of powder handling processes and of nano particle interactions with human tissue.

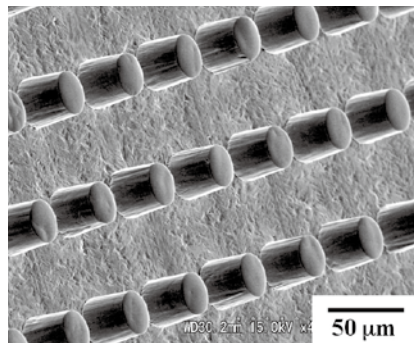
**Chemical reaction engineering:** (1) Micro/nano-scale

chemical or biochemical devices and systems; (2) Novel functional polymer materials; (3) Organic solventstable enzymes and their applications; (4) Mass transfer analyses in gas-solid-liquid systems.

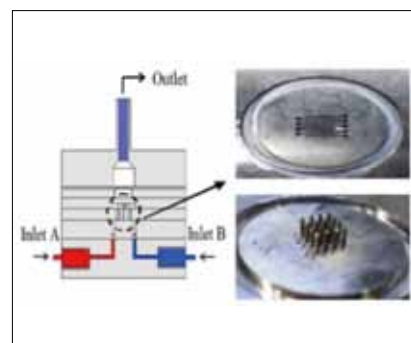
**Separation science and engineering:** (1) Development of new devices and new processes for separation and recovery of various chemical compounds, such as a micro reactor and porous materials; (2) Development of porous carbon electrode for capacitor and secondary battery; (3) Development of new bioprocess for highly-efficient production of basic fine chemicals and energy, such as sugar, hydrogen, amino acid, alcohol and methane, from biomass.

**Materials process engineering:** (1) Electrochemical engineering and current distribution; (2) Design and processing of micro electrodeposits for electronics application; (3) Microelectronics Packaging (Micro connectors (Bumping), Micro conductors (Copper Damascene, Additive Process), Micro electrodes); (4) Additive monitoring for environment.

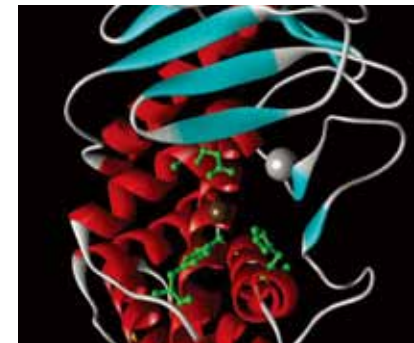
**Cluster control engineering:** (1) Development of new synthesis methods for nanoparticle and thin films; (2) Synthesis of novel functional semiconductor nanoparticles and films; (3) Development of nanoparticle manipulation; (4) Evaluation of nucleation in the atmosphere.



●Pillar shaped LSI micro connectors produced by electrodeposition.



●Separations and recovery of various chemical compounds and preparation of novel separators.



●Novel enzyme designed and developed with the latest biotechnologies.

RESEARCH  
AREAS

Particle Science and Technology, Chemical Reaction Engineering, Separation Science and Engineering, Resources Engineering, Process System Engineering, Material Process Engineering, Cluster Control Engineering

## Department of Materials Science



●Electron Probe MicroAnalyser.

### Materials science, the key for the success of new technology, ... and to the future.

Often, the progress in science and technology in the modern society is limited not by design, but a lack of materials that realize the idea of a designer. The mission of our department is then to ultimately provide such materials, as well as to train materials scientists. This is indeed a formidable task, and a systematic approach by experienced researchers is much needed.

