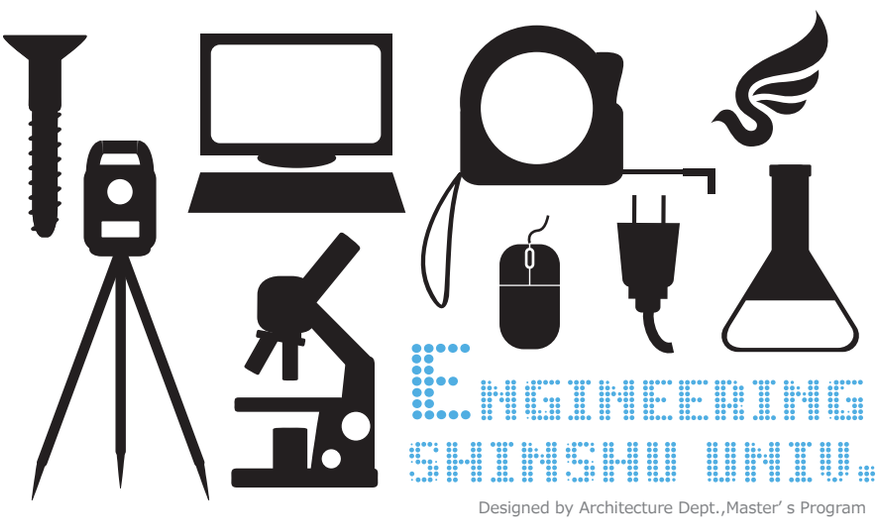
信州大学 | 工学部
SHINSHU UNIVERSITY

研究紹介
RESEARCH ACTIVITY
2015



Designed by Architecture Dept.,Master's Program

Mechanical systems Electrical Electronic Civil Architecture
Chemistry Material Computer Science& Engineering
Environmental Science&Technology Mathematics Physics
English Research Technical Division Library

A teacher of Shinshu University
Faculty of Engineering as of May, 2014.

Mechanical Systems Contents

Electrical Electronic Contents

Civil Contents

Architecture Contents

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Mechanical Systems Engineering

Development and Applications of Ultrahigh-Strength Low Alloy TRIP-aided Steels

Sugimoto lab. Is developing new types of ultrahigh-strength structural steels, TRIP-aided martensitic (TM) steel and TRIP-aided bainitic ferrite (TBF) steel, which possess a good formability, high fatigue strength, high toughness and high delayed fracture strength. The key technology is a usage of metastable retained austenite which increases strain-hardening rate and relaxes the localized stress concentration through strain-induced transformation to martensite in these TRIP-aided steels.

Students preparing some experiment for material testing.

Sugimoto Lab

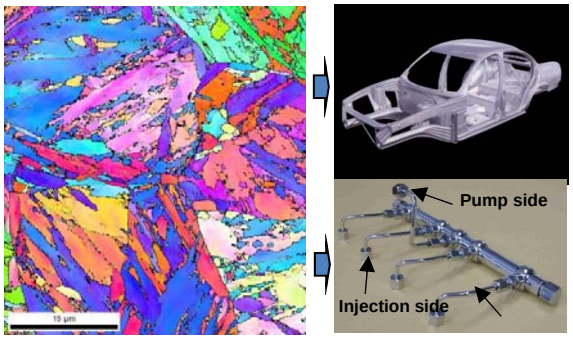
Koh-ichi Sugimoto
Professor

In the Future

Steels are the most important materials even in future. Our lab. Invented some advanced ultrahigh-strength steels with the best formability and mechanical property in the world. Ultrahigh-strength TBF and TM steels co-developed with Japanese steel makers are expected to produce energy-saving automobiles through weight reduction and low fuel consumption.

After Graduation

Students in Sugimoto laboratory will learn metallurgy and forming technology by many experiments and will be able to apply what they learn to the real world. Many students are working as engineers in famous companies such as automobile makers, steel makers and so on.



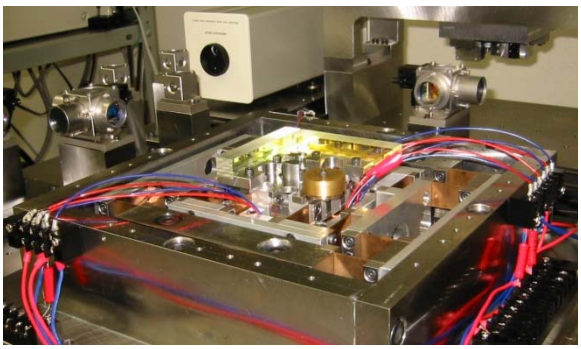
Microstructure of TRIP-aided bainitic ferrite steel (TBF steel) and application to automobile body and diesel engine common rail.

Mechanical Systems Engineering

Mechanical motion with atomic-level resolution and accuracy

toward the realization of ultraprecision mechanism

Evolutional performance of current digital equipments in our lives, such as DVD players, digital cameras and mobile phones, is supported by the progress in accuracy and resolution of ultraprecision fabrication technology. Those ultraprecision technologies essentially need motion devices that are able to move objects with nanometric or atomic-level resolution and accuracy. Fukada laboratory conducts researches in the field of ultraprecision mechanical systems, and our current interests are precision mechanical elements and the measurement and control of ultraprecision mechanisms.



Ultraprecision positioning mechanism realizing nanometric resolution. It performs motion with three degrees of freedom in X-Y plane.

Fukada Lab

Prof. Shigeo Fukuda

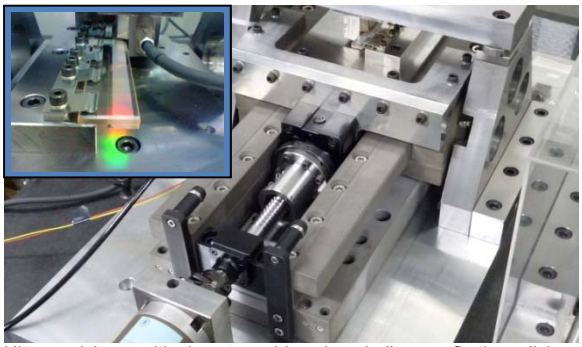
His major fields are precision engineering and ultraprecision mechatronics. He is very attached to design of mechanisms as an engineer. Precision machining is also his hobby.

In the Future

The accuracy of machining or fabricating processes for mechanical elements or electronic devices implies the level of technological development in a nation The improvement of machining accuracy leads to the improved performance of every machine and equipment. The progress of ultraprecision positioning technology enables artificial fabrication of ultra-fine structures with atomic spacing, which opens doors to develop novel medical devices and ecological technologies.

After Graduation

Students in Fukada laboratory design and manufacture ultraprecision experimental apparatuses and program tsoftware to control them iby themselves. Our graduates are working as engineers in various industries.

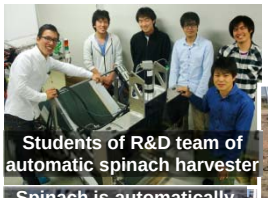


Ultraprecision positioning stage driven by a ball screw firstly realizing positioning resolution at angstrom level as atomic spacing

Mechanical Systems Engineering

Automatic control: realization of desired motion of systems

Automatic control is used in many systems in our society such as automobiles, precision mechanical systems, and high speed elevators, etc. To contribution to the society, Chida laboratory investigates novel and effective technologies of the automatic control. We are especially interested in control theory, modeling, state estimation, system identification, fault detection and isolation, and optimization. The developed methods are applied to agricultural robots, pneumatic isolation tables, and hard disk drive systems, etc.



Students of R&D team of automatic spinach harvester

Spinach is automatically harvested.

Automatic spinach harvester

Automatic spinach harvester cuts the root of spinach by cutting blade in the underground and transfers the spinach to the upper section.

Chida Lab

Yuichi Chida
Professor
He is interested in control theory and applications, system modeling and identification, state estimation and prediction, agricultural system, energy management system, etc.

In the Future

Automatic control technology is used widely in our industrial world and is one of the basic technologies in the system science which is effective for system integration applications. And the control method can be applied to many areas from precision machines to agricultural robots or energy management systems. The philosophy of designing control system can also be applied to solve various design problems in different fields.

After Graduation

Many students go to graduate schools. In Chida laboratory, students are active and are expected to work on their research projects independently. The experiences in the laboratory will help them in their future careers.

Experimental systems of pneumatic isolation table and students

A novel active control method was proposed by Dr.Koike who was a Ph.D. course student. The method was presented in an international conference at Santa Clara University in USA.

Research results are presented in international conferences and journals. One of the results was commended by the Fluid Power Technology Promotion Foundation.

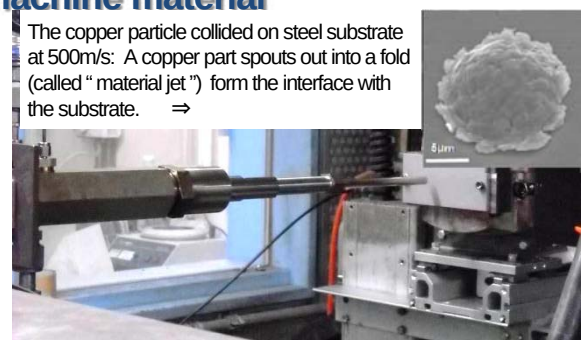
Mechanical Systems Engineering

"Development of the coating technology (process and materials) "

for high function of the machine material

The main area of research at our laboratory is surface technologies, focused on thermal spraying and kinetic spraying (cold spray). The process parameters and their effects on the microstructure and properties of the coatings are analyzed. The results are used to develop coating properties tailored to the function of the coated parts and to improve existing surface systems. Our Lab maintains a close relationship with other domestic industries and institutes. We conduct basic research and develop applications with industries.

The copper particle collided on steel substrate at 500m/s: A copper part spouts out into a fold (called " material jet ") form the interface with the substrate. ⇒



The cold spray gun nozzle produced in our lab. In the cold spray method, a coating is formed by exposing a substrate to high-velocity solid-phase particles, which have been accelerated by supersonic gas flow at a temperature much lower than the melting temperature of the feedstock.

Sakaki Lab

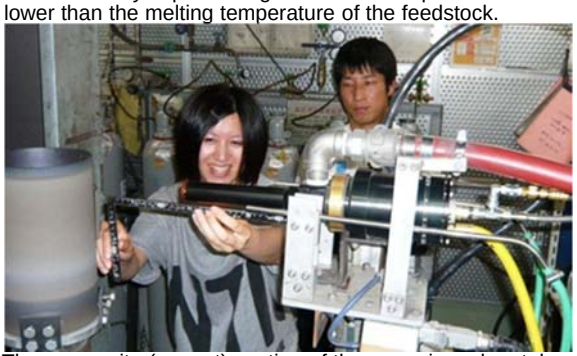
Kazuhiko Sakaki
Professor
・Graduate School：Shinshu Univ. , (Master course , Graduate School, Division of Engineering) , 1988
・1988 - 1993 , Toshiba Co.
・Doctor of Engineering , Shinshu University

In the Future

Our lab had been pioneering cold spray R&D in Japan since 1999. We have carried out both theoretical and experimental studies. We collaborate with many companies that are willing to develop new products. The examples are a silicon electrode for the next-generation lithium batteries with CNT compound by the cold spray and the power unit with ceramic matrix and the metal coating by a new joining mechanism.

After Graduation

The graduates are working actively at car, ship-building, precision instrument, and medical equipment manufacturers. Many of them choose to work in the fields that are not directly related to their thesis works, but they have the ability to adjust themselves to different environments as well as the basic scholastic ability.

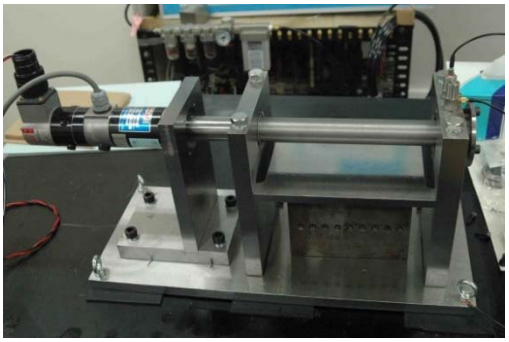


The composite (cermet) coating of the ceramic and metal superior by abrasion properties-resistant had been developed by high velocity flame (HVAF) spray.

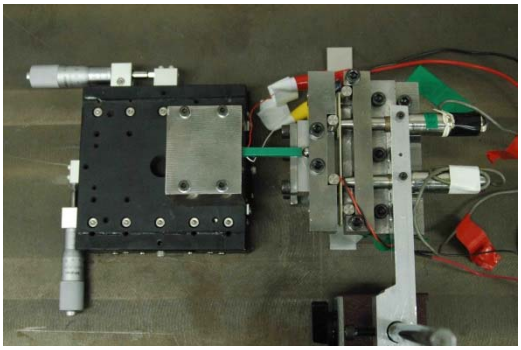
Mechanical Systems Engineering

Ultra Precision Machine and Mechatronics (Sensor, Actuator and Mechanism)

Sensors and actuators are important and fundamental elements of mechatronics. We are developing new sensors, analyzing actuator mechanisms, and investigating new application of the sensors and actuators. For example, a novel sensor to detect “jerk” is developed in our laboratory and its application for motion control or for machine diagnosis are investigated. Jerk is differentiation of acceleration. Also we investigate fundamental or new characteristics of piezoelectric actuator which is often used in precise positioning machine.



Experimental apparatus for novel diagnosis method of rolling bearing failure with piezoelectric jerk sensor. The method is available even to very slow rotation speed bearings.



Experimental apparatus for measurement of flexoelectric effect in piezoelectric ceramics. Application of the new phenomena in piezoelectric materials are investigated.

Henmi Lab

Nobuhiko Henmi,
Professor
Graduated doctoral course in Tokyo Institute of Technology. Worked five years at Tokyo University of Science as a research associate. Working at Shinshu University since 1998. Research interests are in precision mechanism, measurement and control, sensors and actuators, etc

In the Future

Mechatronics is basis of production and manufacturing technology. Fusion of evolution of each element technology and development of synthesis technology progresses science an technology of human beings. All of the researches in our laboratory relates directly with industrial technology or contributes to future development of engineering technology. They also have interesting academic aspects.

After Graduation

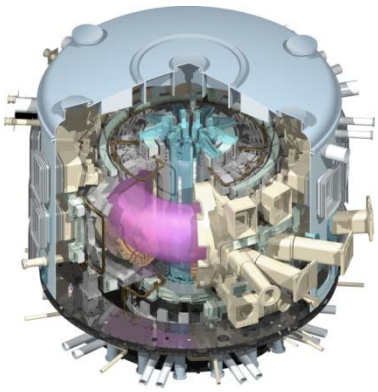
Our researches require engineering knowledge of both hardware and software. Students get hard training to learn the both skills. Graduated students have got careers in various industries, e.g., cars, electronics, precision machines, power supplies, or software development companies. The academic knowledge, technical skills and relationships with the colleague who shares joy and hard time in the lab. becomes treasure of life.

Mechanical Systems Engineering

Realizing Nuclear Fusion Energy

Modelling of Hydrogen and Helium in Fusion Plasma

The most exciting application of plasmas is the production of power from thermonuclear fusion. Fusion plasmas give off large amounts of heat and very energetic particles. However, they damage the surfaces of the reactor walls. The protection of the walls is one of the remaining critical issues for the realization of fusion plants. Neutral atoms and molecules in the near-wall region of fusion plasmas are expected to act as buffers. Thus it is important to understand the reaction processes of these atoms and molecules.



ITER is the world's largest experimental fusion reactor, which is now under construction at the Cadarache facility in France.

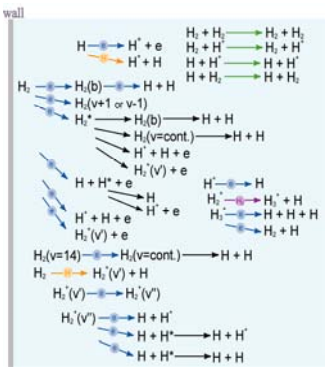
http://www.iter.org/gallery/com_image_download
The ITER Organization provides images and videos on its public website free of charge for educational and institutional use.

Sawada Lab

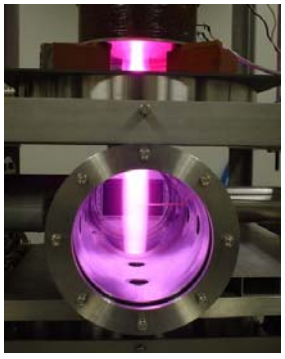
Keiji Sawada
Professor
Received his doctor's degree (engineering) at Kyoto University in 1994.

In the Future

We are studying the atoms and molecules in the near-wall region by constructing numerical codes that simulate their reaction processes. The codes have been used in the design of ITER: ITER is intended to prove the viability of fusion as an energy source, and to collect the data necessary for the design and operation of the first fusion power plant. RF plasma device in our laboratory is used to test our codes by comparing the calculated and observed photoemission intensities of the atoms and molecules.



Reaction processes of atoms and molecules.

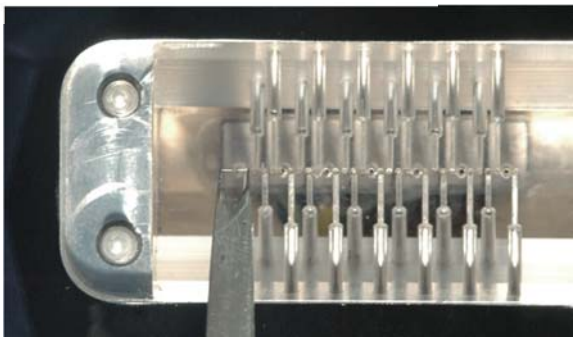


RF plasma device in our laboratory.

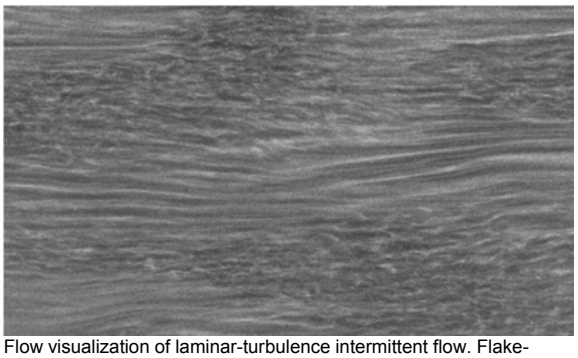
Mechanical Systems Engineering

Capturing 'coherent structures' in turbulence by MEMS sensors

In turbulence, three-dimensional and tangled disturbances are alternating ceaselessly. Our current challenge is to elucidate coherent structures in turbulent shear flows by means of a MEMS microphone array and hot wire anemometry that can capture a streak structure near the wall as well as hair-pin vortices. In addition, 'laminar-turbulent transition,' which one can regard as embryology of turbulence, is also investigated using flake particles and a high-power laser sheet.



Array of MEMS micro sensors. Spanwise intervals are 0.8 mm and a diameter of a hole is 0.5 mm. A hot wire at the left end of the array has a2.5 mm diameter sensor.



Flow visualization of laminar-turbulence intermittent flow. Flake-suspended water flows between glass plates apart 7 mm.

Matsubara Lab

Masaharu Matsubara
Professor
Postdoctoral in KTH(Stockholm) and Tohoku Univ. The current title from 2014. His main interest is turbulence in his main reserch area, fluid dynamics.

In the Future

'Turbulence' is an old, but new problem. It is one of the most fundamental subjects that persists from the 20th century. Researcher all over the world are trying to understand "turbulence" using supercomputers and over-100-meter wind tunnel facilities in the recent years. In order to approach the essence of a turbulent flow, we participate in the international joint research CICLoPE and we share the gigantic pipe flow facility.

After Graduation

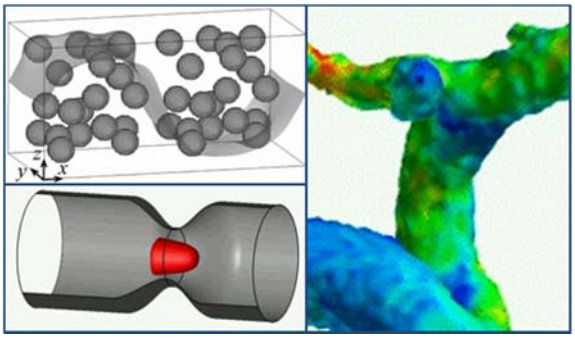
In our fluid dynamics experiments, we measure the flow fields using and controlling many kinds of optical and acoustic devices as well as standard anemometers. Our graduates with such experiences are highly active in the development of fluid machineries.

Mechanical Systems Engineering

Numerical Simulation of Microfluidics (Multiphase Flow)

In our laboratory, complex fluid flows with heat/mass transfer are studied by numerical simulations. Owing to recent great advance in computers, we have been able to investigate so-called microfluidics with high accuracy. In particular, the lattice Boltzmann method (LBM) is a powerful numerical scheme, and multiphase fluid flows such as bubble flows are simulated by the two-phase LBM. Moreover, blood flows around cerebral aneurysm are also studied as collaborative work with medical doctors.

Assembling of scientific computers. Students not only select high-spec computer parts but also install compiler for computations.



Examples of numerical results: an osmotic phenomenon of a liquid in a porous media (upper left); a red blood cell passing through a throat (lower left); stress distribution near a cerebral aneurysm (right).

Yoshino Lab

Dr. Masato Yoshino
Professor
Bachelor Eng. -1994,
Master Eng. -1997,
Doctor Eng. -2000,
Kyoto University.
Specialty: Computational Fluid Dynamics, Lattice Boltzmann Simulation

In the Future

In most companies, a commercial software is usually used for quick solution of fluid flow problems. Sometimes, however, actual complicated phenomena especially in the microfluidics are not accurately simulated by a commercial software. In the future, we hope that our developed code based on the LBM will become a useful tool for solving complicated problems in multiphase fluid flows.

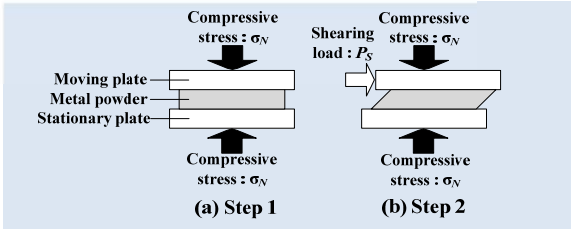
After Graduation

Students in our laboratory mainly go into various industries: automobile industry, consumer-electronics maker, heavy industry, precision equipment maker, and so on. Prof. Yoshino would like them to open a new frontier in many kinds of industries as a mechanical engineer.

Mechanical Systems Engineering

Development of materials useful in the fields of medicine and welfare

Our research group has developed the Compression Shearing Method at Room Temperature (COSME-RT) wherein metal powder is simultaneously loaded by a shearing force and a compressive stress in air at room temperature to form a plate. Usually, heat is necessary for powder metallurgy forming processes such as hot pressing. In contrast, the COSME-RT processes the powder at room temperature, so grain coarsening does not occur. As a result, the COSME-RT yields good mechanical properties.



Compression Shearing Method at Room Temperature (COSME-RT):
(a) Step 1: metal powder is first placed between a stationary plate and a moving plate in the apparatus. A compressive stress is then applied to the moving plate and maintained during the forming process.
(b) Step 2: Finally, a shearing load is added to the moving plate and displaced in the shearing direction.
A thin plate is fabricated in this step.

Nakayama Lab

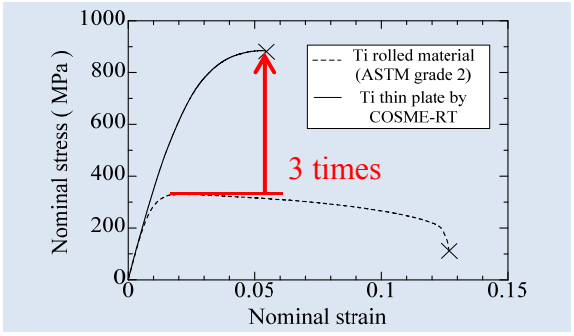
Noboru Nakayama
Dr. Eng.
Associate Professor
Research area :
Plastic working (powder metallurgy), Non destructive inspection

In the Future

Ti-6Al-4V is widely used in biomechanical applications, such as dental implants and intramedullary nails. However, since vanadium (V) is detrimental to organisms and is also a rare earth element, V-free biomaterials are desired.
COSME-RT can be used to produce pure Ti plates that exhibit high strength and nanometer grain sizes, making this material a useful alternative to the common biomaterial Ti-6Al-4V.

After Graduation

The graduates of Nakayama laboratory are working actively in automotive industries or manufactures and metal processing factories.

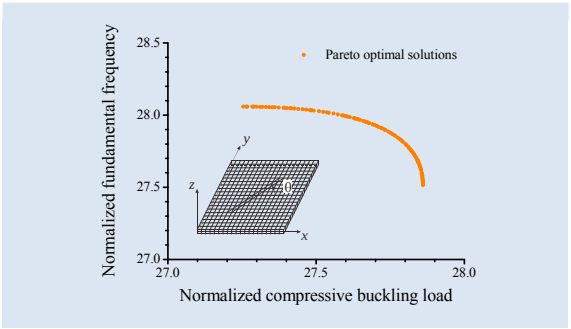


The tensile strength of the Ti thin plate formed by the Compression Shearing Method at Room Temperature (COSME-RT) was found to be 3 times larger than that for the rolled Ti.

Mechanical Systems Engineering

Structural Design for Safety, Reliability, and Adaptability

Mechanical structures around us are designed to meet certain criteria. In recent years, the design criteria such as safety, reliability, and adaptability to natural environment are considered very important.
“Optimal design”, “shape / vibration control”, and “health monitoring” are expected as novel technologies to improve mechanical structures in safety, reliability, and adaptability as well as their performance.



Optimal design of structures considering multiple design criteria by using PC.

Kameyama Lab

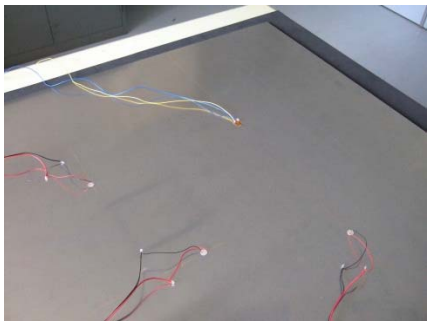
Masaki Kameyama
Associate Professor
Area of Interest:
Optimal design of smart composite structures
Key words:
Aeroelasticity, Structural Mechanics, Optimization, etc.

In the Future

For example, it is important to improve the safety, reliability, and environmental adaptability of aircrafts as well as the performance. We have carried out fundamental studies on the technologies to realize innovative aircraft structures which are safe, reliable, and kind to nature.
We believe these technologies will be valuable in the design and development of future machine structures.

After Graduation

Because this laboratory is brand-new, the number of graduates is still few. Most of them are working in the fields of transportation and electric machinery industries. “Independency” and “a broad perspective” are fostered through the research activities in this laboratory.

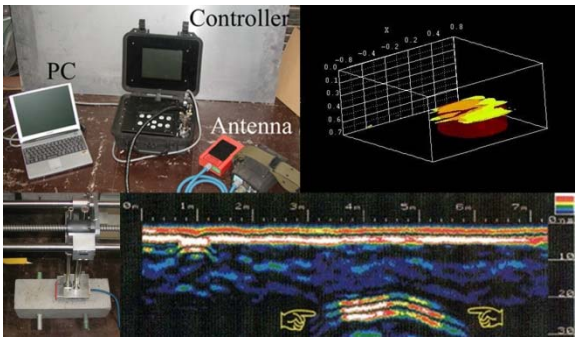


Damage detection of structures based on Lamb wave propagation characteristics.

Mechanical Systems Engineering

Realization of intelligent sensing systems that can think about their own performance

Sensing techniques are essentials to achieve simple and highly efficient mechatronics systems. In Takayama-Laboratory, non-destructive or non-contact sensing techniques have been studied based on propagation or reflection analysis of waves, such as sound, light, and radio or electromagnetic waves. In addition, we aim to improve these techniques and develop an “intelligent sensing system” that adaptively changes its measurement dimension, precision or resolution in response to sensing targets or purposes.



Photograph of the electromagnetic wave radar systems and cross-sectional surface image of inner structure obtained by them.

Takayama Lab

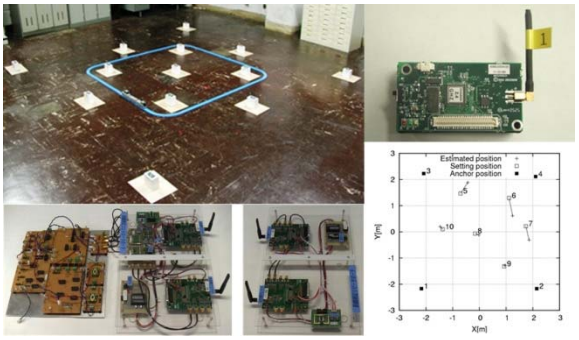
Jun-ya Takayama:
Associate Professor
He has been a faculty at Shinshu University since 2012. His current research interests are the intelligent sensing systems and the high-accuracy sensing techniques relating them.

In the Future

What kind of society can you imagine with the advance of sensing techniques? It’s a society where sensing and control techniques are fused with fully automated mechanical devices. For example, if the surrounding environment is fully recognized by the advanced sensing techniques, the car will operate automatically. In addition, a number of future technologies, such as perfect autonomous robots that cooperates with humans, will come true.

After Graduation

Sensing techniques are the fundamental elements to realize various scientific technologies such as kinematic control and external recognition of robots Therefore, our students can use their knowledge and problem-solving abilities obtained through academic researches in various research fields beyond mechanical engineering .

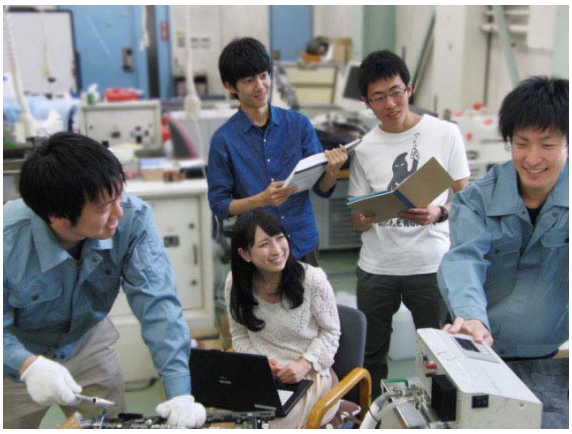


Photograph of localization experiment for the wireless sensor nodes. Good localization result is obtained from rough RF information.

Mechanical Systems Engineering

For efficient use of energy and energy conservation

We study “absorption refrigerators” and “ice storage systems” for efficient user of energy and energy conservation. Absorption refrigerators utilize waste heat reducing electric energy consumption. Ice storage systems store and reuse excess electricity. We can realize energy savings by these technologies that enable the efficient use of energy.



Students in our laboratory

Asaoka Lab

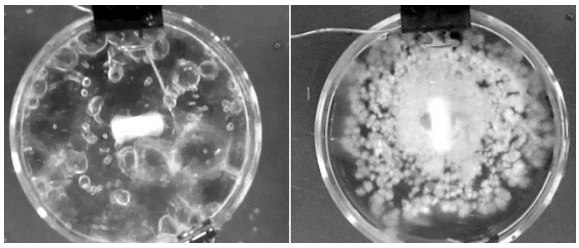
Tatsunori Asaoka
Associate Professor
Are interested in heat transfer and refrigeration.
(’13) Present post.
(’08) Doctor Eng. at Tokyo Tech.
(’08) Assistant professor in Aoyama Gakuin Univ.

In the Future

Our research will help resolving today’s serious environmental problems such as energy depletion and ambient pollution. We have to save energy and reduce emissions of pollutants such as greenhouse gases. Efficient use of energy and energy conservation achieved from the technologies such as absorption refrigerators, ice storage systems and heat pumps will enrich our lives.

After Graduation

Students acquire engineering skills by working on heat transfer and thermal engineering experiments in our laboratory. I expect they will lead the development of new technologies and accomplish great works in the wide field of engineering.

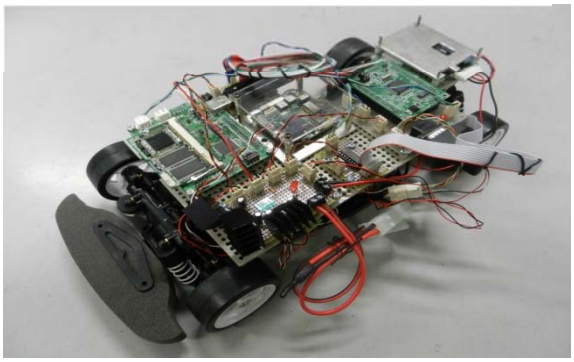


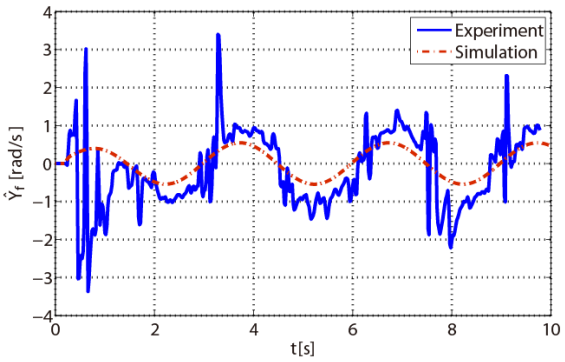
Aqueous solution as a refrigerant is cooled due to the evaporation under low pressure (left), and ice is formed in the solution (right).

Mechanical Systems Engineering

Development of a method to achieve safe and high-performance system operation

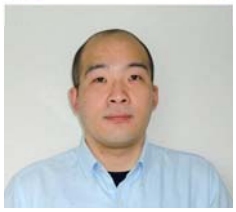
At Ikeda lab, we are developing a control method to operate mechanical systems such as satellites and automobiles safely and accurately. In recent years, we’ve developed methods to actively control steering in order to improve the safety and maneuverability of a vehicle and to control multiple small satellites for the observation of magnetic fields.





(Top) experimental vehicle which converted RC car. (Bottom) verification result of tire lateral force estimation method (front tire). Since estimate value conforms almost to simulation, effectiveness of proposed method is shown.

Ikeda Lab



Yuichi Ikeda
Assistant Professor
Dr. Eng. Degrees from the University of Electro-Communications, Japan in 2006. His research interests include control of nonlinear mechanical systems and its applicati--on.

In the Future

The safety and maneuverability of automobiles are improved by actively controlling steering as well as the accelerators/brakes, and in this way, we will be more comfortable driving. In addition, satellites are used for communications and broadcasting and are very important in our lives. It is possible to increase the communication capacity by controlling the satellites with high accuracy, and then, our lives will be easier.

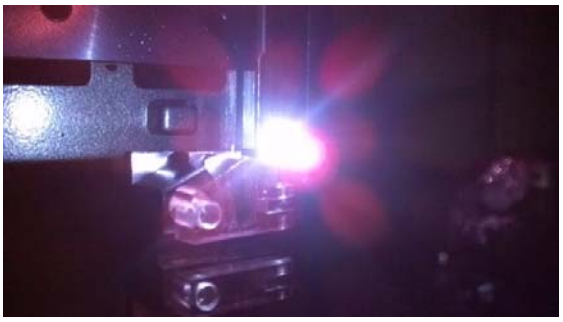
After Graduation

Many graduates find jobs in equipment manufacturers. Our students studying control engineering must also know about electrical engineering and programming, so they will be able to work in various fields after graduation.

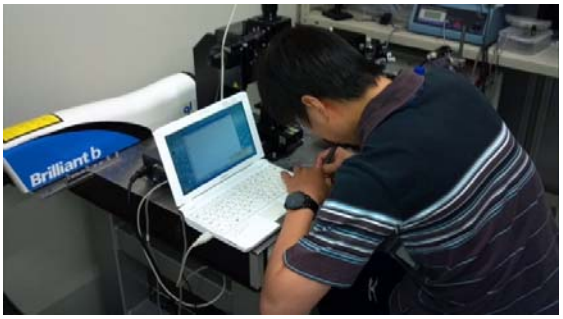
Mechanical Systems Engineering

Unique material processing by lasers

Laser light is special because its energy is concentrated in a very small area and a very short time frame We are developing small drilling and micro grooving methods using lasers. However, materials melted by laser beams spread over and adhere to the processing area; therefore, by processing the materials in chemical solutions, we try to remove the spread materials simultaneously. Combining laser with chemical reactions, we are developing unique material processing methods.



Pulsed Nd:YAG laser light is invisible; however, air is plasmarized to flash strongly because a huge amount of energy is condensed to a focal point.



A laser oscillator is set on the left corner of an anti-vibration table. An experimental equipment is lbehind the student.

Hosono Lab

Takashi Hosono
Assistant professor
Doctor of Engineering.
Research field: laser processing, lightweight metal based nano-carbon composites

In the Future

Sapphires and silicon carbides are known as next-generation semiconductor materials. They are very hard to be cut with conventional tools. Lasers are expected to be the solution to cut these hard materials because they can cut any materials with any hardness. Progressive research on the laser processing will facilitate the laser cutting of the next-generation semiconductor materials.

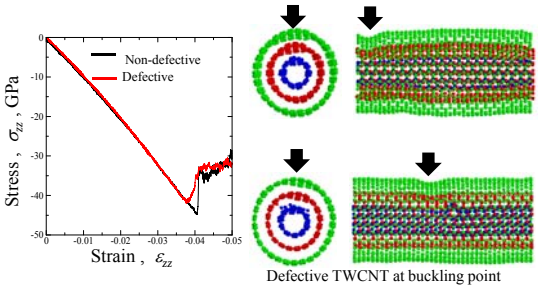
After Graduation

Our research is experimental and practical. Students in our lab learn to realize the complexity of material behaviors and material processing mechanisms. Do you want to become an engineer with a solid foundation ? Then join our lab.

Mechanical Systems Engineering

Solid mechanics on nanometre-scale materials using atomic simulations

We study deformation mechanisms of nanometre-scale materials by molecular dynamics (MD) simulations. It is difficult to explore such nanometre-scale materials experimentally due to their size ([nm] = 10^{-9}[m]). MD is one of atomic simulation methods and can simulate the movement of each atom in a material. Using MD, we perform deformation simulations of various materials such as carbon nanotubes and bulk metallic glasses to reveal the deformation properties in atomic scales.



Defective TWCNT at buckling point

Compressive simulation of defective triple-walled carbon nanotube: local buckling occurs from around the defect in defective model.

Nishimura Lab

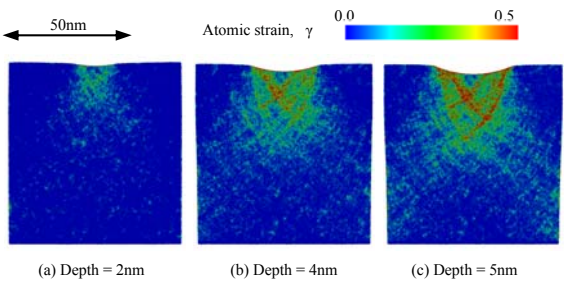
Masaomi Noshimura
Assistant Professor
2009, Ph. D., Kobe University, Graduate School of Science and Technology.
Field of study: Molecular Dynamics simulation, Solid Mechanics.

In the Future

In this laboratory, we study nanometre-scale materials using computation-simulations. Carbon nanotubes and bulk metallic glasses are new materials discovered recently. We have to understand the properties of materials in order to use them in various products. Our studies reveal essential deformation properties of these new materials. Based on our studies, they may be utilized in various fields.

After Graduation

Graduates are working in broad fields such as auto and electronics industries. In this laboratory, students acquire the computation-simulation skill and the knowledge in solid materials, which will be very useful in your future jobs.



Distribution of atomic strain under the indentation simulation on bulk metallic glasses: shear bands as localization of deformation are observed below the indentation point.

Mechanical Systems Engineering

Robots with intelligence! Toward beneficial autonomous systems

There is an increasing demand for autonomous robots working in daily indoor and outdoor environments and disaster-affected environments. Because these environments are not structured for automated machines, robots should be able to analyze the environments and plan their motions accordingly to conduct various useful works. Thus we are conducting fundamental and empirical researches to develop high-level autonomous systems.

Left figure: our research platform (robots). A life-sized dual-arm robot and small humanoid robots. Wheeled mobile robots are also used.
Right figure: an experiment that the dual-arm robot manipulates a piece of clothing.

Yamazaki Lab

Kimitoshi Yamazaki
(Assistant Professor)
He recieved Ph.D. degrees from Univ. of Tsukuba. Until 2012, he was joined at Univ. of Tokyo, Japan. His current research interests are in intelligent robots, robot vision, and motion planning.

In the Future

Recently, various robots are see in the media, but these robots of today are still far from achieving human-like intelligence. We, robotics researchers, must solve a lot of problems in order to create robots that function in our daily lives. Therefore, we are developing intelligent systems which every robot in the future will be equipped with.

After Graduation

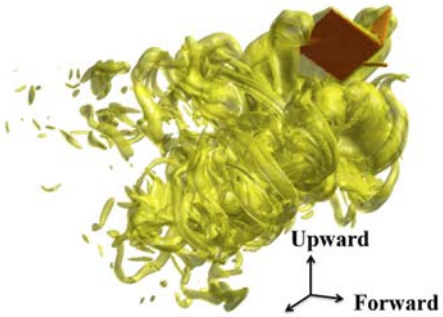
We value real-world robotics. Through experiments using real robots, you will find valuable results and will gain valuable experiences. You may work as engineers of product development for public consumers or researchers at universities.

The shape modeling of a refrigerator door. Not only its shape but also revolution axis are modeled through one door-opening action by a performer. In the right figure, red part shows the modeled door is used for online motion tracking of the door.

Mechanical Systems Engineering

Numerical Simulation of Complex Fluid Flows in Daily Life

In our laboratory, complex fluid flows which we can see in our daily life but cannot understand sufficiently are studied by numerical simulations. Owing to recent great advance in computers, we have been able to investigate complex fluid flows with high accuracy. In particular, the combination of the lattice Boltzmann method (LBM) with the immersed boundary method (IBM) is a powerful numerical method, and complex fluid flows in daily life such as falling leaves or flapping flight by insects are simulated by the method.



Free flight simulation of a butterfly-like flapping wing-body model. Such a simple wing-body model can fly against gravity.

Suzuki Lab

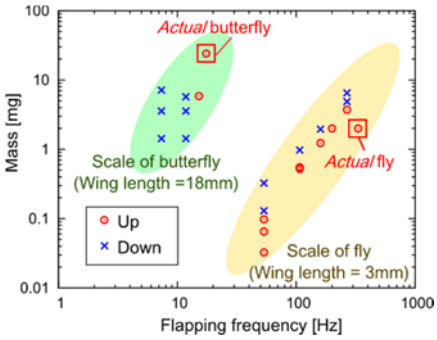
Kosuke Suzuki
Assistant Professor
PhD in Eng. -2014, Kyoto University.
Specialty: Computational Fluid Dynamics, Lattice Boltzmann Method, Immersed Boundary Method

In the Future

Everyone can observe in winter that a leaf flutters and tumbles down, but cannot easily predict the trajectory and the orientation of the leaf. Similarly, anyone cannot completely answer the following question, i.e. 'How can insects fly?'. If the fluid flow induced by insects and the lift force acting their wings are understood, an airplane flapping like insects may be constructed.

After Graduation

In our laboratory, you can acquire not only specialized knowledge on fluid dynamics, but also abilities for logically thinking, explaining, and writing as well as programming skill. These knowledge, abilities, and skill are useful in a wide range of engineering field.



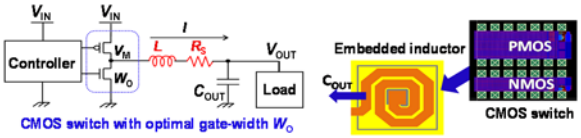
The map of 'Flapping frequency' vs. 'Mass'. The simple wing-body model with mass of actual insects can go upward against gravity.

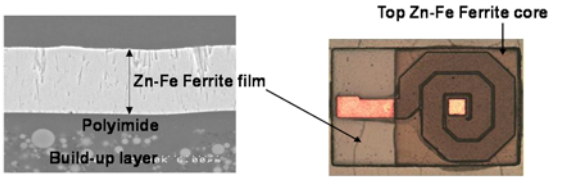
Electrical & Electronic Engineering

Green electronics devices and equipment

- DC smart grid in LSI package for low power consumption driving -

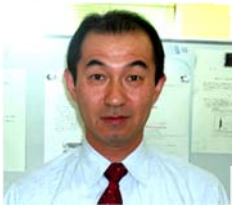
The GREEN (high-efficiency and low-loss) technology based on the magnetic materials, devices, and sensor technologies has been researching and developing vigorously in Advanced Magnetic Devices (Sato and Sonehara) Laboratory (AMDL; http://amdl.shinshu-u.ac.jp). For example, package-level DC smart grid in the LSI using the magnetic devices such a low-flux-leakage planer power inductor and various devices such a sensor was studied with companies, The Univ. of Tokyo, Tokyo Inst. of Tech., and some projects.





Photograph and schematic view of the low-flux-leakage planer power inductor for package-level DC smart grid in the LSI fabricated.

AMDL (Sato-Sonehara) Lab



Toshiro Sato
Professor (2005-), Ph.D. (1989)
Research filed; High frequency magnetic materials, microwave and power magnetics, and magnetic sensor, et al.

In the Future

In the near future, an insufficiency of the electric power will be even serious. Therefore it is necessary to develop the green devices and equipment for the highly-networked information society. We collaborate with various companies and universities with different technology such materials, devices, and system, so that we research and develop the green electronics devices and equipment.

After Graduation

Many AMDL graduates work in the general electric devices manufacturing company, and the research institute, et al. They has not only a skill of the electrical and electronic engineering but also an idea of the global environment and the saving energy.

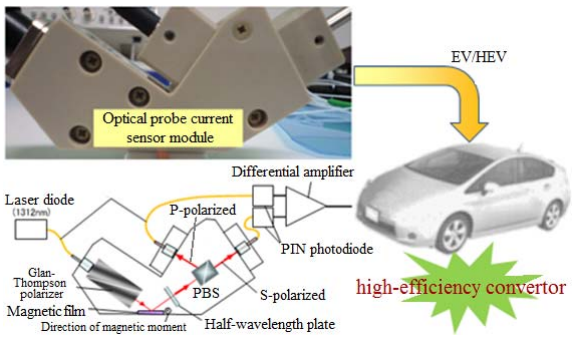
The 11th International Conference on Ferrites (ICF 11) New Product & Novel Technology Award was awarded to them. The title is "Magnetic Properties of Spin-sprayed Ferrite Film Deposited on Glass/Epoxy Build-up Layer in Organic Interposer Substrate"

Electrical & Electronic Engineering

Green electronics devices and equipment

- Optical probe current sensor for high-efficiency converter -

Many GREEN (high-efficiency and low-loss) magnetic material, devices, sensor, equipment, and system have been researching and developing vigorously in Advanced Magnetic Devices (Sato and Sonehara) Laboratory (AMDL; http://amdl.shinshu-u.ac.jp). For example, an optical probe current sensor with the magnetic Kerr effect for high-efficiency convertor in the EV/HEV and the Smart Grid was studied. The green devices and equipment are expecting by the joint research projects, companies, and administration.