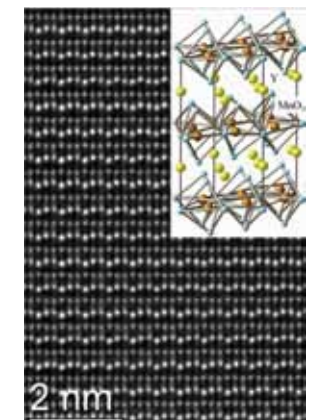
Thus, in our department, about twenty qualified materials scientists, together with talented graduate students, are working on a number of problems ranging from the synthesis of high-temperature intermetallic compounds to the analysis of nanostructured magnetic thin films. Our specific activities include design and fabrication of various functional materials, such as thermo-electric materials, multilayered thinfilms, and nanostructured composites; investigations of mechanical and thermal-resistant properties of recent ceramic materials used in the aerospace industry; and

the first principle simulation of the structure of light-weight superalloys, just to name a few.

On the top of the aforementioned fields of conventional materials science and engineering, the worldwide concern of the environment has led us to revisit such mundane materials like solder alloys (because of the lead they contain) and copper alloys used in a wire connection for a computer system (because of beryllium). Other environment-friendly materials that we are studying include new-generation corrosion-resistant alloys, hydrogen storage materials, and magnesium-based alloys having superplasticity. In addition, our research field has recently been expanded to cover bio- and human-related materials to meet the demand from the society. With these views in our mind, and state-of-the-art facilities in our hands, we are confident that our future will not be limited by the lack of materials thereby freeing our imagination to soar.



●Materials Science and Engineering Laboratory.



●Atomic-resolved image of ferroelectric YMnO<sub>3</sub>

RESEARCH  
AREAS

Materials Physics, Materials Process, High-Temperature Materials, Tribo-Materials and Bio-Materials, Microstructure Designing, Materials Strength, Materials Chemistry, Radiation Materials Physics



# Department of Quantum and Radiation Engineering



●Co60 gamma ray irradiation pool.

## The key for science and technology, manufacture, medicine, food industry, environmental.

The research field of the Division of Quantum and Radiation Engineering is the interdisciplinary frontier science and technology using ionizing radiation and characteristic beams such as ion beams and lasers, leading the advanced industry, medicine and nuclear engineering. We provide students with the basic and practical education using large-scale radiation and accelerator facilities in our university. They can study the advanced science and technology in research and development along with radiation safety management to become the member of the international community.

Four research groups are devoted to research in the fundamentals and applied fields of quantum and radiation engineering. Their major research fields are summarized in the following.

**Radiation Metrological Science:** Space Radiation, Non-destructive Testing, Accelerator Beam Technology, Radiation Imaging, Radiation Damage, Radiation Measurement, Radiation Engineering, Radiation

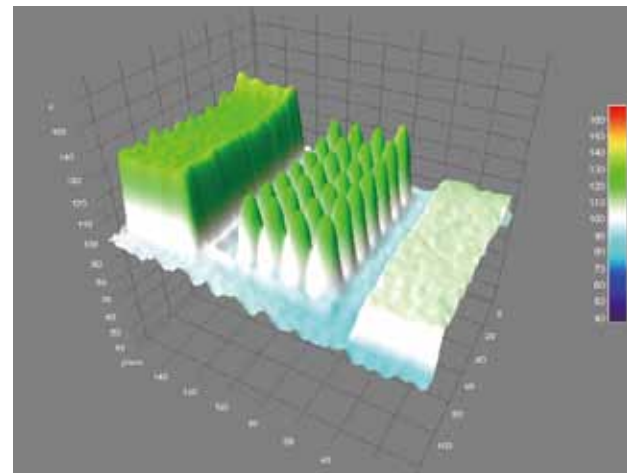
Physics, Neutronics, Environmental Radiation Science.

**Quantum-Beam Materials Science:** Quantum-Beam Materials Science, Radiation-Induced Reaction, Accelerator Science, Quantum-Beam Engineering, Terahertz Coherent Radiation, Plasma Science and Engineering, Nuclear Fusion, Nuclear Engineering, Nuclear Power Plant Technology, Radiation Processing. **Quantum-beam Chemical biology:** Quantum Radiation Sterilization Technology, Microbial Control, Food Hygiene, Quantum Radiation Applied Biology, Radiation Biology, Radiation Chemistry, Radiation Damage to DNA, Modified DNA bases, GC/MS, HPLC-EC, Syntheses of poly nuclear complexes.