Photograph and schematic view of the optical probe current sensor with a few cm size fabricated.

AMDL (Sato-Sonehara) Lab

Makoto Sonehara
Associate Prof. (2013-), Dr. (Eng., 2007)
Research filed; Magnetic materials engineering, magnetic and high-frequency devices and sensor, et al.

In the Future

In the near future, an insufficiency of the electric power will be even serious. Therefore it is necessary to develop the green devices and equipment. If all the electrical equipment and system have our green devices, we will use the power plants by recyclable energy only, no more the nuclear power plants. We hope for the global environment and human life using by the electric and electronics technology.

After Graduation

Many AMDL graduates work in the general electric devices manufacturing company. They has not only a skill of the electrical and electronic engineering but also an idea of the global environment and the saving energy.

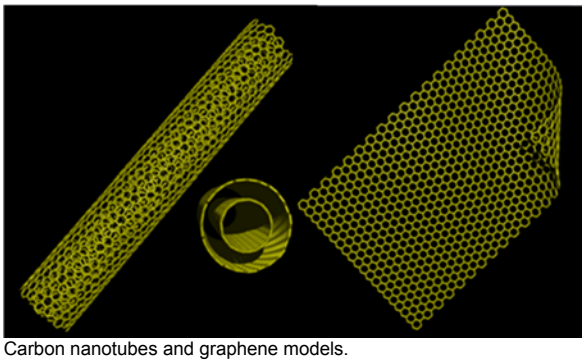
The students who fabricates the magnetic film using by the sputtering method, and Prof. Sonehara who explains the process to the researchers of a company.

Electrical & Electronic Engineering

New-generation energy devices from nano-carbons

Nano-carbons such as carbon nanotubes, graphenes, and nanoporous carbons are considered to be the most important materials that revolutionize present technology related to energy devices, water purification, biological materials, and structural materials.

In our laboratory, we fabricate nano-carbon materials, process them, and using them in next-gen energy devices to improve the capacity so that our life becomes more comfortable.



Carbon nanotubes and graphene models.

Hayashi Lab

Takuya Hayashi
Professor
Graduated Tokyo University,
Main research field in materials science especially structural and physical characterization of nano materials

In the Future

Through the development of highly controlled synthesis method for carbon nanotubes, graphenes, and nanoporous carbons, we strive to provide novel high capacity energy devices that will last much longer than what present technology can finally achieve. You will be able to go miles away with a new EV, use smartphones and tablets forgetting about charging.

After Graduation

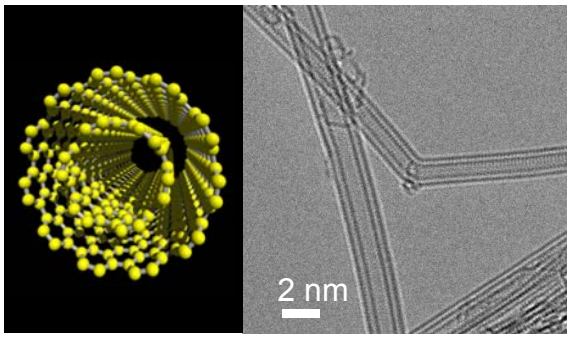
Many graduates work for automotive companies, railway companies , electric companies and electric power companies. They are mainly doing research and development at the company.

New generation energy devices will provide much longer life to the electric vehicles, and smart phones.

Electrical & Electronic Engineering

Synthesis, characterization, and applications of carbon materials

Muramatsu laboratory collaborates with Prof. Hayashi in the division of electrical and electronic engineering. Our research topic is synthesis, characterization, and applications of carbon materials. Carbon materials, especially, fullerene, carbon nantoube, graphene have known to possess exotic chemical and physical properties depended on their atomic structures. Its applications for lithium-ion batteries, super-capacitors, and nano-composites are also our subjects.



Simulated and transmission electron micrsoscopy image of double walled carbon nanotubes.

Muramatsu Lab

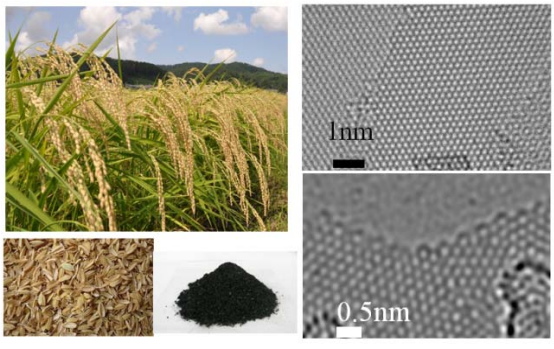
Hiroyuki Muramatsu
Assisatant Professor
My research topic is synthesis, characteration, and applications of carbon materials for electronical, energy, and mechanical applications

In the Future

Carbon nano-materials have known as innovative materials, and these related-studies have attracted much attention to many researchers and engineers in the world. We promote the research of synthesis, characterization, and applications of the nano-carbons. We believe the knowledge, technology, and attitude students study in our laboratory are very useful for future work in research institutes or companies.

After Graduation

Muramatsu laboratory encourages students to achieve following abilities: (a) make and design strategy of research, (b) improve communication ability, (c) find and solve solutions. We believe these trainings are very important and useful not only for researchers but also engineers.

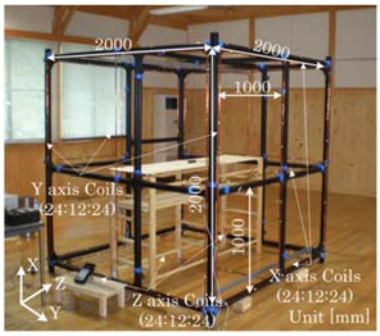


Graphene aggregates prepared from rice husk-based materials
Graphene aggregates including highly crystalline nanosized graphene can be obtained from the agricultural wastes.

Electrical & Electronic Engineering

Energy from environmental magnetic field, application of Magnetics

We are researching energy, sensor, actuator and shield related to magnetic phenomena. Although magnetic fields are invisible, human generate weak magnetic fields which correspond to human activity. One of research theme is development of magnetocardiography sysmtem, detection of magnetic field from human heart, which consists of simple magnetic sensors and shield. In this system, magnetic fields around power lines and electric appliances are undesired noise. From a different point of view, we have also proposed a novel idea, magnetic energy harvesting.



Simple-Cubic-3 coil system for generating uniform magnetic field to three dimensional direction. It is used for demonstration of several magnetic field environment.

Tashiro Lab

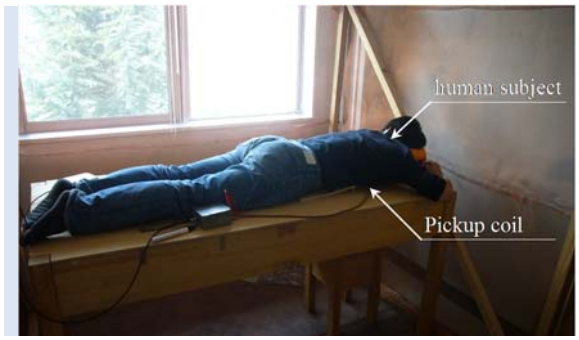
Kunihisa Tashiro
Associate Professor
He received the PhD degree from Kyushu University, in 2006. His fields of interest include sensor, shielding, and energy harvesting etc.

In the Future

Because power line is a lifeline for our modern life, we focus on the magnetic field as a source of energy harvesting. This energy could be re-used for power sources in various system with wireless sensor networks. It makes this system free from battery. We can also use magnetic field or its energy as an information of human activity. Our ideal is to contribute to the human happiness with our research results.

After Graduation

Almost graduated students will be a key person in a company. The fields of company are not only limited to electrical and electronics, but also instrumentation, medical, infrastructure and so on. Because applications of magnetics help our modern life, engineers related to magnetics are very important.

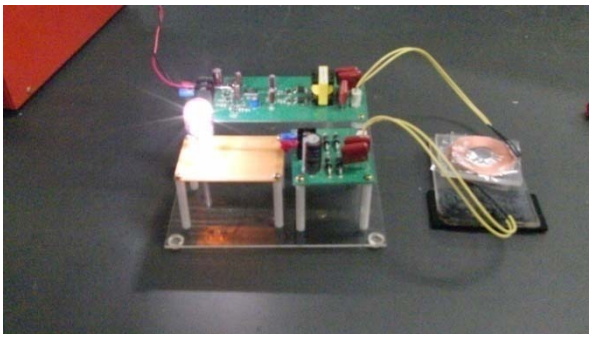


Measurement of magnetic field from human heart. We have developed an induction gradiometer in low cost, which can operate without cryogenic equipments.

Electrical & Electronic Engineering

Wireless light bulbs: the mystery of electromagnetism !

Wireless power transfer can be powered without connecting conductors, by converting electrical energy into magnetic energy. If this technology is applied on the walls of a house, we will be able to power home appliances without connecting them to power outlets. However, the efficiency of power transfer is low, so we are studying to improve it by devising the wire used and the structure of the coil.



Bulb lights wirelessly. Brightness changes when you change the distance between the two coils

Mizuno Lab

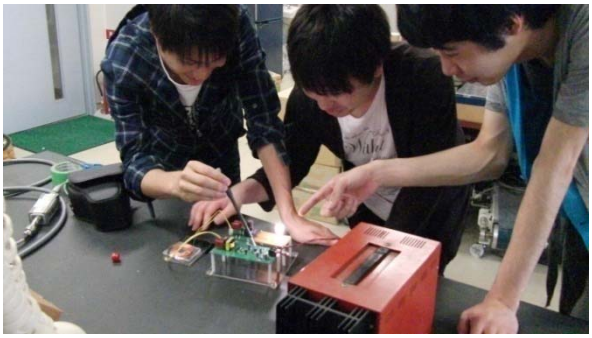
Tsutomu Mizuno
Professor
Research field: linear motor, electromagnetic actuator, electromagnetic sensor, power conversion device.

In the Future

We are trying to improve the transfer efficiency by re-analyizing wires and the shape of coils that are used for wireless power supplies. With this technology, charging cords will disappear from home, and the batteries for robots used in the medical field will no longer be needed. Thus our research is very meaningful, and we are studying every day toward the future cordless society.

After Graduation

Graduates of our laboratory are active in various fields, but many are working in electric power companies and manufacturers. We educate our students to become the future research leaders with the discipline and sophistication.

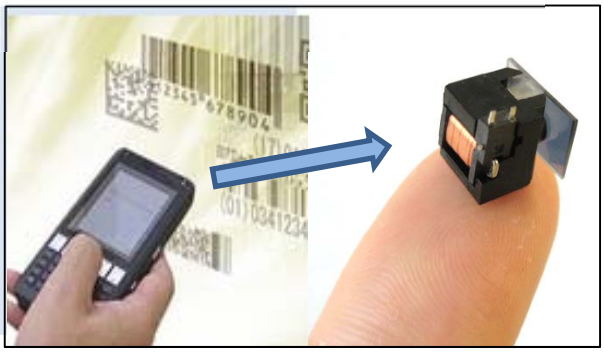


By using wireless power supply, charging cord is not required. Wireless power transfer technology is useful for the electric car and the robot to be used in the medical field.

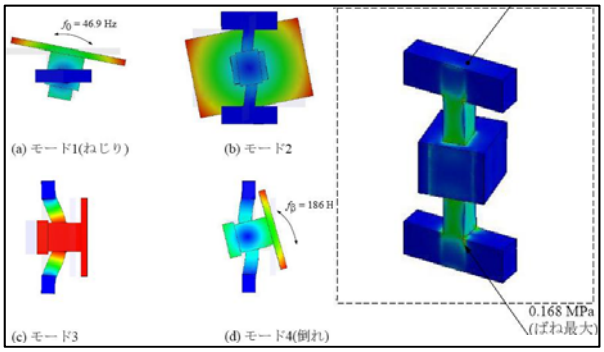
Electrical & Electronic Engineering

"Soft motor" that can be placed on a fingertip ～actuator technology and its application ～

It is a fingertip-size motor for the application of barcode readers designed by recent actuator technology in Bu laboratory. This tiny motor is composed by a permanent magnet, a coil, a mirror and a support silicone polymer, driven by external current, and the motor resonantly vibrates at 50Hz as a result of elasticity of the silicone polymer. The motor weighs 3 grams and withstands more than 100,000G mechanical shock. Using 3D computer simulations, we study the dynamic performance as well as the structural analysis of the motor and investigate the best motor design for each different application.

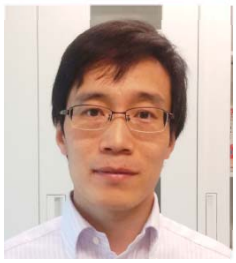


Micro resonant motor as a barcode scanner for a smart-phone device.



Motion analysis of the actuator using a three-dimensional structural analysis.

Bu Lab



Dr. Bu Yinggang
He is an assistant professor from 2012 and was an engineer for optical scanning device at Optoelectronics Co., Ltd. from 2009-2012. His current interests are electromagnetic actuators and micro motors.

In the Future

Actuator technology studied in my laboratory can be applied to various other fields including the field of optical scanning, For example, we may be able to develop a robot that can internally explore a human body using soft polymers with good tissue affinity to human body and sealing this soft motor into a capsule. It is no longer a dream that this type of medical robot can inspect diseases and even carry out surgical operations inside a human body.

After Graduation

You will work as engineers and technicians in electrical or precision measurement companies.

Electrical & Electronic Engineering

Semiconductor devices for power electronics

Innovative materials can be produced with innovative apparatuses. The first step of the research is to prepare the unique experimental setup that has not been commercially available. Students can understand all of the process by constructing the equipment. The main attention is paid to Silicon carbide (SiC) devices. SiC devices offer a route to extending the microelectronic revolution into high power applications. In our laboratory, nitridation process is employed to achieve SiC MOS devices with high performance.

Experimental setup for preparation for semiconductor devices for power electronics.

Kamimura Lab

Kiichi Kamimura
Professor
Are interested in power semiconductor devices, and also in playing the old Japanese musical instrument "Shakuhachi

In the Future

There are many handmade setups in Kamimura laboratory as shown in the picture. Students are experts in the field of electronics and also machinery to prepare equipment for their thesis. It takes rather long time to fabricate the experimental apparatus, but student can obtain very fruitful results by spending times to do it.

After Graduation

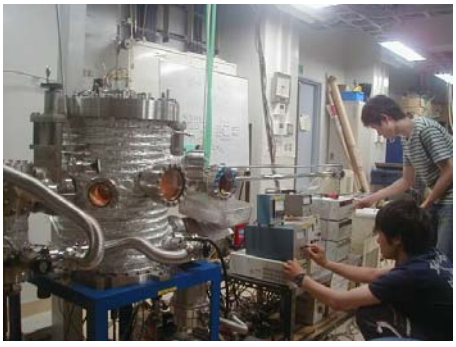
Students are fairy lurking in the laboratory. The room is comfortably prepared for the desk work. There are graduate students and under graduate students in the students room, and they discuss not only research problems but also their views of life.

Students are fairy lurking in the library.

Electrical & Electronic Engineering

Developments of novel semiconductor thin film materials

In ABE lab, we study semiconductor materials. The semiconductors are used in personal computers, mobile phones, solar cells, etc and they support our information society. Silicon carbide and $CuAlO_2$ are expected as novel semiconductor materials as they both have high electrical characteristics and are ecological. The SiC thin films are grown by a chemical vapor deposition (CVD) method using high purity gases and the $CuAlO_2$ films are deposited by a sputtering method.



Hot-wire CVD system for SiC film growth.

ABE Lab

Katsuya Abe
Associate professor

Field of study
Semiconductor engineering

In the Future

Semiconductors are widely known as materials of the integrated circuits used in digital applications such as computers. They are used in every one of our familiar electrical products, and are indispensable for the technologies to save energy and the environment. With the development of new materials with higher electrical performances that replace the present semiconductor materials, we can reduce the electric power and suppress the unnecessary energy loss of the electrical products.

After Graduation

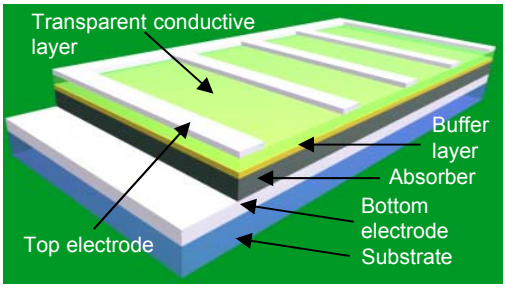
Semiconductor industry, electric/electronics industry, automobile industry, etc.

X-ray photoelectron spectroscopy system for analysis of bonding configuration.

Electrical & Electronic Engineering

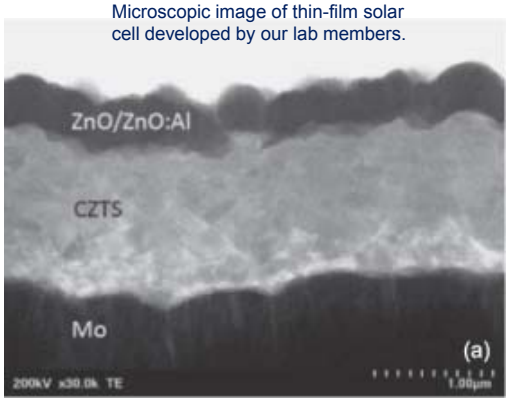
Research of Compound Semiconductor Thin-film Solar Cells and Environmentally Friendly Materials

I am now exploring an alternative material with low pollution that can be applied to the thin-film solar cells. And also focusing on the research of new energy device and fabrication process.



Fundamental structure of a thin-film solar cell. The total thickness of the cell is just a few micrometer.)

Microscopic image of thin-film solar cell developed by our lab members.



Right photo:
We are developing a solar cell by utilizing environmentally harmonic materials and processes.

Hashimoto Lab

Dr. Yoshio Hashimoto
Professor
PhD (Engineering) Univ. of Tokyo
Special Research Fellow of the Japan Society for the Promotion of Science
Head of the Research Center of Carbon Science

Research fields :
- material research for photovoltaic applications
- applications of oxide thin film
- semiconductor hetero junction
- applications of carbon materials

In the Future

- To contribute to the global society by means of innovating renewable energy devices (RED) and environment-friendly materials (EFM).
- To promote the applications of RED and EFM in various industrial fields in order to reduce the environmental pollution.
- To establish green electronic production process based on low pollution technologies

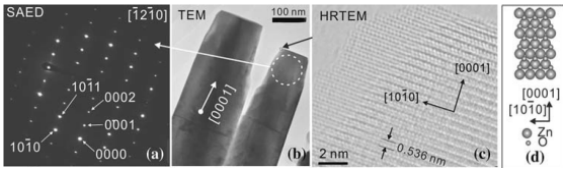
After Graduation

Graduate students will get changes to become active scientists or engineers of the future by experiencing advanced researches in the field of environmental-friendly electronic at our Lab.

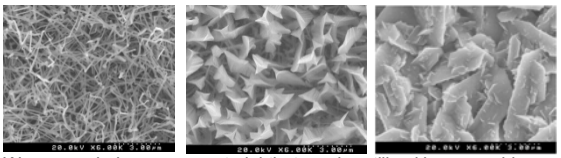
Electrical & Electronic Engineering

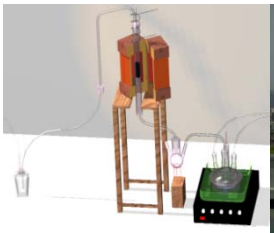
Research of Solar Energy Utilization and Related Materials

I am now exploring a new device that can be excavated renewable solar energy efficiently. And also focusing on the research of utilizing concentrated solar energy for material synthesis processes.



Various structures of ZnO crystals prepared from our Lab.


We are exploring a new material that can be utilized in renewable energy devices.


Ultrasonic spray pyrolysis system developed in our Lab.


We are pursuing for developing a low pollution reaction process.

Myo Lab

Dr. Myo Than Htay
Assistant Professor
B.E, EcE, Yangon Technological Univ.
PhD (Engineering) Shinshu Univ.
Research fields:
- synthesis and application of ZnO nanostructures
- transparent conductive oxides
- solar energy excavation

In the Future

- To contribute to the global society by means of innovating renewable energy devices (RED) and environment-friendly materials (EFM).
- To promote the applications of RED and EFM in various industrial fields in order to reduce the environmental pollution.
- To establish green electronic production process based on low pollution technologies

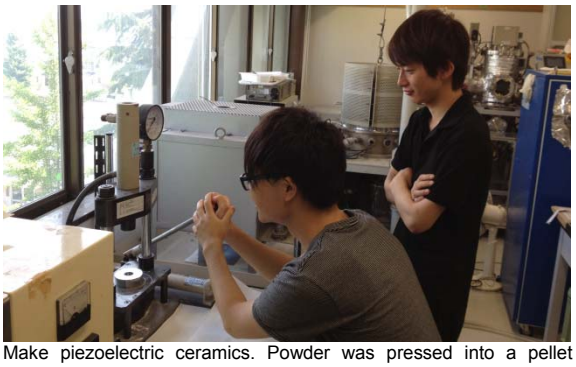
After Graduation

Graduate students will get changes to become active scientists or engineers of the future by experiencing advanced researches in the field of environmental-friendly electronic at our Lab.

Electrical & Electronic Engineering

Piezoelectric material
～Material development and application～

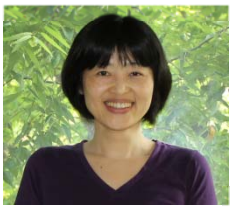
Piezoelectric material is used as an ultrasonic transducer and an ignition element of lighter. The material generates electricity (electric charges) when pressure is applied, and it deforms (expands and contracts) when a voltage is applied on the contrary. Since many of piezoelectric ceramics used now contain harmful lead, there is an increasing demand for lead-free piezoelectric materials. Therefore we conduct research on such lead-free piezoelectric ceramics. Furthermore, we are applying piezoelectric ceramics to develop ultrasonic motors.



Make piezoelectric ceramics. Powder was pressed into a pellet using this pressing machine and fired at above 1000ºC, then ceramics was obtained.

Characterization of the ceramics. The dielectric constant or resonance property are measured with changing temperature or frequency.

Bamba Lab



Noriko Bamba
Associate Professor
I worked at Shinshu University after received the Ph.D. (Engineering) in Materials Chemistry at Osaka University in 1998.
Research field:
・electronic materials

In the Future

Piezoelectric material can convert kinetic energy (pressure, displacement) and electrical energy, thus is applied not only to a sensor but to a vibrator and an actuator. Since their performances depend on the characteristics of the material, it is important to do research on the material development. Besides, the development of piezoelectric material requires a new device. Our students work hard to explore a new material and its application.

After Graduation

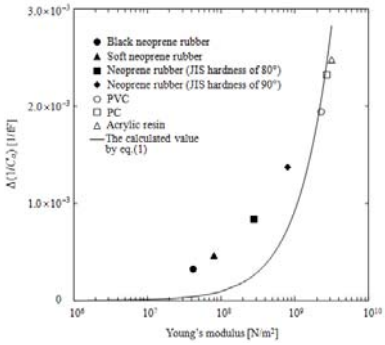
Our graduates are working at electric powder companies and home electrics makers or as public officials. I am teaching how to carry out the research and solve problems through the research, so that the students will succeed in play in any fields.

Electrical & Electronic Engineering

Analysis of the electrical equivalent circuit of a quartz-crystal tuning fork and its application to a tactile sensor

In Itoh Lab, we conduct the analysis of the quality factor, the motional capacitance, and the frequency, which are the most important parameters of a quartz crystal tuning fork for wrist watch application, and the change in motional capacitance, which is applied to a quartz-crystal tuning-fork tactile sensor. The change in the reciprocal of motional capacitance, before and after the sensor's base getting into contact with neoprene rubbers, is intrinsically induced by both their dynamic Young's modulus and viscosity of neoprene rubbers at 32.5kHz. Our tactile sensor responds in a wide range from 10^7 to 10^9 N/m^2 of Young's modulus.

Robot arm and impedance analyzer using the contact experiment



Relationship between the change in reciprocal motional capacitance before and after the sensor's base comes into contact with materials and Young's modulus of materials

Itoh Lab

Hideaki Itoh
Professor
Engaging in analysis of a quartz crystal tuning fork and its application, and analysis of quantized displacement of silicon MEMS resonator form the viewpoint of elastic model

In the Future

To develop a tactile sensor like a human hand, we study the tuning fork's structure being in contact with viscoelastic materials by treating them as a viscoelastic foundation depicted by the Voigt body. We intend to develop a tactile sensor to detect viscosity of materials besides their hardness or softness and to estimate both dynamic Young's modulus and viscosity of viscoelastic materials by use of several tactile sensors with different frequencies.

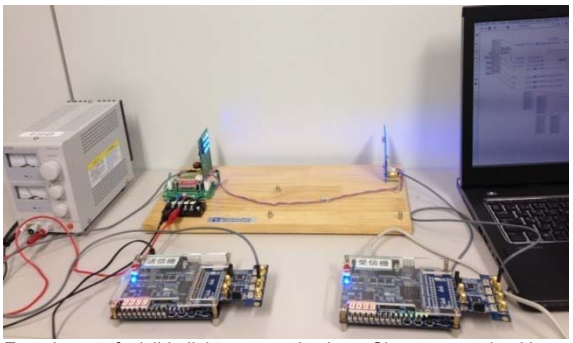
After Graduation

A quartz crystal is widely used as a timing source for the consumer digital equipments. In many companies, however, it is often treated as a black box. Graduates are working at motorcar companies and companies that manufactures electronic components.

Electrical & Electronic Engineering

Visible Light Communications
(Information transmission by LED light)

Radio waves are not visible, but very useful for cell phones and wireless communications. Our research subject introduced here is "visible light communications." The information can be carried by the visible light emitted from an LED by turning it on/off based on the information data. Because you see the light, you know where the information is from, and if you have trouble receiving the information, you know where the source of the trouble is. And the information does not reach in the direction where you block the light (confidentiality). In addition, you can communicate with each other under water, through the glass, and even in places prohibited to use radio waves such as hospitals, as long as the light reaches.



Experiment of visible light communications: Since we need neither wireless-workers license nor radio station license , communication experiment can be done freely in the laboratory.

Experiment of visible light communication over long distance: The world record is 42.19km that is attained by co-working company. We am challenging to satellite communications.

Handa Lab

Shiro Handa,
Professor
since 2005, after Kobe Uni-versity and Nagano National College of Technology. His current research interest is the development of visible light communications.

In the Future

Energy-saving LED lamps are installed everywhere. So if such LED lamps are equipped with the visible light communication function, they can send out the signals of terrestrial digital broadcasting and positioning signals like GPS instead of radio signals. And you will be able to get the detailed map of the surrounding area under the street lamps. Visible light communication is a relatively new technology, so its future depends on the ideas of young people.

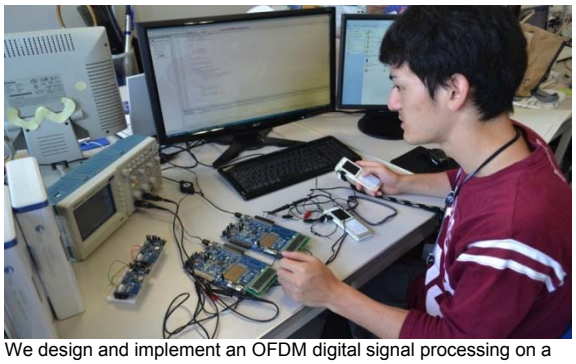
After Graduation

The students graduated from our lab are "working hard and playing hard", which is our motto. They are active in the areas of electronics and communications, working at radio equipment manufacturers and mobile service, railroad, electric power companies.

Electrical & Electronic Engineering

Theoretical approach to realize wireless communication with usability and efficiency

Many people are using wireless communication services such as cellular-phone/smartphone communications, terrestrial digital broadcasting, and wireless LAN (Wi-Fi) on a daily basis. These services are supported by many wireless technologies such as spread spectrum, OFDM and diversity combining. In this lab, we theoretically investigate the performances of those technologies in order to realize a new wireless communication system with usability and efficiency.



We design and implement an OFDM digital signal processing on a microcontroller over voice grade analog channels of PHS.

In order to simulate wireless systems, we build a PC cluster with which many PCs can be virtually viewed as a high spec computer.

Sasamori Lab

Fumihito Sasamori
Associate Professor
Received Dr. Eng. degree from Waseda Univ. in 2000. Research Associate since 2000 and Associate Prof. since 2006 with Shinshu Univ. Research interests include digital mobile communications systems.

In the Future

Cellular-phones/smartphones communication, terrestrial digital broadcasting and wireless LAN services require high-speed (broadband) wireless channels and exclusive terminals. However, a tracking system for children's security/safety and an automatic metering system for electricity/gas/water don't require them. We take a theoretical approach to explore a wireless system that uses a low-speed channel such as a free-of charge voice channel, as it consumes less energy, thus is cheaper and also is easier to use,

After Graduation

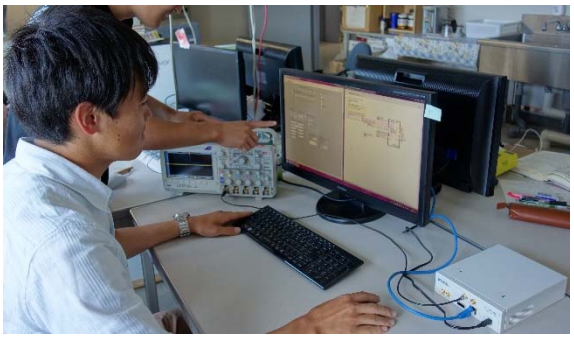
Wireless communication engineers are in high demand in numerous companies such as tele-communications carriers, railway companies, electric power companies, and electrical manufacturers. Wireless technologies can be applied in various fields of engineering, so some graduates change their careers for career enhancement.

Electrical & Electronic Engineering

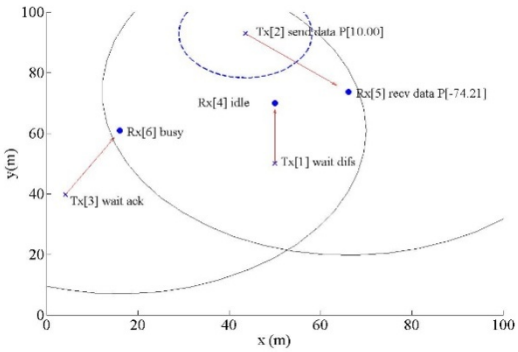
Intelligent and Self Recovering Wireless Communication Systems: Cognitive Radio

As you know, the high speed internet access is available anywhere, anytime since the smart phones have widely spread. However, if the number of smart phones' users keeps increasing, the base station will not be able to support all the users. As a result, the smart phone service may be suddenly stopped. This is a serious problem.

The cognitive radio (CR) can automatically find and use the vacant wireless system and thus it is quite intelligent. We are specifically interested in the signal processing for recognizing the wireless environment and the construction of the accessing protocol for the efficient usages of frequency spectrum and the high power efficiency.

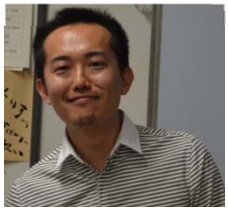


Software Define Radio (SDR) can construct the various wireless communication system. So, the system which you consider can be easily evaluated in the wired experimental system.



Results of Wireless LAN (WLAN) Simulator. The mutual relation between wireless devices can be evaluated by computer simulation

Takyu Lab



Osamu Takyu, Ph. D.
Associate Professor
From 2004 to 2005, he was visiting scholar in the School of Electrical and Information Engineering, University of Sydney. His research topics are wireless communication technology.

In the Future

Recently, the wireless module is applied to the various objects, such as electrical power meter, electrical appliances, and vender machines. Such communications has recently attracted much attention, and they are called machine-to machine (M2M) and device-to-device (D2D) communications.. With the emergence of M2M and D2D, the number of wireless communication devices increases dramatically, so the CR is becoming more important than ever. Therefore, the research on CR is crucial for the future wireless communication.

After Graduation

The alumnus of our laboratory play active roles as researchers in developing the wireless communications in the manufacturing industries and wireless communication vendors.

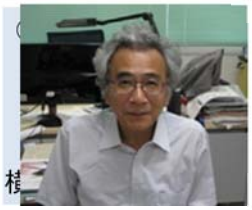
Electrical & Electronic Engineering

High-reliability space spanned on n-dimensional space

In recent year, the problem how to maintain the reliability of digital data which is recoded or transmitted is a pressing issue we are now facing. For reliable information, there are error-correction technique and encryption technique. In our laboratory, we work to develop the fundamental theory for these subjects.

Photograph of a discussion

Sugimura Lab



Tatsuo Sugimura, Professor
He joined Shinshu University in 1991. He is interested in the mathematical structure of reliable ommunication.

In the Future

It is outrageous to be doubtful whether provided data have an error. At first such a technique is necessary. And the certification technology whether who sent these data to will be necessary. By encryption and certification technology, the ordinary future which does not suffer from ""It's me" fraud" will come.

After Graduation

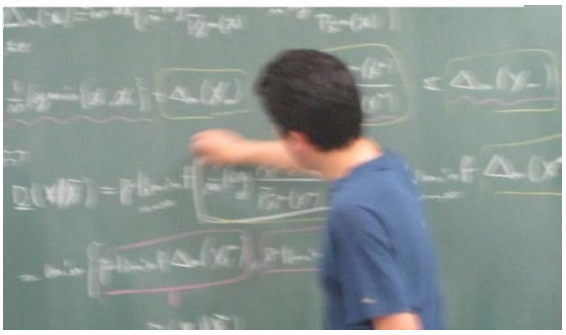
It is not necessary to decide the future at the study in bachelor or master course. If there is the ability that you can model a problem, and can be settled, you can play an active part in any place. “Be interested in various things. In particular, be interested in the place where another person does not have its eyes on.”

Photograph of a Lecturing in turn

Electrical & Electronic Engineering

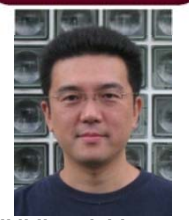
Revealing the limits of the source coding problems

Communication, broadcast, and reading and writing on a storage can be regarded as processes of delivering information from sources to destinations. In our lab, we formulate the mathematical models of various information systems and explore the theoretical limits of the their performance. For example, the implementation of a streaming system requires an investigation of tradeoff between the bandwidth and the compression. Although many kinds of such products are already available for usage, the truth behind the phenomenon is still not clear.



No intellect, no information. The nature of information is digital and discrete. It is invisible, but we can depict it with mathematical science.

Nishiara Lab



Mikihiko Nishiara,
Assoc. Prof.
is at the present post since 2007 after a research associate of the university of electro-communications. He is interested in infor-mation theory. Also has a career as a system engi-neer.

In the Future

At the start of digital-broadcasting, emergency signals were sent together with image data. However, it turns out that the compression process of image delays an emergency signal, and so they are processed separately now. By investigating the tradeoff between the processing and the delay, we can improve the transmission of the emergency signals.

After Graduation

In our lab, you can develop your programming skills because you will use computer simulations in your research. You will also earn the trust of your colleagues as you train to express your understanding to others.

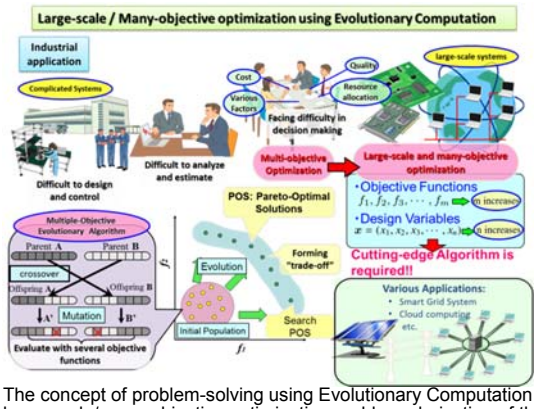
Each student handles his/her individual research problem. Discussion with the peers is important to solve it. We must develop partnership and friendship.

Electrical & Electronic Engineering

Research on "Multi-Objective Optimization" using "Evolutionary Computation" and its application to solve various real-world problems.

Tanaka, Hernan and Akimoto Lab. has been working on "Multi-Objective Optimization" using the "Evolutionary Computation", inspired from the natural evolution of living things, and the development of its applied technology. "Multi-Objective Optimization" must involve several conflicting objective functions such as quality and cost, and this is the key issue in industrial applications and decision making.

Our laboratory develops new "Multi-Objective Evolutionary Algorithms (MOEA)" that effectively and efficiently solve complex optimization problems including many objective functions and design variables, and we are pursuing the collaborative research with other research institutes and companies to apply the technology to various real-world problems that require "Multi-Objective Optimization."



The concept of problem-solving using Evolutionary Computation for large scale/many-objective optimization problem; derivation of the set of optimal solutions in the management and the operation of complicated system.

Tanaka Lab

Professor Kiyoshi Tanaka
Prof. Tanaka has worked at the Faculty of Engineering since 1995. Currently, he is the associate dean of the Faculty of Engineering. He has put great effort into industry liaisons with companies and international exchange with universities and research centers abroad. His laboratory has energetically conducted research and education globally by receiving many international students and researchers.

In the Future

"Multi-Objective Evolutionary Algorithms" evaluate many individuals in a given population using multiple objective functions , and choose superior individuals as parents, who then produce their offspring by crossing over and mutating genetic information. By repeating the evolution of the entire population, we can obtain a set of compromised solutions (many options to be chosen) called POS. We hope to apply this technology to numerous applications such as smart grid, cloud computing and derivation of design variables (set of parameters to express complex shapes) in manufacturing.

After Graduation

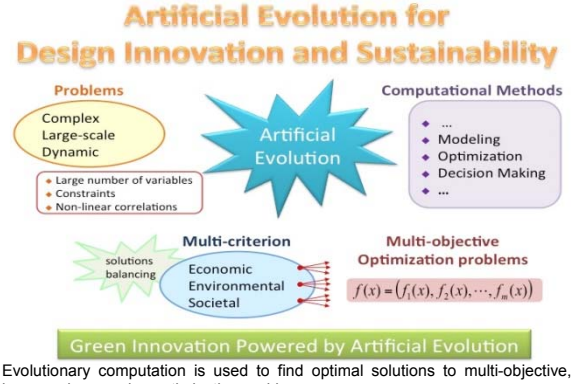
The alumni of our laboratory are working as research and development engineers at the manufacturers in a wide range of areas such as electrical, electricity, communication, information processing, machinery, electric device and medical system. Some of them are faculties at universities including Shinshu University.

Shinshu Univ. has signed the agreement for academic cooperation and exchange with CINVESTAV which is the most prestigious graduate university in Mexico. (From the left: President of CINVESTAV Prof. Palacio, Prof. Coello, Prof. Tanaka.)

Electrical & Electronic Engineering

Evolutionary Multi-objective Optimization and Sustainability

Evolutionary computation uses computational models of natural evolution to solve complex problems in science and engineering. The creation of sustainable systems to meet our needs without compromising future generations is a social challenge. It demands the development of new technologies and the redesign of our infrastructure, balancing environmental, economic, and societal needs. Sustainability problems are intrinsically complex, dynamic, large-scale, span several disciplines, and require multidisciplinary efforts and methods to solve them. We use the power of evolutionary computation for design innovation and optimization of solutions to complex sustainability problems.



Evolutionary computation is used to find optimal solutions to multi-objective, large scale, complex optimization problems

Hernan Lab

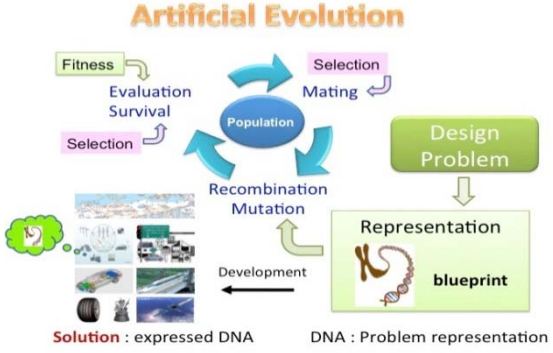
AGUIRRE HERNAN
Associate Professor
Ecuadorian Engineer. PhD from Shinshu University in 2003. Collaborates actively with industry, promotes international exchange, and conducts joint research with national and international institutions.

In the Future

Smart power grids, intelligent mobility and transportation systems, and intelligent water grids are three key systems to which evolutionary computation can be used to optimize their design and improve their sustainability to meet the needs of the future. Additionally, design innovation in key industries, such as automobile and space exploration, are areas in which evolutionary computation will play an important role.

After Graduation

In the Laboratory we learn about real-world problem-solving and optimization by computational means. This requires a clear understanding of the problem, its modeling, and the creation of a program to solve it. There is also opportunities to collaborate in joint research with industry. These activities complements the education received in the undergraduate curse and broadens the skills of engineers.

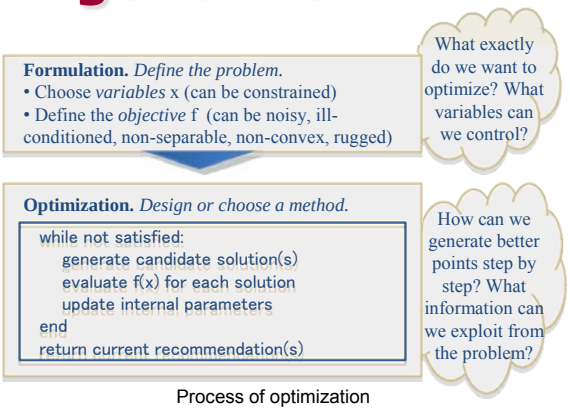


Evolutionary computation simulates evolution and it is applied to solve a variety of design innovation and sustainability problems

Electrical & Electronic Engineering

Design, Analysis and Applications of Optimization Algorithms

Optimization, aka *mathematical programming*, is the process of finding the optimal solution to a problem. When we face an optimization in the real world, the objective function is often black-box and we cannot obtain the optimum mathematically. Instead, we search for the optimum by using an iterative method on a computer. In his lab, the main interest is in stochastic search algorithms including evolutionary algorithms. They analyze optimization algorithms for better understanding, design more efficient algorithms, and apply them to optimization in the real world.



Process of optimization

Aguirre, Akimoto, Tanaka Lab

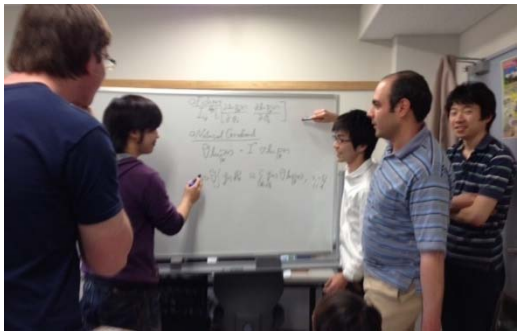
Youhei Akimoto, Ph.D.
He received his Ph.D. from Tokyo Institute of Technology. During his Ph.D., he worked as a JSPS research fellow, then worked for INRIA-Saclay in France as a postdoctoral fellow. Since April in 2013, he works at Shinshu University as an assistant professor.

In the Future

We face optimization everywhere in science and engineering such as vehicle design, spacecraft routing, controller design, proteins interaction prediction, etc. In his lab they are contributing to the frontiers of science and engineering by developing a unified framework for black-box optimization problems. They are also applying their methodology to real world optimizations such as lens system design, ship routing making full use of weather forecast, etc. Further contributions are of course expected.

After Graduation

The students learn from their research in the lab the process of problem solving; understanding the problem, developing a solution to the problem, programming to realize the solution, evaluating the solution objectively. These skills will be valuable after graduation. There are lots of situations where the knowledge of optimization is useful such as car design industry and financial industry.

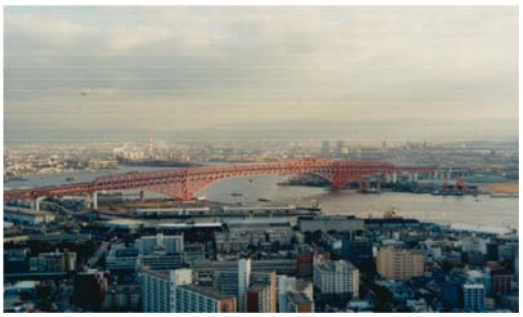


Discussion with students and visiting researchers. Prof. Akimoto works in a group with Prof. Aguirre and Prof. Tanaka. Many international students are studying in the group, and of course welcomed.

Civil Engineering

A Bridge, as a structure
A Bridge, in your mind

What is a bridge ? A kind of the infrastructure provided to cross a river ? Our laboratory is dealing with the wide range of Bridge Engineering, in particular the buckling / failure of steel bridges and bridge aesthetics. The recent target on the problems on bridge failure is dynamic behaviour of bridges / viaduct columns under a seismic load.



The Minato-Ohashi bridge in Osaka, Japan. A questionnaire survey indicates that this bridge is good in its shapes and the color, however harmony on its surroundings is not good due to its squalidity.

Shimizu Lab

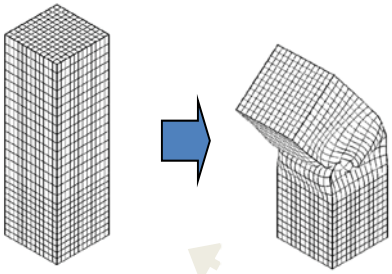
Shigeru Shimizu
Professor, Bridge Lab., Department of Civil Engrg.
Interesting in Bridge engineering (in particular steel bridges), Bridge aesthetics.

In the Future

The research on bridge failure is dealing with "how a bridge collapse" under an extreme situation such as an earthquake. However, it shall be difficult to examin with a practical bridge. Therefore, such research work is carried out with the computer simulation, together with the experimental test. On the research on bridge aesthetics, the "on-site survey" is an important means.

After Graduation

Alumni of our labolatry have their professions mainly in the bridge companies, the railway companies and general contractors. Some students become civil servants in the local governments as well. Some of alumni in the bridge companies have concerned in the design and the construction works of the world largest Akashi-Kaikyo Bridge or the famous Tokyo Gate Bridge.



A computer simulation result in which a steel viaduct column fall down under the Niigata Chuetsu Earthquake.

Civil Engineering

Analysis of structural mechanics and investigation of disaster mitigation

Computer simulations are useful means of solving engineering problems. Ohkami Lab investigates various problems in civil engineering by numerical analyses and simulations:

- parameter identification for material properties
- multi-agent simulation of evacuation behavior in disasters
- sediment disaster hazard assessment
- efficiency of various numerical analysis methods

Ohkami Lab

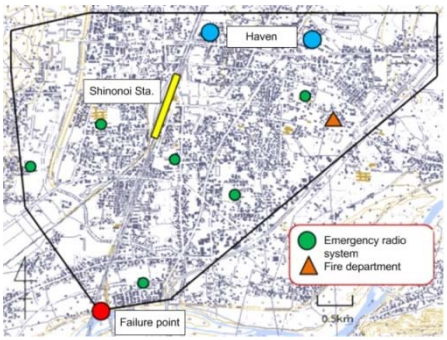
Toshiyuki Ohkami
Professor
Research interests: Numerical analysis on structural engineering and disaster prevention, parameter identification of material properties.