**Nanoscale Materials and Devices:** Compound Semiconductors, Nanostructure Semiconductors, Semiconductor photonic devices, Epitaxial Crystal Growth, Superconductors, Magnetic Materials, Compound Semiconductors, Magnetic Measurements, Electric Transport Measurements, Nano-Fabrication.



●Class 100 clean room.



●Gamma ray radiography.

### RESEARCH AREAS

Non-destructive Testing, Accelerator Beam Technology, Terahertz Coherent Radiation, Plasma Science and Engineering, Radiation Biology, Radiation Damage to DNA Semiconductor photonic devices, Magnetic Materials,

## FACILITIES



●Frontier Science Innovation Center

**We are here to stay ...  
shaping landscapes  
beyond the horizon !**



●Practical training at the Engineering Center

### ●Frontier Science Innovation Center

The Center for Advanced Science Innovation is involved in unique interdisciplinary research in collaboration with leading domestic and overseas researchers and also supports research projects on an open proposal basis. The Center manages and operates an extensive collection of ancillary research facilities, including irradiation equipment and a semiconductor clean room. This allows the Center to contribute to development efforts in advanced research areas such as radiation, environmental research, biochemistry, and semiconductor studies and, at the same time, to actively contribute to the local community.

### ●Production Technology Center

The Production technology center has been established to support the education and research activities in the school of engineering. The center provides a variety of advanced and precise machine tools, such as precision turning machines, machining centers, EDMs (Electric Discharge Machines), and welding machines, which are used for the manufacturing process laboratory for the under graduate course and for the development of experimental devices for the leading-edge researches in the graduate course. A set of tools is also equipped for manufacturing the glass devices, such as glass tubes and glass heat exchangers.

### ●Intellectual Property Bridge Center

Intellectual Property Bridge Center of Osaka Prefecture University was established in September, 2003. This organization is financially supported by MICST (Ministry of Education, Culture, Sports, Science and Technology). It is our aim to materialize the intellectual properties of our university in the form of patents and by other means, as well as to make use of them for the public benefit. A number of coordinators are playing an important role in achieving this aim.

### ●21st Century COE program: Science and Engineering for Water-Assisted Evolution of Valuable Resources and Energy from Organic Wastes

The objective of the program is to establish the COE on Science and Engineering for Water-Assisted Evolution of Valuable Resources and Energy from Organic Wastes, which occupy more than 80% of the wastes in Japan. The novelty of this program is to activate water drastically by sub-critical, super-critical, superheating, ultrasonic wave, electromagnetic wave, radiation techniques, etc. and then derive valuable resources and energy from organic wastes. The unique feature of the activated water is absolutely harmless since no additional chemicals are required, and water returns to its original state with the progress of time. Therefore, this process is highly ideal for environmental protection and superb in technological innovation. The 21st century COE program has been successfully completed in March 2007 with a number of contributions to industry as well as various academic fields. Advanced studies in related research areas continue to be pursued actively.

### ●R&D Center for Plant Factory

Plant factories are roughly classified into "fully artificial light-type" or "sunlight-type" facilities. The R&D Center for the Plant Factory at OPU is the largest and the most advanced R&D base specializing in a fully artificial light-type facility in Japan. The Center aims to utilize the experience gained through the university's industry-academia-government collaborations to develop fundamental technologies to build efficient plant factories, conduct human resources development to train competent individuals for the development and operation of such factories, create related new R&D fields and, thereby, promote local industries.

### ●Development Center for New Metallic Material

Hoping to enhance the knowledge and technological potential of local companies in Higashi-Osaka and southern Osaka (Sakai, Senshu), the Development Center for New Metallic Material promotes collaboration among industry, educational institutions and the administration. One goal is to become a hub facility for material oriented manufacturing.