In the Future

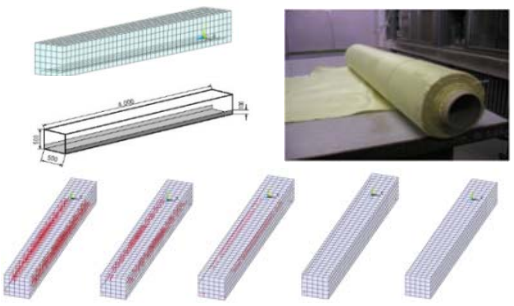
Computer simulations are useful as they can study structures of any size, made of any material, they don't require any special equipments, and they can be carried out in a short period of time. In particular, for a problem like a disaster, as it's difficult to study it by experiments, computer simulations can clarify the predominant cause of the disaster and also evaluate the effects of disaster mitigation. Computer simulations provide useful information for disaster prevention planning.

After Graduation

Graduates from our Lab are working at public organizations, construction companies, railroad companies, construction consulting companies etc., for infrastructure improvement and community development.



Numerical simulation of evacuation behavior from river flooding. We ivestigate the influence of the physical environment and the properties of evacuees through the simulation.



Evaluation of fiber reinforcement effects of RC-beams, showing the difference in cracking situation between reinforcement patterns.

Civil Engineering

Dating & Visualization of Ground Water — using chemical tracers —

Nakaya Lab studies the visualization of groundwater flow using chemical tracers. For example, sulfur hexafluoride (SF_6) and chlorofluorocarbons (CFCs) gases, which are found in atmosphere by anthropogenic production, in water are potential dating tracers of young groundwater (~50 yr). ^{18}O and ^{2}H in water are also potential tracers to detect the origins, the source areas, and the paths of groundwater flow of spring and well waters. From the age and the flow path of groundwater, we can understand subsurface environment in water cycle.

Groundwater sampling in Ryukyu-limestone area, Okinawa Island. Collaboration with Univ. of Ryukyu.

Nakaya Lab

Shinji Nakaya, Prof.
Major : Hydrology
Recently, have developed dating system of groundwater.
Field Research : Bangladesh, China, Nagano, Okinawa, Miyagi, Osaka, Hyogo etc.

In the Future

By measuring chemical tracers in groundwater, we can clarify when and where the groundwater was recharged as well as its flow path and residence time from the recharge zone to a sampling point. Such hydrological data can be used to preserve the environment of water source area and to set up the rules for sustainable water use. Solving water problems in Asia through our researches is important for the future earth.

After Graduation

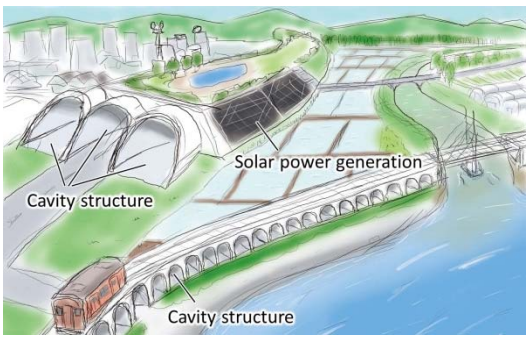
The graduates from our lab are involved in the management of surface water and groundwater as researchers, governors, and consultants in local and international societies. One graduate who was investigating groundwater pollution is employed in a lawyer's office.

Arsenic polluted groundwater & soil core sampling in a village along old Brahmaputra river, Sonargagon, Bangladesh. (Collab-work)

Civil Engineering

From soil mechanics to ground environments Disaster prevention and environmental conservation

My laboratory has been promoting fundamental studies related to strength and deformation characteristics of soil. To establish measures for water quality in enclosed water areas, we are conducting indoor experiments, field investigations, and verification experiments. Development of decontamination technology of ground contaminated by radioactive materials are also conducted. These projects are carried out in conjunction with many private firms in the form of joint research.



Reconstruction after Great Eastern Japan Earthquake using a cavity structure is proposed.

Umezaki Lab

Takeo Umezaki
Professor
2014 Professor
1995 Associate Professor , Shinshu Univ.
1993 Research Associate, Shinshu Univ.
1987 Research Associate, Kyushu Univ.

In the Future

Diverse studies are conducted for elucidation of fundamental soil mechanics, as well as surveys and improvement of ground environment. In addition to disaster prevention and environmental preservation, research resulting in construction of a lunar base, planetary exploration, and construction of undersea town are promoted. In the laboratory, students are working on experiments related to these tasks.

After Graduation

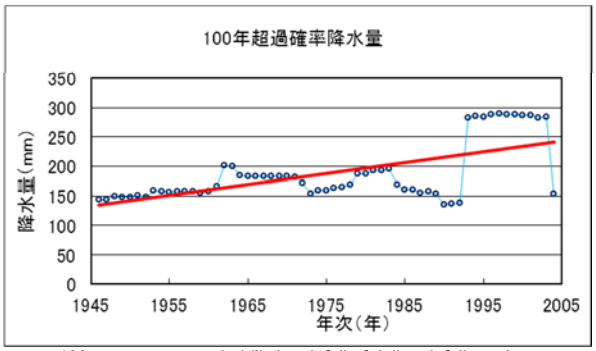
Graduates are working in government agencies and local government engaged in city planning and disaster prevention measures, at construction companies and environmental research firms engaged in improvement of social capital, and at research institutions and universities after graduate school.

Sampling of bottom sediments in enclosed water areas (Suwa Lake), surveys of strength of lake bottom ground and density log.

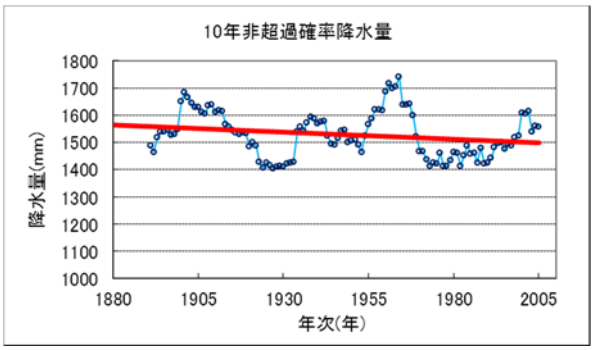
Civil Engineering

Non-stationary frequency analysis for flood control and water utilization plan

Sogawa laboratory studies the non-stationary rainfall frequency analysis for flood control and water utilization plan. The flood control plan is to prevent and control floods. The water utilization plan is to prevent and control droughts. The probability for rainfall has been computed by stationary frequency analysis. However, it was recently proved that the rainfall time series is non-stationary. Therefore, the non-stationary rainfall frequency analysis is required. Sogawa laboratory has been working on this problem for many years. We will investigate the non-stationary rainfall frequency analysis by using GCM data for flood and drought.



100 year excess probabilistic rainfall of daily rainfall maximum, increasing tendency (Niigata)



10 year non-excess probabilistic rainfall of annual rainfall, decreasing tendency (Niigata)

Sogawa Lab

Noriaki Sogawa
Associate professor
Research associate in faculty of eng. Shinshu univ., present office from 1991.
Research field : Hydrology and water resources eng..
Specialty: Hydrologic statistics

In the Future

The non-stationary rainfall frequency analysis provides the indices to prevent future floods and droughts. The index flood indicates an increase in floods and the index drought indicates a decrease in droughts. We are the first team in the world to use these indices for flood control and water utilization. We completed the studies and are waiting to hear from administration for directions.

After Graduation

The graduates of Sogawa laboratory are public officials and consulting technicians, and they are very active.

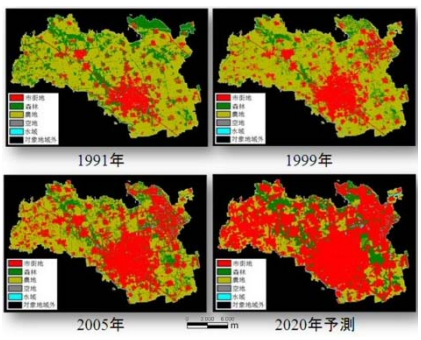
Civil Engineering

Regional Environmental Planning

In recent years, the sustainable society and preservation of the natural environment are required. The pro-environment construction of community is needed. In Fujii laboratory, I perform the following studies, planning theory for regional cities and hilly and mountainous areas, analysis and evaluation of the regional environment and watershed environment, and method and plan for social development. The research contents are divided into the next three fields.

1. Urban Planning
2. Landscape Analysis
3. Environmental Planning

Analysis and evaluation by the image processing for urban planning.



Analysis of land-cover change and prediction of the future land-cover by using the satellite data.

Fujii Lab

Yoshio Fujii
Associate Professor
After completing the Graduate School of Kyoto University, through the Shimane University, to the present.

In the Future

I will apply the spatio-temporal analysis of the urban-rural structure to the future planning. I think about the landscape plan through the evaluation of the city landscape and the rural landscape. I evaluate the configuration of green space from the point of view of landscape ecology.

After Graduation

Civil servants(professional), consultancy (urban planning, environmental planning), and Japan Railways.

Civil Engineering

We study biological waste and wastewater treatment

Matsumoto laboratory studies biological waste and wastewater treatment. We focus on anaerobic digestion and land treatment. Anaerobic digestion has some advantages: the low production of waste biological solid and the recovery of methane. Land treatment also has some advantages; it is cheap and robust and it requires little maintenance. These processes will help improve our regional environment.

LEFT: Packed bed reactor for denitrification.
RIGHT: Digester .

Matsumoto Lab

Akito Matsumoto
Associate Professor
1990 Sanki Eng. CO.,LTD
1993- Shinshu Univ.
Speciality:
Environmental health engineering, Biological waste and wastewater treatment

In the Future

Unheated anaerobic digestion doesn't need a heating system and requires a low construction cost and little maintenance. Land treatment for denitrification with solid higher fatty acid is cheap and requires little maintenance. Those processes are suitable for small-scale wastewater treatment plants and household septic tanks. For example, they are useful in developing countries and mountain huts.

After Graduation

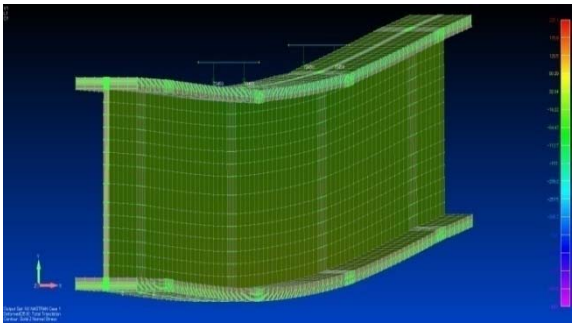
Most graduates have joined the civil service or have served at construction companies.

Water analysis with HPLC

Civil Engineering

Analysis on New Materials in Civil Engineering

Even in the field of civil engineering, new materials such as fiber reinforced plastic(FRP) and fiber reinforced concrete(FRC) are increasingly used to construct structures. Mechanical characteristics of these materials are not clearly understood, when they are used for large structures. There is only one bridge in Japan that all structural members are made with FRP. In our laboratory, we run numerical simulations to predict mechanical behaviors of such materials and structures.



Deformation and stress distribution of hybrid FRP composite I-beam(finite element analysis)

Koyama Lab

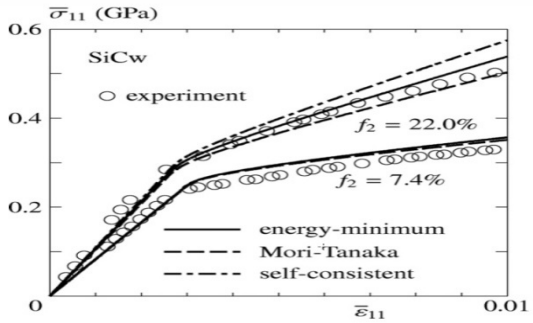
Shigeru Koyama
Associate Professor
Current Subject: analysis on overall properties of composite materials and multi-agent simulations in civil engineering field.

In the Future

Using these materials, we expect to be able to design civil structures with a high degree-of-freedom due to their superior properties such as light weight, flowability, and corrosion resistance. Furthermore, it will be possible to minimize strains on the environment in manufacturing them if we can estimate the overall mechanical properties with some degree of accuracy.

After Graduation

Our graduates are working as public employees(MLIT, Shizuoka Pref., Aichi Pref., Okinawa Pref., Shiga Pref., Nakano City) and in East Japan Railway Company, Nippon Cable, Tokyu Construction, and Yahagi Construction, Kando Co., LTD.



Predictions of average stress-strain relations of SiCw-reinforced 5456Al by our method

Civil Engineering

Study on bridge deterioration to prolong bridge service life

In Japan not only population but also bridges have been proceeding rapidly aging. In Nagano Prefecture, about 54% bridges will be or over the age of 50 and be aging bridges in 2022. The maintenance and rehabilitation of bridge are becoming more and more important. In Cao Lab, we are doing researches into bridge deterioration mechanism, inspection and diagnostic technology, bridge maintenance and management technology and so on to aim at prolonging the service life of bridge.

At 6:05 pm, August 1, 2007, I-35W Mississippi River Bridge collapsed when it was under 40. 13 people died and 145 were injured.

Cao Lab

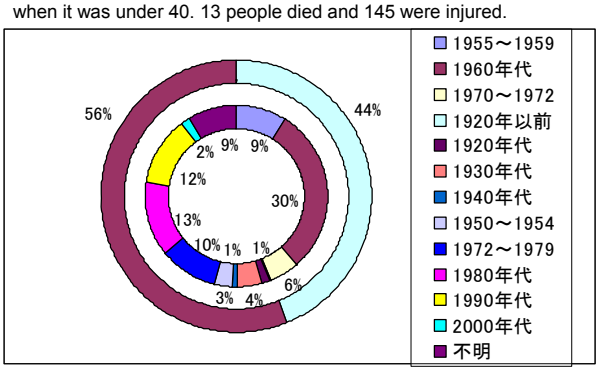
Cao Xi
Assistant Professor
Graduated from Xibei Polytechnic Univ.,studied as a visiting scholar at national expenses in Osaka Pref. Univ. etc. Dr. Engineering. Research areas are structural mechanics etc.

In the Future

In Cao lab, through the research for graduation thesis and based on the engineering knowledge, students could enhance their ability of academic observation and to solve engineering problems. Their spirit of cooperation and international sense will be developed. In the future, as capable engineers or researchers the graduates will work and flourish in civil engineering and other fields not only in Japan but also over the world.

After Graduation

Some graduates work as national or local government officials in civil and construction field. Some of them are workers for consultant company. Some graduates work for Japan Railways corp., nuclear power plants, etc. A few students have chosen to become restaurant cook.



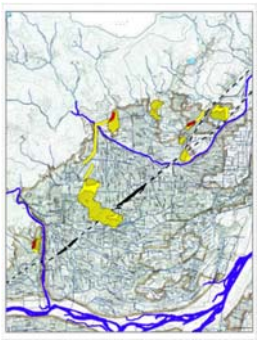
During the post-war high economic growth period in Japan, many bridges were built. Now they have been proceeding rapidly aging.

Civil Engineering

Consider the water current and quality in lakes and rivers

There are various kinds of environmental problems related to water and flood disasters all over the world. The members of Toyota Lab. are developing countermeasures for the lakes and rivers in Nagano Prefecture against such problems. We use field measurements, computer simulations, and map interpretations etc. of “the movement of water” in our research. Our results will produce useful data for the future administrative plans for the lakes and rivers.

Field measurement on the water current and quality in Lake Suwa
Members work by dividing up the duty on the boat.



Flood hazard map from the viewpoint of topography characteristics in Nagano city. (Red and yellow zones are hazard areas.)

Toyota Lab

Masashi Toyota
Assistant Professor
Completed master course of graduate school in Kyoto University.
Current subject is water current and quality in lakes and rivers.

In the Future

“We are guests on earth.”
One of the real joys in Civil Engineering is to investigate the natural phenomena and think of ways to live with and get along with nature.
It is necessary to think of ways to coexist with nature, so we do so by incorporating the results from the researches in other fields such as biology and geology into our research.

After Graduation

Most students are working as public (government) officials. Some students got the jobs with construction companies and consultants. One student works as an IT engineer.

Civil Engineering

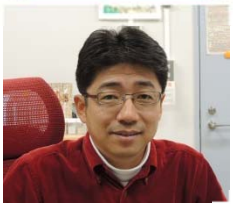
From construction of a gigantic earth structure to deep subterranean development

My laboratory has been promoting research in the form of indoor tests targeting ground that supports structures such as bridges and buildings. We are conducting research into the reinforcement of soil, which is not sufficiently strong as concrete, on steel reinforcement used for civil and other large scale structures. Moreover, investigations are conducted on the strength and deformation characteristics of super hard clay in deep subterranean areas.

Experiments in the class by third year students (left); destruction of material composed entirely of soil (upper right); strength is improved significantly if paddy-rice straw is mixed with it (lower right).

Loads exceeding several tons are applied to clay taken on campus (upper right) to reproduce super hard clay existing several hundreds of meters below the ground (lower right).

Kawamura Lab



Takashi Kawamura
Assistant Professor
Graduated from Kyushu University, present post from 2007 after serving as Research Associate and Lecture at Faculty of Eng., Shinshu Univ.

In the Future

Earth reinforcement is related to the technology applied practically to high steep slopes. The present task is measures and countermeasures to ensure stability even with excessive precipitation, which has increased dramatically in recent years. Elucidation of characteristics of super hard clay will lead to development of deep underground towns. In the laboratory, students are working daily on experiments related to these tasks.

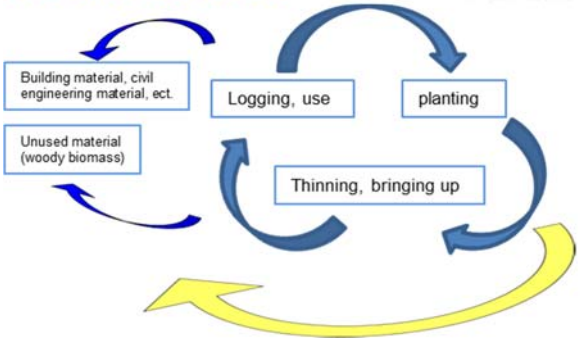
After Graduation

Graduates are working actively as public employees of government agencies, civil engineers of construction companies, and as consultants contributing to society. Many students find employment after completing their senior year, although some go on to graduate school.

Architecture

Research on measures of wooden house for cold region and distribution of domestic wood.

In terms of global warming, we study the reduction of CO_2 emissions in house. The wall and roof which face outside air, and also heat insulation and air proof of floor and opening are very important for house in cold region. The wood is the source of carbon fixation. We investigate the distribution of the wood in house from the forest to promote use of wood. We have been promoting recycle of construction materials by research on recycle of waste product generated from house construction and demolition. Based on these investigations and researches, we have been proposing specific housing production with less environmental burdens.



Efficient use of woody biomass

Asano Lab

Prof. Yoshiharu Asano
Dept. of Architecture, faculty of engineering, Shinshu University through as an assistant professor since 1984
Ph.D. in Architecture and Building Engineering, Tokyo Institute of Technology, 1979

In the Future

Revised law for energy-saving, performance of heat insulation in house will be greatly improved in near future. At the same time, positive use of wood has been promote. Increasing demand of domestic wood contributes greatly to the maintenance of forest at the time of logging, and also helps to encourage the growth of forest to be the original of biological diversity. To build a mature recycle-based society, it is important for us to consider the use of recycled-material and emissions-reduction of waste product generated from architecture field.

After Graduation

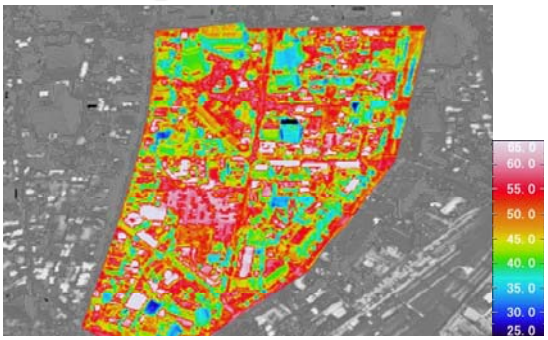
In order to maintain an affluent society, it is necessary to consider environmentally-conscious method from designing of residential building to construction and implement. We are widely expected by the public to be a bearer.

Process of lumber from log to house construction through sawing

Architecture

We make a suggestion about buildings and town planning for the global future: Takagi LAB.

We study buildings and town planning from an environmental engineering perspective. It is important that the buildings are healthy and comfortable to live in. However, the interior environments are connected to the exterior environments of the buildings. Thus we study heat-island phenomena, “wind roads” in cities, and energy problems in urban environments, and then make a suggestion about the future town planning, as we address global environmental problems.



Thermal image from helicopter (altitude:1000m) of central urban area in Nagano city. At parking lot a(northern area of Nagano station), surface temperature is over 60℃.

Takagi Lab

Naoki Takagi :Professor Graduated Tokyo Institute of Technology doctoral program, Major subject is urban environment, remote-sensing and heat environment.

In the Future

To create comfortable and healthy urban areas, it is important to design cities systematically. Thus for town planning, we must consider the environment from a global perspective.

After Graduation

The students graduated from our lab understand environmental problems well, so are highly wanted by various industries. They are working on town planning as city officers, major general contractors, office designers and so on.

Color image of same area. There are many parking lots. There are few parks and trees.

Architecture

Research on safety and security of steel structures

Research for designing safe and secure steel structure buildings is carried out by evaluating the seismic performance of frames as well as structural members using two ways. One way, which requires very high-strength steel, is to keep the structural response within the elastic range even for severe earthquakes. Another way is to provide secure buildings by evaluating the limit performance of their frames and members even when they undergo large deformations excessively beyond the elastic limit.

Experiments and numerical analyses investigating lateral buckling of large-span composite beams subjected to live loads

Kaneko Lab

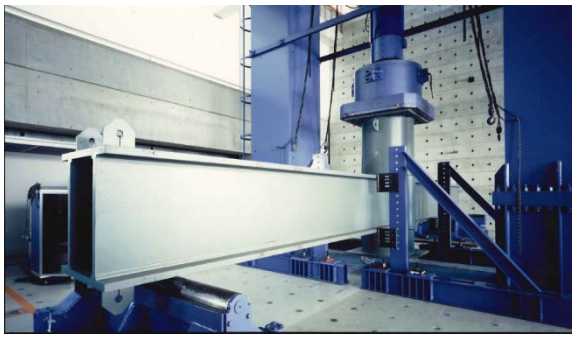
Prof. Hirofumi Kaneko
Kaneko laboratory is working on various research themes, such as rationalization of steel frame members, steel dampers and other subjects related to steel structures.

In the Future

After the Great Hanshin Earthquake, which resulted in many damaged or collapsed buildings, use of vibration damping devices to reduce the shaking of buildings has considerably increased. To regain confidence in using again many steel structures, our rational research has aimed for a structural design method that involves not only minor structural damage but also confines it.

After Graduation

Graduates are lead to broad professional and academic areas with opportunities in companies and research institutes that are involved in the steel industry such as general contractors, design offices, steel companies and metal fabricators.



Evaluation of the limit performance of mega-truss beams by full scale tests.

Architecture

Integration of the old and new in historic environment

Historic environment comprises the old and the new in terms of the tangible as well as the intangible. The first step to integrate them is to understand what it has been and is at present through academic survey and research. The skillful approaches are also required to design what it will be. Conservation, rehabilitation and vitalization are required to achieve the gradual integration. The field around the lab covers the central Japan where traditional villages and buildings are well preserved. Field is another desk of the lab.

The historic environment of Zenkou-ji temple city built from the ancient is one of the most familiar research field of the Lab.

Tsuchimoto Lab

Toshikazu Tsuchimoto
Professor,
Doctor,
Architect,
Architectural Historian,
Urban Historian,
Member of IIWC; ICOMOS international Wood Committee.

In the Future

The lab has been mainly targeting the well-forested area to research traditional wood construction. Then, comparative approaches are highly recommended with the fields, for examples, of east Asia, west Europe and central America. Built environment with wood is beautiful but fragile. View to the sustainable future of the environment of wood should be provided. Comparative approaches create a global view and network. Generalized images of the future start in an individual research.

After Graduation

Architect for the historic environment should play an important role for our planet. Students are recommended to work as such sort of architect in several fields after graduation. The architect is a skillful philosophical one in terms of his/her practice and theory for the fragile built environments that have been created for a very long time.

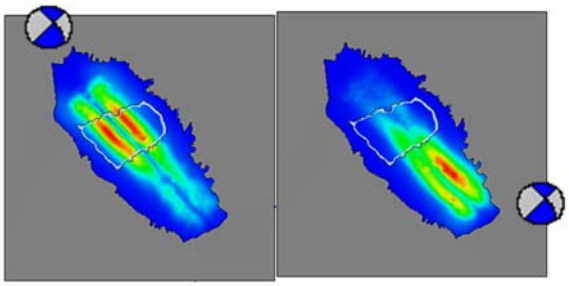
Small mountain hut reconstructed by T. Tsuchimoto and his colleague integrating the old and the new after detailed survey.

Architecture

Develop Structural Design method for Disaster Mitigation

Members of Tamori Laboratory are performing following investigation;

(1) Estimation soil layer profile using micro-tremor observation,
(2) Predict earthquake ground motion using soil layer profile models mentioned above,
(3) Developing optimal structural design soft wares for base isolated buildings.



Earthquake simulation for the Suwa basine

Tamori Lab

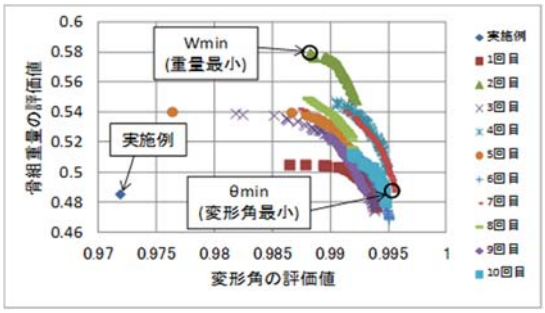
Shinichiro Tamori , Associate Professor, are interested in Structural Engineering, Earthquake Engineering, and Optimal Design of base isolated structures.

In the Future

Estimation for Soil profile model is first step for disaster mitigation. We are planning to evaluate accuracy of out soil profile models using earthquake observation.
The soft wares for the optimal design will have enough performance for structural design of base isolated buildings soon.

After Graduation

Occupation of graduate students were
(1) Structural Engineer
(2) Software developer
(3) field supervision

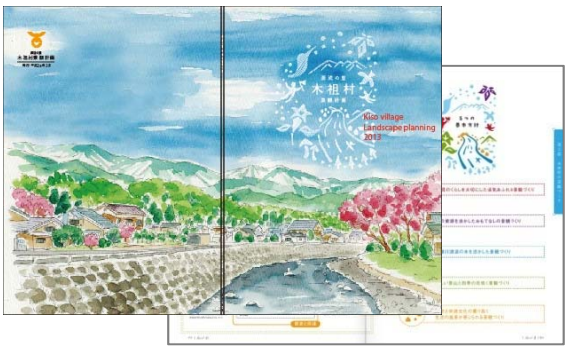


Performance of optimal design results

Architecture

From architecture to urban, the possibility of a design

At the Terauchi laboratory, an architectural design and a design survey is worked while considering what a good design is. Moreover, it asks for the rationale of activity and is advancing research for architecture and urban space. Since it gets interested in all the environment that surrounds us and understands the feature, a design starts. We propose the design loved by you of the area through various projects, such as a design competition, a design of a residence, city planning.



Kiso village Landscape planning
It is taking part in making the village in Kiso-village Nagano from 2012.

Terauchi Lab

Mikiko Terauchi
Associate professor
Architect, specialty is an architectural design, not only a design but research on architecture or the space composition of urban space.

In the Future

At the Terauchi laboratory, design activities are developed in cooperation with various cities, towns and villages. There is also a long-term project of resulting in a concrete design proposal in our activity, through a workshop with local people. Moreover, there is also a short-term project called the design competition which must propose the best proposal in the limited time. Students and a teacher are united, and it gropes for a good proposal, and is searching also about the method of a presentation.

After Graduation

Many graduates are working in the architect's office, the construction firm, the house maker, or the construction section. I would like you to play an active part in a genre broad as a designer and an architect.

Shinjuku Kinetic eyesight
Shinjuku creators festa 2013 space design section exhibition work

Architecture

The most efficient home heating and cooling equipment that significantly reduces CO_2 emissions

Global warming is a very serious problem in the world today. By 2010, the amount of CO_2 emissions from the residential sector had increased by 35.5% from the standard set at the first year of the Kyoto Protocol. Therefore, it is urgent that we reduce CO_2 emissions from energy consumption in the residential sector. In our laboratory, we calculate the amount of actual CO_2 emissions and the rate of energy consumption in the residential sector by measuring the amount of energy consumption (electricity and gas) and the amount of electricity generated from fuel cell co-generation systems (ENE FARM) and photovoltaic power generation systems. In addition, we investigate the efficiency of housing equipment to reduce CO_2 emissions by measuring the amount of energy consumed in housing equipment such as hot water supply systems.

Residential fuel cell co-generation system which supplies electricity and hot water.

Appearance of the sensors which measure the system's efficiency.

Takamura Lab

Hideki Takamura
Associate Professor (since 2010)
Through Kaneka Co., Ltd., Shinshu University - faculty of engineering as an assistant professor
The main theme of research is the reduction of LC CO_2 (Life-cycle CO_2: the total CO_2 emissions of a home measured from construction to demolition) in residential house.

In the Future

The system efficiency of housing equipment varies significantly depending on the climate and the users. We analyze actual data from homes in very cold Nagano prefecture to try and reduce CO_2 emissions and save energy while keeping the homes comfortable. Additionally, we can use this information to educate residents how to use their equipment more efficiently.

After Graduation

Our students are expected to gain the knowledge in architectural-environmental engineering and building equipment, but we also encourage students to think and act for themselves. Many students after graduation are working at construction companies and housing equipment production companies, etc.

Equipment to measure the amount of electric consumption and electricity generated from fuel cell co-generation systems and photovoltaic power generation systems.

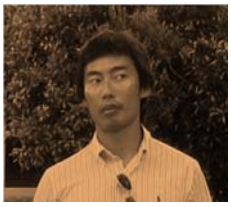
Architecture

Transformation of the historic city

It is historically true that Kyoto was developed as an old capital. Kyoto has been celebrated in poems and depicted in paintings. People can not only sense Kyoto's historicity in the historical facts or literature associated with it but they can also tangibly experience this historicity with physical evidence in this city. Therefore, the physical matter has become an object of preservation and provides a clue for development. However, merely the existence of old materials in Kyoto is inadequate to fully indicate its history. What is the historicity of Kyoto?

Rakuchu-rakugai-zu, 17th century

Hayami Lab



Yohei Hayami
Assoc.Prof.
Dr.Eng.

In the Future

You can tour the city, to know the goodness of the city.

After Graduation

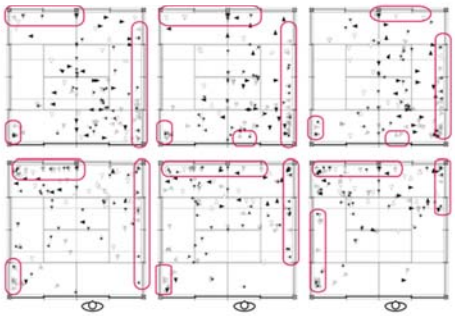
Try to look at something in a slightly more long-term perspective.

Rakuchu-ezu, 1637

Architecture

Thinking deeply about the human environment

We build houses, large structures and cities. Different from any other animals, humans are capable of changing the environment dramatically. The results of Environmental psychology studies not only help on improving the environment of the human kind but also provide critical data for designers, planners and architects. My lab is doing the study on space cognition, personal space, territory, crowding and behavior for the realization of better human as space design. Almost all of our studies target at public space, and the study subjects range from young children to senior citizens.



The existence of person have an influence on another in the room, and that degree vary with a partition(sho-ji).

Yanase Lab

Ryota Yanase
Associate professor
School of Human Sciences, Waseda Univ. Ph.D. (Human Science) (2001), Environmental Psychology, Cognitive Psychology

In the Future

Among our activities, there are high demands for the attitude and behavior to have an interest in the human environment as well as the physical environment. Therefore, making extra efforts to understand about the process of sensation, perception, and cognition is very important. We need to keep thinking deeply about the human environment, and provide the primary reference materials to improve personal and public space.

After Graduation

Students often got hired by construction companies, construction equipment manufacturers, housing industries, architectural design consulting company, government related offices and so on… The experiences gained from thinking with interdisciplinary knowledge are going to be useful in solving problems at the various fields.

Almost all of our studies target at public space, and the study subjects range from young children to senior citizens.

Architecture

Japanese traditional wooden buildings to resist earthquake

There are many kinds of wooden buildings in Japan, for example houses, schools, shrines, temples and so on. Japan is the earthquake country and so engineers must design new buildings that can withstand the seismic forces. However, traditional buildings have existed for centuries though they are built based on the experiences and skills of carpenters. Are they really earthquake-proof or not? It is not clear how they can resist earthquakes. It is exciting to tackle such questions from an engineering point of view.

Monitoring the seismic behavior of this traditional farmhouse with a thatched roof by strong motion accelerographs

Matsuda Lab

Masashiro Matsuda
Assistant Professor
The University of Tokyo
Dr.Eng. (2006)
Wood construction, Structural capacity of Japanese traditional wood buildings

In the Future

The traditional buildings such as folk houses, shrines, and temples are our cultural heritages and are alive even now. Our research will clarify what must be done to protect these beautiful traditional wooden buildings from earthquakes, to preserve them, and even to design new ones. This is an important subject for the future of Japan.

After Graduation

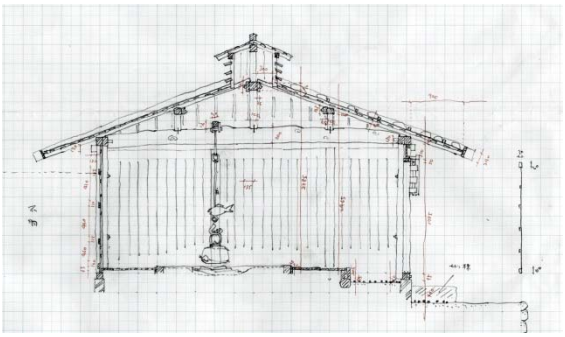
By understanding the basic building structures and doing research on wood construction, you will be able to work actively in the fields of preservation of traditional buildings and the structural design of wooden buildings.

Static loading test of the wood frame of traditional construction houses in the Gassho style of Shirakawa-go

Architecture

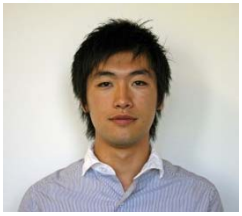
Preservation and regeneration of the historic architecture

Our main research interest is Japanese architectural history. By studying historic architectures in a town, we try to understand its historic context, and then suggest town planning solutions which reflect the original character of the town.



Field note : Research of the historic architecture

Hoyano Lab



Shigeo Hoyano
Assistant Professor
Degree:
Dr. in Engineering,
Shinshu University
Main Research Field:
Architectural History

In the Future

For the future of architecture, it is important to be able to understand both advanced and historic architectures. The research on historic architectures will foster the creativity that can relate advanced architecture to historic architecture.

After Graduation

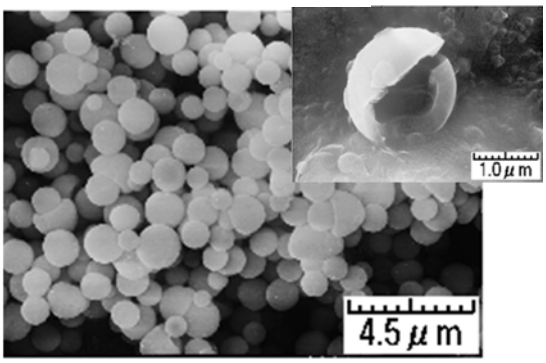
・Designers and engineers on the preservation of historic architectures.
・Designers and engineers on the regeneration of historic architectures.

Historic architecture in Nagano prefecture

Chemistry & Material Engineering

Challenge for Environment-Friendly Chemical Technology

Our major research interests involve the development of an efficient catalytic system that decomposes pollutants in air or water and chemical technology for reuse of waste plastics. Hollow and tin film polymethysiloxane micro-particles have been synthesized by a new method and applied as a new material for catalyst preparation. A new technology for dechlorine and reuse of polyvinylchloride and polyvinylidene chloride have been developed by using Zinc oxide.



Hollow microspheres of polymethylsiloxane prepared in W/O emulsion system. The inset is a crushed particle.

Mishima Lab

Shozi Mishima,
Professor,
Shinshu University
Ph.D. 1995, M.S. 1975
B.S. 1973
Professor 2004—
Assistant professor
1996-2004

In the Future

It is our task to leave the pollution-free earth to future generations. Thus it is important to develop technologies to control air- and water-pollutants, remove toxic substances, and recycle waste products based on chemistry. We have been challenging to develop chemical technologies in order to keep the environment clean .

After Graduation

The students in our laboratory acquire a wide variety of chemical knowledge and experimental skills, so they are ready to work in the fields of electric and mechanical system as well as chemistry.


Students working in our laboratory

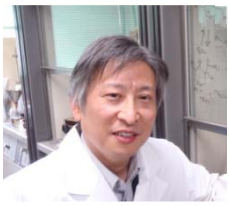
Chemistry & Material Engineering

Creation of heterocyclic compounds by organic synthesis: Development of novel catalysts and highly selective reactions

There is a subtle deference among chemical structures that has to do with the three-dimensional arrangements of atoms in space. These arrangement differ in the way that a right hand and a left hand differ-that is they are mirror images of each other. Many medicinal chemicals can exist in two mirror image forms, and it is often true that one of them is a better medicine and the other may even be harmful. In our laboratory, we have been investigating a new methodology for the synthesis of medicinally important optically active heterocyclic compounds with the desired handedness.


Organic compounds are synthesized by using several reagents, solvents, and glassware in a hood.

Suga Lab



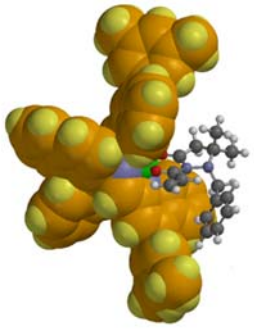
Hiroyuki Suga
Professor of Chemistry
He joined Shinshu University in 1998. His research interest is the synthesis of optically active heterocyclic compounds with biological activity.

In the Future

Organic synthesis contributes not only for the creation of medicines and agrochemicals but also for the synthesis of organic materials such as organic semiconductors. For the organic synthesis, it is important to develop an efficient and selective reaction to afford only a desired product. Our goal is to develop such novel catalysts for the reaction, which will contribute to a wide range of chemical industries.

After Graduation

Graduates from my laboratory now work in pharmaceutical, agrochemical, and chemical companies. Our students can apply their knowledge of organic chemistry to the fields of polymers and even other chemical materials as well as relatively small organic molecules.


An organic molecule coordinates to a catalyst and it is activated.

3D structure of a product is determined by NMR.

Chemistry & Material Engineering

Application of biological function for industrial fields as green chemistry

Organisms always produce many proteins such as enzymes which designed based on genes. Enzymes work as catalysts for most reactions occurring in cells of organisms. The velocity of catalytic reactions by enzymes are incredibly rapid under the common temperature and pressure. We can apply this eco-friendly process for industries, as a sustainable development requires green. Our Laboratory is interested in the fundamental issues such as properties, structures and functions of enzymes to produce materials and molecules by a sustainable process.

Mushroom fungus, *Irpex lacteus* isolated in 1930s by Prof. Nisizawa. This microorganism has a high ability for degradation of woody biomass.

Amano Lab.

Yoshihiko Amano
Graduated from Shinshu University, PhD (1994, Shinshu University)
2005- Professor of Faculty of Engineering, Shinshu University
Major fields : Biological Chemistry (Enzymology, Carbohydrate Chemistry)

In the Future

Our Lab focuses on the carbohydrates which are synthesized by photosynthesis using carbon dioxide. Cellulose is one of most abundant organic substances in biosphere. Biomass stores a large amount of energy in chemical linkage. We should use the energy to produce biofuels and materials.

After Graduation

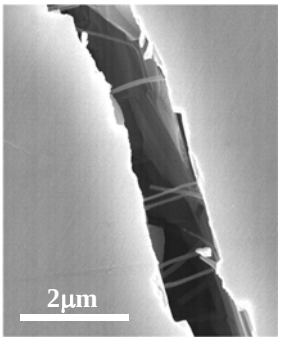
Chemistry contributes to every field that manufacturing companies work on. They are chemical, electrical, food companies. Students that have graduated are actively working everywhere in Japan.

Continuous flow-type hydrothermal reactor we designed: this is a powerful tool for processing organic substances from plant biomass.

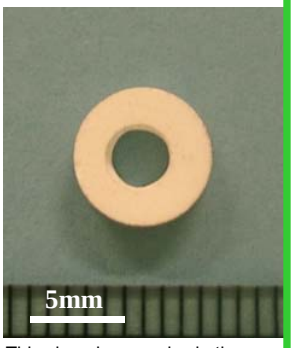
Chemistry & Material Engineering

Synthesis of Novel Materials Using Ceramic Processing

Ceramic materials have many useful properties, but their “brittleness” and “hard machinability” that are essentially their weak points limit their application. Taruta Lab studies the synthesis of ceramic composites using carbon nanotubes (CNTs) and micas in order to improve the “brittleness” of ceramics and realize the machinable ceramics with high mechanical properties. Micas have been applied in various fields, such as cosmetics and paints etc. In these departments, micas have been studied for more than 40 years. Taking Over such studies, Taruta Lab investigates the novel functions such as ionic conductivity and luminescence.



This photo shows that CNTs prevent the propagation of cracks in ceramics.



This zirconia ceramics in the photo can be machined with conventional drilling tools.

Taruta Lab

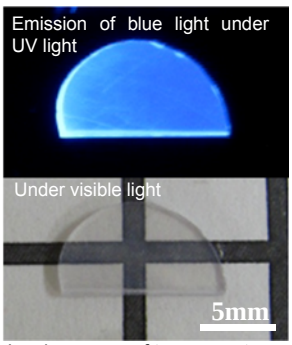
Seiichi Taruta
Professor
He received his doctor’s degree of engineering from Tokyo Institute of Technology. He is specialized in inorganic chemistry and inorganic materials chemistry.

In the Future

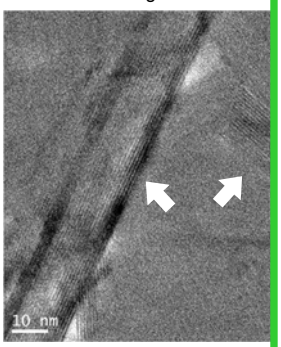
The CNTs/ceramic composites and mica/ceramic composites have been studied in order to develop high performance bio-ceramics such as artificial joints with longer life, bioactive artificial bones with high mechanical properties and dental ceramic materials with machinability. In addition, ionic conductivity of many types of micas has been studied to apply micas as solid electrolytes for fuel cells. The transparent mica glass-ceramics doped with rare earth may be applied as novel luminescent materials for white LED because they emit red and blue lights. .

After Graduation

Materials chemistry covers a broad range of sciences, so students can adapt in many industrial fields. Taruta Lab. alumni work in many different kinds of industries, particularly in the field of materials and chemistry.



Luminescence of transparent mica glass-ceramics doped with rare earth under UV light.



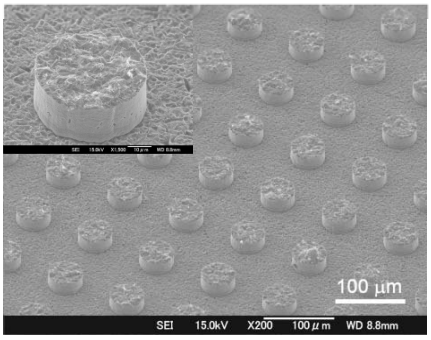
Transmission electron microscopic photograph of transparent mica glass-ceramics

Chemistry & Material Engineering

Development of Next-Generation Functional Materials Through Plating

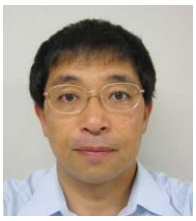
Nanomaterials, battery materials, and other advanced materials

Arai Laboratory is focused on developing functional materials through electrochemical methods, especially plating. Plating technology is key to production of personal computers, cellphones, smartphones, and many other electronic and semiconductor devices, and will be an important production process for nanomaterials, battery materials, and other advanced materials. The laboratory performs plating with carbon nanotubes (CNTs) to produce metal/CNT composite films and metal nanoparticle modified CNTs, and investigates their performance as materials for lithium-ion batteries, fuel cells, flat-panel displays, high abrasion resistance and thermoconductivity, and other advanced applications.



Electron micrographs of display material produced by electroplating.

Arai Lab



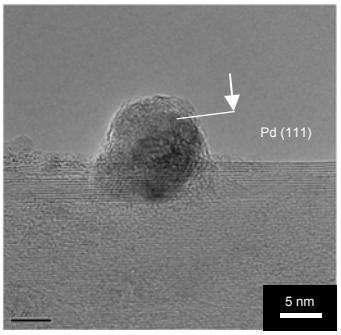
At Arai Laboratory since 2011, He was a technical researcher in Nagano Prefecture, etc before he became a professor. Main disciplines: electrochemistry, analytical chemistry. Current research: lead-free solder plating, carbon-nanotube composite plating, and other plating technologies.

In the Future

Arai Laboratory is exploring a new world of plating technology for micro- and nano-size metal processing of new nanometal and metal-composite materials. Our lab is committed to the development of new functional materials for rechargeable battery electrodes vital to renewable energy systems, low-power and high-definition displays, low-wear coatings, high-performance heat dissipation, and other advanced applications, and to joint research with business and industry for their implementation.

After Graduation

Plating technology is highly prized both by general electronics companies and companies specialized in plating. Graduates accordingly enjoy a wealth of employment opportunities in companies producing consumer devices, appliances, and components as well as chemical manufacturers.

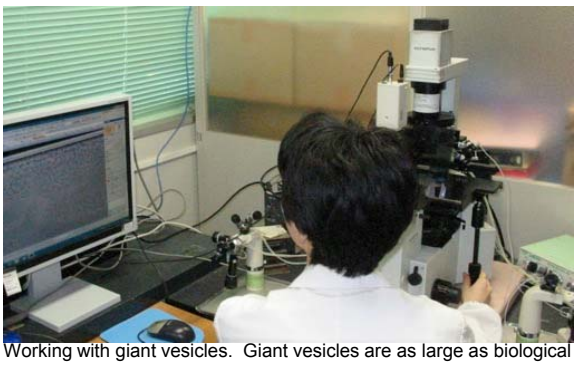


Palladium-catalyst nanoparticle formed on carbon nanotube surface by electroless plating

Chemistry & Material Engineering

Artificial Membrane for Cell-Like Microchemical Systems

A biological cell is an extremely sophisticated microchemical system. The realization of this fact has led scientists to construct a cell-like microchemical system by human hands. For the system, artificial plasma membranes are essential as they separate the inner world from the outside and become the interface between the two worlds. Our research group studies lipid membrane vesicles that have the size comparable to biological cells (giant liposomes) as such artificial cell membraned.



Working with giant vesicles. Giant vesicles are as large as biological cells and can be directly observed on an optical microscope.

Okumura Lab

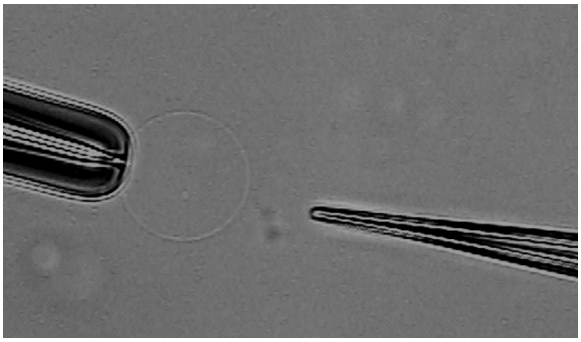
Yukihisa Okumura, Professor
Chemistry of artificial lipid membrane vesicles (liposomes)
Bio-mimetic microchemical systems.

In the Future

The construction of a sophisticated artificial cell will be one of the major scientific and technological achievements. Although there clearly is a long way ahead, many research groups around the world have been working on the problem. The technology, if established, will be used in many bio-related fields, such as medicine and agriculture. An example of possible applications is a drug delivery system more efficient and compatible to human bodies.

After Graduation

Many graduates found their careers in various chemistry-related fields in companies. Through thesis works, students in our group are expected to improve the skills necessary as an engineer; careful observation, logical thinking and good research planning.

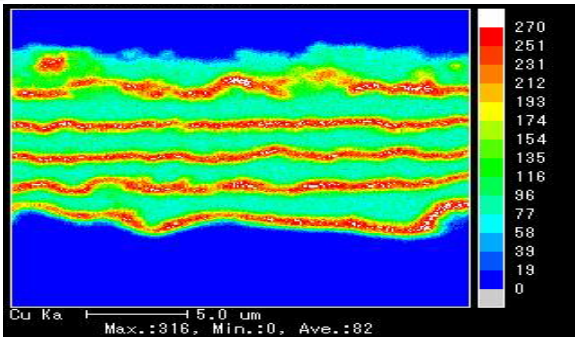


Micromanipulation of a giant vesicle. Various substances may be introduced into the vesicle by microinjection through a hollow needle.

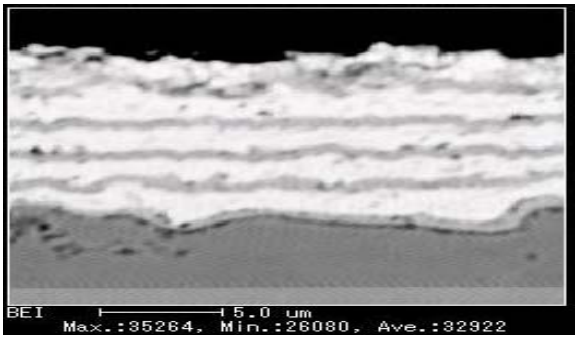
Chemistry & Material Engineering

Mass production of micro parts by electroplating

We are doing research work on preparing thin alloy plates. The alloy plates have properties such as low melting points, high corrosion resistance, and high hardness. The thin alloy plates have been prepared by placing the positive deposition potentials of metals near the negative ones of other metals using organic additives. However, these additives have negative effects on the characteristics of alloy metal plates. In our laboratory, we try to make alloy plates by a potential plus electroplating method without additives.



Cross section Cu/In deposit, Cu deposited on red area, Cu and In codeposited on green area.



Cross section of Cu/In deposit prepared by potential pulse electrodeposition method.

Shinohara Lab

Naoyuki Shinohara
Associate Professor
After graduated the Shinshu Univ., I have been studing the effects of organic substances on the electroplating of metal.

In the Future

Usually small parts are made by cutting or shaving materials. But these methods are not suitable for mass production of small parts whose size are smaller than 0.1mm. So, we try to make small parts by piling up the atoms using electroplating methods. Now, we are selecting proper alloys for this method.

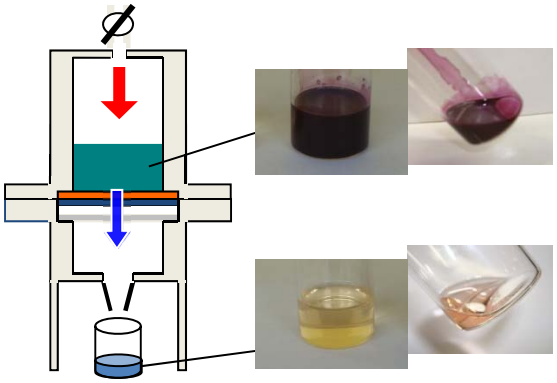
After Graduation

The graduates of our laboratory are employed in a variety of manufacturing companies in the fields of electronics and precision equipments.

Chemistry & Material Engineering

Separation technology using polymer membranes

Membrane separation technology can be found in various industrial areas. The technology has become increasingly important and it requires new materials and membranes. In our laboratory novel membranes (hollow fiber ion-exchange membranes, composite membranes of polydimethylsiloxane with carbon nano fiber,…) have been prepared using various polymers and functional materials. Transport properties across the membranes are investigated.



The apparatus for membrane separation experiments and a result. Pure liquid was obtained by the separation.

Kiyono Lab

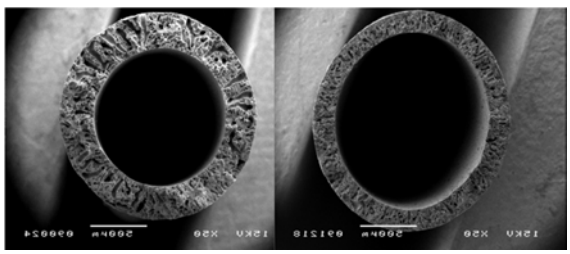
Ryotaro Kiyono
Associate Professor
Polymer Chemistry, Polymer Materials
Preparation of novel polymer membranes, Analysis of transport mechanism across membranes.

In the Future

Some scientists say membrane technology plays a central role in our daily life. Today, membrane processes are used in a wide range of industrial applications: desalination of sea water, purification of materials, food and beverage, fuel cell, gas separation, etc. The number of such applications is still growing and environmental applications for clean technology are very promising.

After Graduation

Many undergraduate students advance to our graduate school. After the graduation, they work at companies that deal with polymer materials or membrane separation technology.



Cross-sectional images of hollow fiber ion-exchange polymer membranes prepared in laboratory.

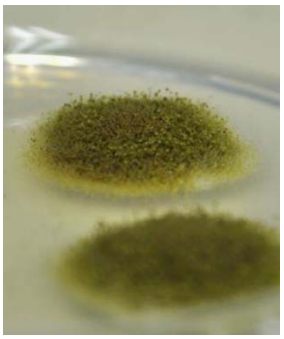
Chemistry & Material Engineering

Degradation and utilization of biomass !

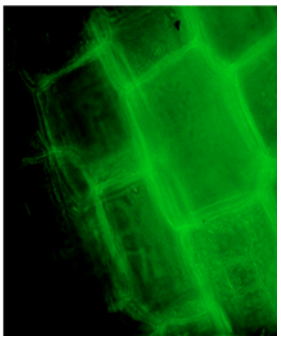
~Improvement of enzyme by gene manipulation technique~

We are trying to find useful enzymes from microbes, and utilize them to decompose biomass. Biomass is a renewable resource and is degraded by microbial enzymes in nature. This degradation is a very efficient system the microbes have developed in the process of evolution.

In order to use this for our target reaction, enzymes must be isolated and their stability and activity must be improved . Would you like to join our team to explore the ability of microbial enzymes and develop biomass utilization?



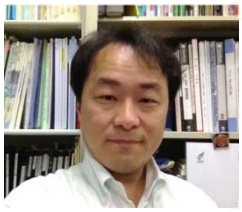
Aspergillus oryzae producing recombinant enzyme from mushroom



Cellulose in plant cell wall visualized by fluorescent protein

DNA extraction to use for gene manipulation (left), Isolation of microbe aseptically in clean bench (right)

Nozaki Lab



Kouichi Nozaki, Ph.D.
Associate Prof.
2005- Associ. Prof.
Research fields:
Biological chemistry and Genetic engineering of enzymes. The scientific research and its application of microbial enzymes.

In the Future

There are infinite types of microbes and most of them are unidentified. Among them, there may be an available one which produces useful enzymes for human beings. In our lab, we use gene manipulation to increase enzyme productivity and improve enzyme function. Enzymes catalyze the specific reaction under mild conditions. Biomass and enzymes will play an increasingly important role as we try to establish a sustainable chemical process.

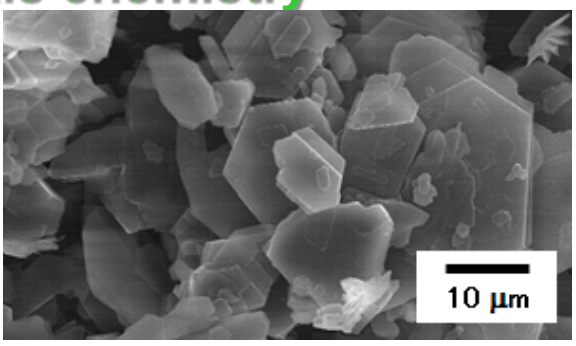
After Graduation

Enzymes have been used in the fields of chemistry, medicine, food, agriculture, and fibers. The experimental techniques the students learn in our lab. will be useful in the fields of chemistry and biology. In order to do more advanced research, some students go on to graduate schools.

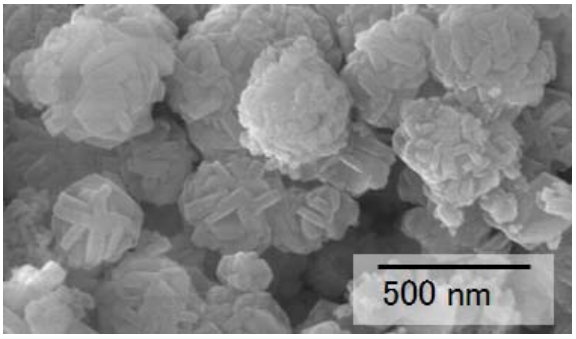
Chemistry & Material Engineering

Creating inorganic materials: Ceramic materials chemistry

Various ceramic, inorganic materials are used around us. The Yamaguchi Laboratory is conducting research on the synthesis and application of various inorganic materials including mica and alumina. At present, we are undertaking research on the synthesis of novel mica crystals and the composites having micropores in the interlayer region of mica crystals. We are also working on the process of alumina ceramics using a new sol-gel method with an inorganic salt solution.

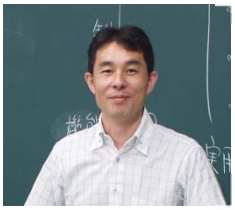


Swellable mica crystals having a hexagonal plate-like morphology synthesized by using NaCl as a flux.



Alumina gels containing a small amount of organic additive lead to the formation of fine alpha-alumina particles at lower temperatures.

Yamaguchi Lab



Tomohiro Yamaguchi
Associate Professor
Fields of research:
Ceramics, Inorganic Materials Chemistry, Clay Science, etc.

In the Future

Micas and aluminas have been studied and used for many years, but researchers today are finding methods of synthesizing materials with new compositions and also finding new phenomena. In our laboratory, students in their senior year and graduate students are conducting the experiments for their individual research themes.

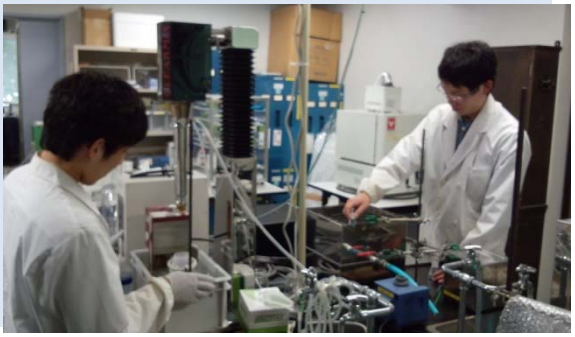
After Graduation

Many graduates from our laboratory are working in companies related to ceramics and glass as well as various chemical materials. They are also active in various other fields.

Chemistry & Material Engineering

Nano-architecture based on colloid and interface science

Sakai's research aims to develop the methodologies for fabrication of the nanometer- and micrometer-sized materials (e.g., metal nanoparticles, mesoporous materials and emulsions) and organization of nano-materials into multi-dimensional (1D, 2D and 3D) structures in solutions and/or at interfaces in an efficient manner with respect to cost, energy and environment. In particular, amphiphilic characters (dual natures) of molecules or polymers are essential elements for designing the methodologies.



Ultrasonicators and homogenizers are used for emulsification, dispersion and chemical reaction.

Sakai Lab

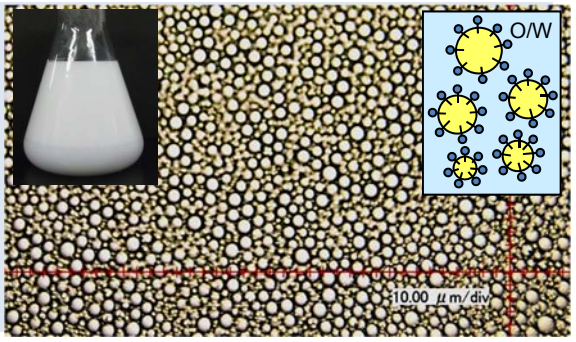
Toshio Sakai
Associate Professor
Genesis Research Institute, Inc., The State University of New York, Tokyo University of Science and Shinshu University. Colloid and Interface Science.

In the Future

Nanometer-sized materials and their organization on substrate are strongly required for recent device fabrication because of the device miniaturization. Furthermore, the improvement of device performance is required for the convenience of our daily life. The Sakai's research group attempts to develop "high-purity nano-materials" because they are expected to exhibit higher performance.

After Graduation

Many of our technological processes such as papermaking, pottery making and the fabrication of soaps, cosmetics and medicines involve manipulation of colloidal systems. Colloid and interface science provides various opportunities in the industries such as catalyst, electronics, toiletry and medical fields.

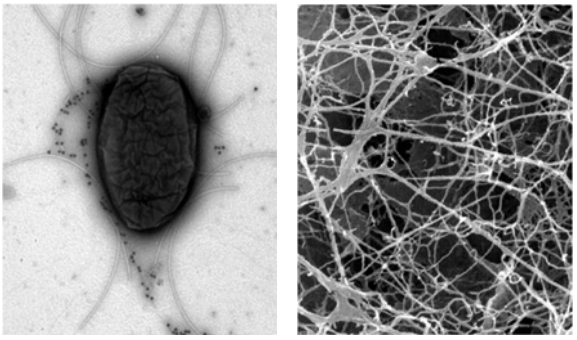


Optical micrograph of oil-in-water (O/W) emulsion..Emulsions are used in various fields such as cosmetic, food and medical field.

Chemistry & Material Engineering

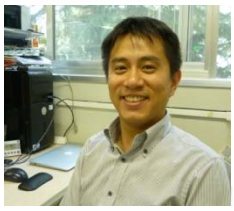
Bacterial Cellulose Nanofiber
- Amazing World of Fiber Spinning by Bacteria -

Cellulose is produced by some kinds of bacteria as well as plants. It is called as bacterial cellulose or microbial cellulose, and is used for various industrial purposes. In our laboratory, we focus on the function of the protein complex participating in cellulose biosynthesis, which behaves like a fiber spinning machine. It is too small to observe the structure of this protein complex by microscope. Thus we are trying to study its structure by X-ray crystallographic analysis at the atomic level.



TEM image of cellulose producing bacterium (left), and SEM image of bacteria cellulose (right).

Mizuno Lab



Masahiro Mizuno
2005: Ph.D from Tokyo University of Agriculture and Technology
2006-: Assistant Professor of Faculty of Engineering, Shinshu University
X-ray crystallography of carbohydrate related enzymes.

In the Future

The width of cellulose fibril extruded from a single protein complex is about 1.5 nm. In nature, these cellulose fibers are bundled to form cellulose fibers (10-100 nm) based on? the array of protein complex on the cell surface and the movement of bacterium. If the array of protein complex can be controlled, it might be possible to make a cellulose nanofiber with a variety of thickness and length.

After Graduation

Most students stay at Shinshu University for their graduate studies. Others find jobs in manufacturing companies in various fields such as chemistry, electronics, and food.

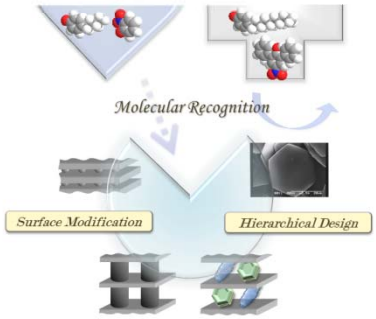
Crystals of cellulose biosynthesis related protein.

The teamwork is very important to overcome a research theme.

Chemistry & Material Engineering

Smart adsorbents/catalysts from inorganic-organic nanocomposites

There is a demand for materials with molecular recognition and separation abilities. Precisely controlled adsorptive properties at a molecular level are a prerequisite, and thus we have been organizing functional organic groups on silica-based materials to induce a selective adsorption. Spatial distribution of the functional groups in the silica matrix has been controlled to create the active sites (e.g., porous structures, reaction nano-vessels) for future applications as an artificial enzyme and a sensing device.



Silicate nanosheets and organic functionalities have been used to scaffolds to create nanospace for molecular recognition.

Okada Lab

Tomohiko Okada,
Research Associate

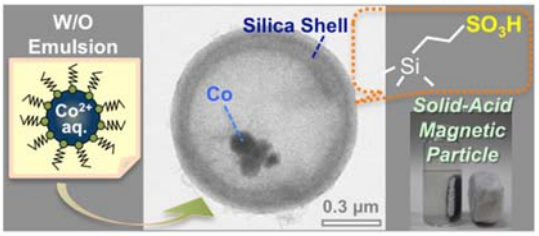
He received his Dr. degree from Waseda University in 2004. His research interests include silica-based adsorbents, and catalysts.

In the Future

We have been interested in hierarchically designed natural products such as precious stones and beautiful animal tissues. Periodic arrangements of particles with defined shapes create such products. By mimicking nature, we may be able to develop useful functions ???-I do not know!- as contaminants concentration, catalytic reactions and controlled release. Hybridization of functional groups on the surfaces of particles has been investigated for optimizing the performances.

After Graduation

I do not know what the first sentence means! A process to design “original” materials for the above-mentioned purposes has been an important subject in preparation of theses. Our students learn various instrumental analyses for characterizing functions of materials. Thus, the alumni are active in the fields of mechanical and electronic engineering as well as chemistry.

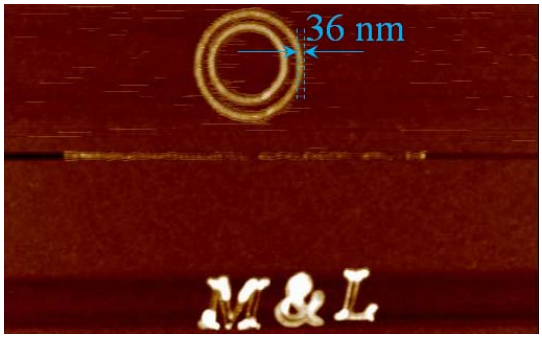


Magnetic nanoparticles enclosed by a silica microcapsule have been developed for a magnetically collectable, reusable adsorbent and catalyst for concentrating heavy metal ions in acidic aqueous solutions and solid acid catalysis in aqueous media.

Computer Science & Engineering

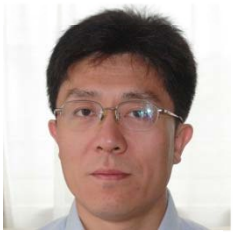
Non-volatile memory based on spin of electron

Our research is focused on developing ultra-fast, high-density, non-volatile, low-power-consuming memory and logic devices based on direct manipulation of electron charge and spin. We are particularly interested in controlling the spins either pointed up or down by directly applying electrical current or voltage. Our laboratory has specialized facilities for film deposition. Lithography and other nano-size fabrication facilities in our laboratory have the ability to fabricate elements as small as one-thousandth the width of a human hair. We also have the facilities to characterize the electrical and magnetic properties of those elements.



Atomic force microscopy images of nanolithography carried out in our Lab.

Liu Lab



Xiaoxi Liu Professor

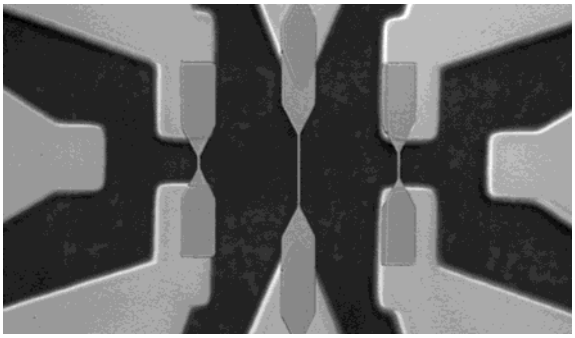
Profile :
2013~ Prof., Shinshu U;
2003~2012, Asso. Prof. Shinshu U;
2002~2003, Researcher, Glasgow Uiversity, UK

In the Future

Memory and logical elements are fundamental devices for processing information. Current memories and logic elements are based on electrical charge. With the increase of capacity and density of the devices, leakage became an issue. Spintronics exploits both the intrinsic spin and associated magnetic moment of an electron, and has a potential for the development of memory and logical devices beyond the current COMS technologies.

After Graduation

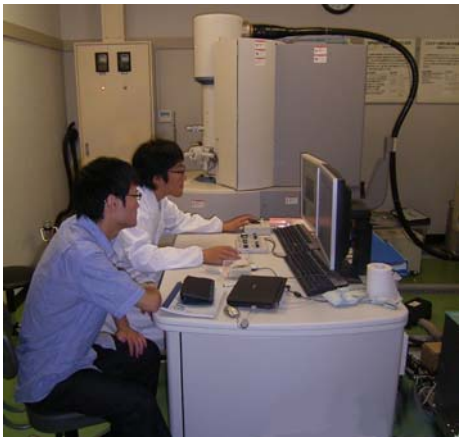
Around 50% of our undergraduate students moved on to graduate schools. Some are working in companies that deal with electronic system or devices, and some are working as government employees, et.al. It is our goal to foster creative and excellent students with global minds.


Typical memory circuit prepared in our Lab.

Computer Science & Engineering

Creations and applications of nanosize magnetic materials for the spintronics devices

Spintronics is an emerging technology as a new branch of electronics. We are studying and developing nano-sized magnetic materials for high-sensitive sensor and high-density memory with spintronics technology. In order to realize such nano-sized magnetic materials, We study new composite materials made of mesoporous ordered thin films containing magnetic nano particles. Mesoporous thin films are inorganic materials synthesized in the presence of surfactants as templates, and have various porous structures.


Scanning transmission electron microscope(STEM)

Haeiwa Lab

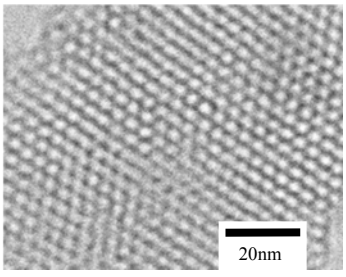
Dr. Tetsuji Haeiwa
Associate Professor
I met with the "magne" at the third-grade of college. Since then, I have been studing and developing the magnetic material. Now, I'm going also "Sato-yama" (natural woodlands) preservation activities.

In the Future

The spintronics device will serve as a Green IT Technology product because of its distinctive low power-consuming characteristic while the computer is in the rest-mode. In Haeiwa laboratory, we are studying and developing the nano-sized magnetic materials for spintronics devices. Nano-sized magnetic materials have a potential to be the ultimate non-volatile memory device which is speedy, highly reliable, and has a large memory-capacity.

After Graduation

In order to develop materials, we repeat the process of synthesizing materials, evaluating them based on structural and compositional analysis, microstructural observation, and electric and magnetic measurement, and altering the synthetic conditions according to the evaluation. This is a genuine engineer training. Our students are working as engineers with vacuum, measurement, and analysis & observation technology after graduation.

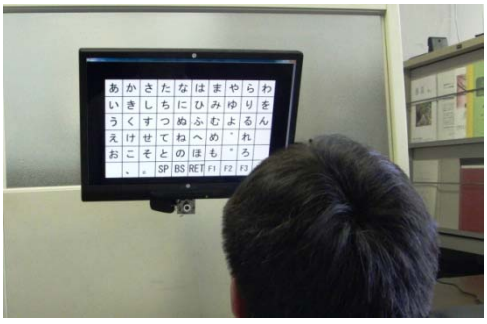


Stem photo image of mesoporous thin film.

Computer Science & Engineering

Development of the user friendly computer interface

Our group mainly focuses on the development of new human computer interfaces that support a severely disabled person. By way of example, we have developed a brain computer interface based on the event related potentials. The eye-gaze input system detects the direction of an user's gaze and it is applied to the software keyboard as an input.



Eye-gaze input system.

Hashimoto Lab

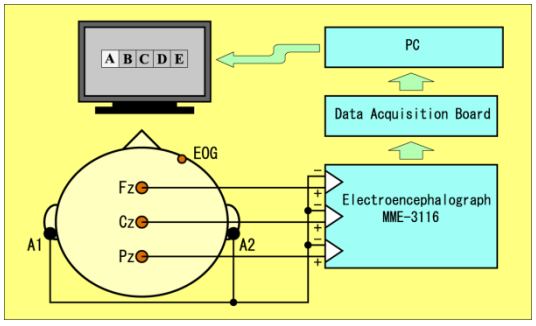
Masami Hashimoto (Associate professor) is interested in human computer interaction, support technology for disabled person, biomedical engineering.

In the Future

In the near future, we will be surrounding by more and more computers. The examples are wearable computers and ubiquitous computing systems. Many kinds of human computer interfaces will be sought after and we are going to contribute to such a society.

After Graduation

A half of our graduates enrolls in master's courses. And they are studying new human computer interfaces that are easy to use.

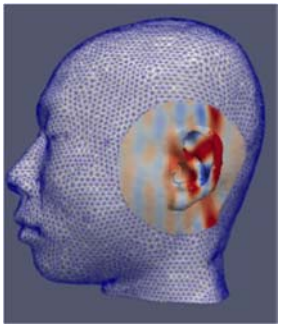


Block diagram of brain computer interface system

Computer Scienc & Engineering

Audio technology for future - Realistic 3D sound -

The auditory system allows us not only to hear sounds, but also to capture spatial information including sound image locations in the surroundings. This is why we can figure out the direction from which people talk to you or a vehicle approaches. By reproducing such spatial information involved in the “sounds”, we can develop next generation audio technology such as highly realistic 3D sound reproduction and communication that transmits people’s presence through the network.



Numerically simulated sound pressure distribution on the surface of human head. Acoustical effects of head were predicted.

Otani Lab

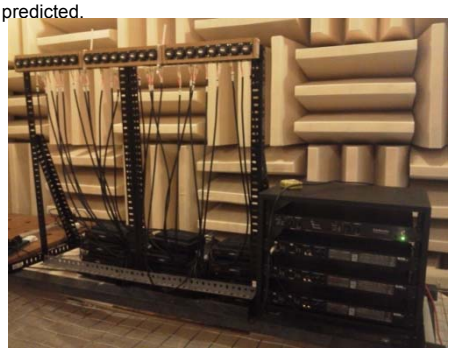
Matoto Otani
Associate Professor was received B.E., M.E., and Dr. Eng. from Kyoto University. His research interests include spatial audio technology and computational acoustic simulation.

In the Future

Such 3D audio reproduction would enable us to participate in music concerts or stadium events from a remote site, or to communicate with our distant families and friends as if they are in the same location. Although we have many problems to solve before realizing truly realistic 3D audio technology, the students in my laboratory are doing research everyday to reach the goal.

After Graduation

Students will have opportunities to work in various fields including electric industries and audio-related companies. Audio-related hardware and software engineering skills that are developed through research activities in my lab can be applied in various industries.



Loudspeaker array system installed in an anechoic chamber, a room without any reflected sound from the walls.

Computer Science & Engineering

IT-based optical sensing systems for better understanding of our living environment

What's going on in our daily environment? What information is needed to keep our living environment secure and safe? The first step is being able to watch situations carefully and know the facts about what is going on in real-time. We have been developing IT (information technology)–based optical sensing systems which can offer lots of information about the environment in which we live. The fusion of optics & imaging with IT is quite powerful in realizing this idea and developing these kinds of systems. Our research is open to the world, but can also be found in the Shinshu-area in such fields as agriculture.

An agricultural sensing network system (AgriServer) operating in Obuse-town: Information on products growing in the fields are provided through the "Nou-Live" website.

Saito Lab

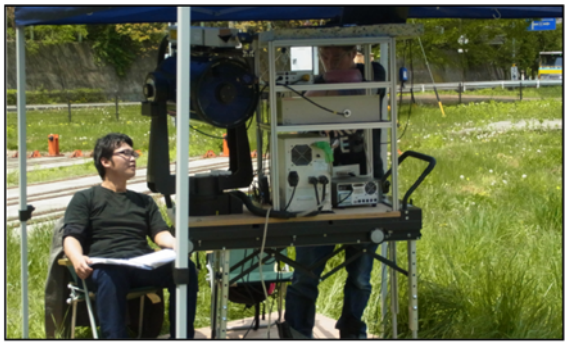
Yasunori Saito,
Professor since 2004.
Always curious to know what happens in the relationship of humans and nature. Field Informatics, Optical & Spectroscopic Sensing, Imaging Technology, and their applications to Environmental Sensing.

In the Future

Humans have created rich and comfortable living environments by using the energy of "light" from the Sun very well. Let's imagine the future world full of bright sun-light. The chances and places for optical technology, which is a gift from nature, will be found anywhere. Especially together with IT, it will be more active in every region of the world. IT-based optical technology will surely open innovative worlds for human living with better security and safety than ever.

After Graduation

"Realize your ideas by taking action. Don't stop to think, but think as you are running. Sometimes you will find yourself challenging and battling difficult trials again and again. Believe your experiences that you've gained by the action, then you will be able to beat the problems you will face." Students in Saito lab. who live by this motto will never give up if they are discouraged by one failure in the real society.

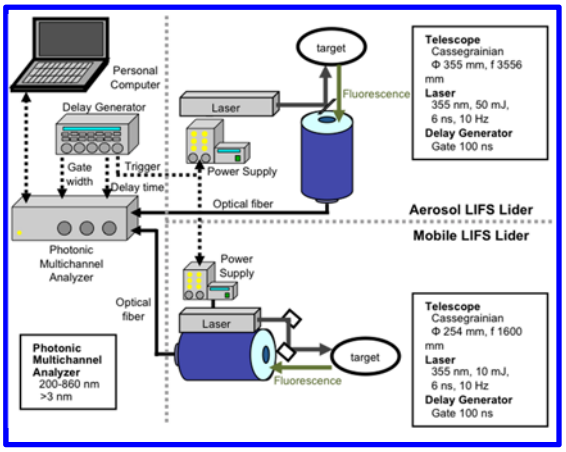


LIFS (laser-induced fluorescence spectrum) lidar field work: Remote sensing of living environments such as air-borne pollen, bio-aerosol, water quality, plant growth status, and others.

Computer Science & Engineering

Development of the measuring device using light for the natural information

We live in a world full of light. We can see the things around us by light. Light gives us information, such as colors, shapes. Light is electromagnetic radiation that is visible to the eye. Electromagnetic wave which is not seen in our eyes are the Infrared, the Ultraviolet, the X-ray and etc.. If you were able to see also electromagnetic waves other than light, then the world around you change greatly. We are not possible to see the electromagnetic waves other than light, but by making use of a special detector can see them, we are able to know the information that can not be obtained by eyes.



Design of remote sensing device using an ultraviolet laser: Observe the fluorescence from suspended matter in the air by irradiation of ultraviolet laser.

Tomita Lab

Takayuki Tomita ,
Assistant Professor
2014: Assistant Prof. (Shinshu)
2012: Postdoctoral (RIKEN)
2012: Ph. D (U. of Yamanashi)
2008: MS (U. of Yamanashi)
2006: BE (U. of Yamanashi)
have done around the study of ultra-high energy cosmic rays and laser remote sensing.

In the Future

In Tomita laboratory is developing an apparatus for measuring fine particles that floating in the air by using the UV laser. This technology is expected success in the engineering field. Moreover, applications in various fields such as physics, earth science, and agriculture are also expected. By pursuing the possibility of electromagnetic waves invisible to the eye, you can see the new world that we have never seen!

After Graduation

The students do the planning of method, strategy and experiment for theme that is given undergraduate students in these-study. Progress in the study will be discussed at the meeting biweekly. In this way, you will be able to master the comprehensive ability to promote as the center of the project, and increase the applied skills that can play an active part in society.

Photos of observation and observation system.

Computer Science & Engineering

Interaction Design and Smart Agri-Gadgets

Our laboratory is interested in interaction design for artifacts in the field of artificial intelligence and agriculture using information and communication technology (ICT Agriculture). Interaction design is about designing processes and exchanging information between users and artifacts such as robots and software agents, and thus we develop novel devices based on our user interface theory. We also apply our study to develop novel gadgets that increases the efficiency of agricultural tasks.

Kobayashi Lab

Kazuki Kobayashi is an associate professor at Shinshu University. He received Ph.D. (2006) in Informatics from The Graduate University for Advanced Studies.

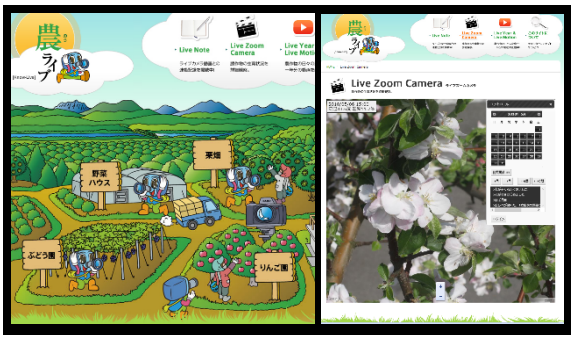
In the Future

There are many digital devices such as smart phones and tablet PCs. We don't feel that it is difficult to use them, not because they are truly intelligent and useful, but because we have the powerful ability to adapt to new things without realizing it. Imagine the future in which smart devices help us autonomously before we even request the help. Our laboratory is trying to build new theories and develop various smart devices.

After Graduation

It is important for students to act on their own initiatives in addition to acquire knowledge about computer science and engineering. We hope that our students continue to challenge and test their ideas by using their imagination and creativity after graduation.

Pet-like remote control agent (left) and High definition Image Monitoring System (right).

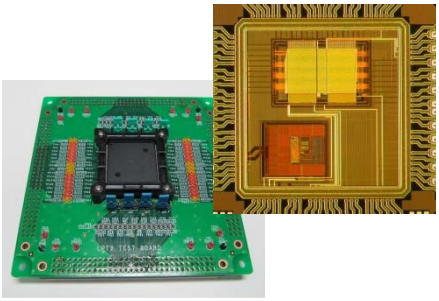


Agricultural Information Website "Know-Live."

Computer Science & Engineering

VLSI technologies for the innovation of new applications

Progresses of electronics and information technologies have produced new industries and services like the Internet, a mobile phone, etc. Espcially, the scaling technology of VLSI realizes a wide variety of functions with low cost. By the commoditization, the matured VLSI technology has been used in many areas. But, Japanese electronics industry is struggling with cost competitiveness. To overcome this, we have to differentiate products from others and customize our VLSI chip with a circuit design technology. Our laboratory will develop a new computer architecture and systems by co-designing hardware, software and application.



VLSI chip and measurement board. Students design and verify a VLSI chip to work as required.

Johguchi Lab.

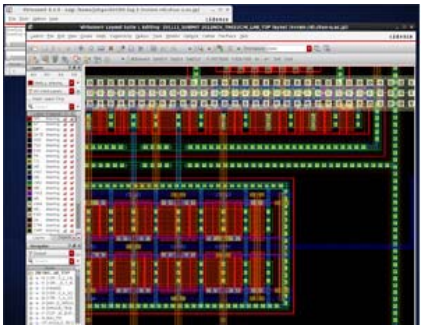
Koh Johguchi
Associate Professor
He received the Ph.D degree from Hiroshima University in 2007.
His research area is low power VLSI circuit design and computer architecture.

In the Future

"Trillion Sensors Universe" is coming up soon. Trillion sensors collect and compute many information from the real world. Then, VLSI circuit design becomes a key technology for medicine, agriculture, husbandry, logistics, architecture and civil engineering. To distinguish products from the competitors and produce unique products, VLSI innovation is essential. In our laboratory, students can study not only digital/analog circuit design but essential technologies from sensor devices to software. By researching in consideration of the output, we will play a vital role in the development of Information Communication Technology (ICT).

After Graduation

As a graduation work, students in Johguchi Lab. propose a circuit and architecture and use their inventiveness to tackle a research project. Students can study a wide area including device physics, measurement technique and software development, etc. Also, successful experiences of achieving something become useful for the future job.



Students define the specification and design a circuit. To fabricate a chip, a circuit designer draws a layout with nm-order scale by CAD software.

Computer Science & Engineering

Computer Technology for a Better Life

In this lab, research is being done on a wide variety of information systems.. With a policy of creating "useful" and "easy to use" technology, the goal is to enrich human life by making mundane tasks easier and more fun.

For example, in the "Mentore-kun" system shown in the top left photo, driver's licence exam questions and answers are explained using animation as shown in screen shot on the top right.

The location display system shown in the two bottom photos is mainly for someone's office. Their location can be checked remotely through the Internet to make it easier for visitors before they come.

Asano Lab

David Ken Asano,
Professor
Worked at the Communications Research Laboratory of the Ministry of Posts & Telecommunications before joining Shinshu University in 1996.

In the Future

In this lab, research is also being done on digital communication systems. If several devices communicate with each other, more intelligent operations can be performed. In the future, devices will work together with their "friends". Students are currently working on ways to do this.

After Graduation

Graduates find employment in such areas as the software, electronics and automotive industries. Prof. Asano teaches students not only about research, but also about life and society, so that they can also enrich their lives.

Driver's licence exam training system: "Mentore-kun"

Questions and answer animation samples

Location display system using an LCD touch panel

Location displayed with a return date and time

Computer Science & Engineering

Creating Support Systems for Better Education and Learning

Why do you study at the school? How do you study? Do you have any clear answers to these questions?
If you have not considered these things, university would be a good place to consider and practice “how to learn” and “how to transfer a learning method to other subject” in addition to acquire highly specialized knowledge and skill.
The members of the lab. are developing some systems to support educators and learners in the viewpoints of knowledge acquisition, learning “learning methods”, and transferring learning methods.

Kunimune Lab

Hisayoshi Kunimune, Ph.D. is an assistant professor with the Department of Computer Science and Engineering, Shinshu University. His research interests focus on educational/learning technology and developing educational support systems.

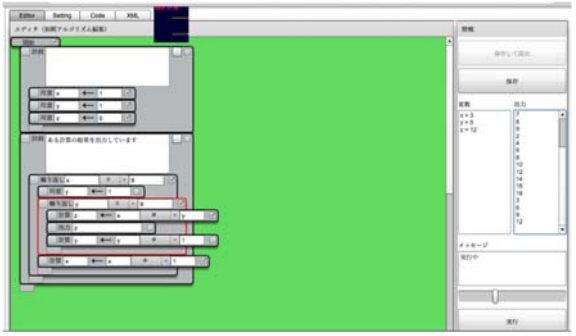
In the Future

The systems we develop partially support educators and learners with the abilities of computers and networks. The abilities are increasing with rapid expansion of the information and communication technology, and the coverage of educational support is also expanding.
However, educators and learners are real people, not computers. The goal of our systems is supporting them to make them focus only on the essence.

After Graduation

The graduates of the lab. are active in various companies including system integrators, infrastructure providers, electronic manufacturers, and so on. The members of the lab. cultivate their attitude about solving problems through their research process, and utilize it in their life.

“Writable Web” system enables it’s users to write memos and communicate with other users directly on web pages.

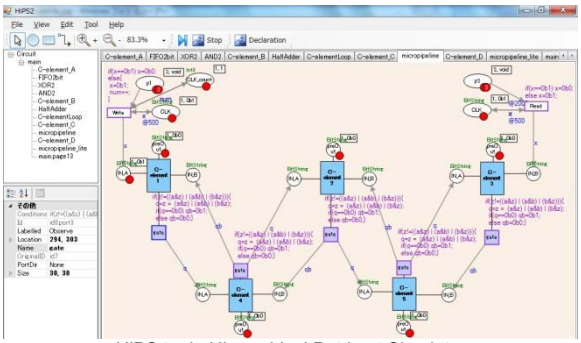


“AT” system offers an environment to learn programming for novice learners without knowledge of programming languages.

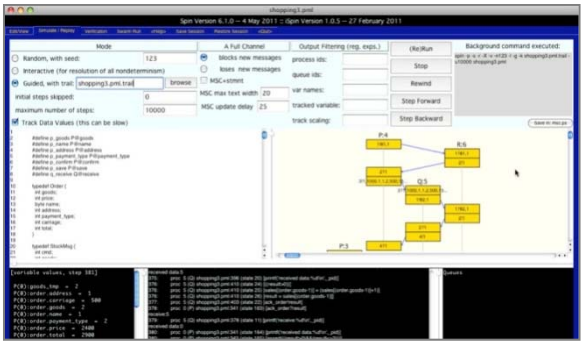
Computer Science & Engineering

★ VERIFICATION FIRST! ★
Foundations of Computer Science

For “Dependability” of information system, it is very important to ensure the system’s "Reliability" and “Safety” represented by QoS or encrypted communications network. We must design without any error (bug) within our ability in order to achieve high reliability required in information system. For "100% bug-free designs,“ we develop the design verification methods and/or tools, for instance by targeting the parallel systems, to inspect all exhaustive state-space.



HiPS tool : Hierarchical Petri net Simulator
http://sourceforge.net/projects/hips-tools/



SPIN Model Checking Tool & iSPIN IDE

Wasaki Lab

Prof. Katsumi Wasaki
His current research interests include modeling and analysis of concurrent, parallel and/or distributed processing systems, mathematical model and formal verification of asynchronous circuits, and hardware compiler for model checking systems.

In the Future

The software is a mysterious, "invisible" industrial product which is stored in the form of "Information (Bit)" without any weight. By verifying the design of the software, we can provide reliable and well-functioning products and services. In this laboratory, we work on the basis theory (theorem proving, model checking systems) and formal verification system (net-oriented design, process algebra specification design, etc.) as well as the modeling method of parallel system, upstream software design, and Petri net design/verification tool.

After Graduation

Graduates are wokring in communication network, software development, system design engineering, and cloud services companies. To train our students as engineers and researchers with logical and independent thinking skills, we discuss our research projects and participate in seminar activities on a daily basis.

Computer Science & Engineering

Developing professional communication skills in engineering students

The students in the Kawamoto Laboratory work on developing important professional communication skills by constructively evaluating the successes and failures of their research work as much as possible during the school year with their colleagues. Their topics of study range from IT applications to support English education inside and outside of the classroom to investigations of the design/development challenges of cyberphysical systems for improving the condition of life in the communities and society around them.

Studying the successes and failures of research in groups, with men and women from various countries helps students develop strong professional communication skills.

Kawamoto Lab

Pauline N. Kawamoto (A.P) has been on the faculty at the Nagano-Engineering Campus in the Dept. of Computer Science and Engineering since 1996.

In the Future

With more and more students eager and willing to do work in English to learn it rather than learn English to do work, there will be greater opportunities for research discussions and collaborations outside of the laboratory, outside of the university that will prepare students for the workforce even outside of Japan.

After Graduation

By emphasizing the development of professional communication skills throughout the research process, graduates enter the workforce with versatile skills in adapting their work discussions with different colleagues, audiences, clients, etc.

Learning what it takes to actually “show” an audience that an engineering solution works.

Computer Science & Engineering

Formalization of Mathematics and Computer Aided Verification

The humans make mistakes, so it is important to verify the correctness of mathematical theorems with a computer. In Shidama Laboratory, students work on formalization of mathematics and computer aided verification. To verify a mathematical theorem with a computer, we write a proof of the theorem by the formalization language. Then we can verify the correctness with a computer logically and mathematically. This method can be applied to the inspection of the development of the engineering system and its movement. A computer program is a description with logical operations that makes output data from input data by a formal language, thus we can express the operations as a mathematical proposition. It is an incomplete method for humans to inspect results using data and to analyze all operations, as we make mistakes. We should verify the mathematical correctness of a computer program with a computer. Then we can make a computer program in which normal operations are mathematically guaranteed..

Shidama Lab

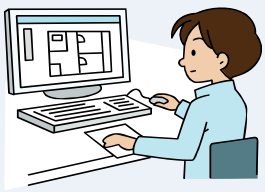
Yasunari Shidama
Professor
Has been on the faculty int the Dept. of Computer Science and Engineering since 1990.
Are interested in Formalization of Mathematics and Computer Aided Verification.

In the Future

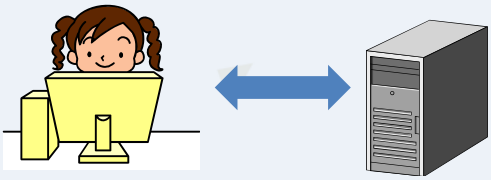
We participate in an international investigation project, that aims to make the library of formalized theorems and proofs of all mathematics.
The purpose is to apply formalized mathematics to computer software development. And we are developing a system that can make a computer program that normal operations are mathematicaly guaranteed.

After Graduation

Our graduates are working as computer science engineers as they have logical and mathematical thinking skills.



Verify the correctness of a specification sheet



The interactive teaching materials of the issue of proof

Computer Science & Engineering

Mathematical Image Understanding

In the Yamazaki Laboratory, we study about understand and analize a image by computer. To understand and analize digital image mathematically, we study mathematical morphology based on set theory, lattice theory, topology and probability theory. Image processing is used for flaw detection and recognition processing in the manufacturing process. The precision instrument is very complicated then human being still inspects the product in many process. As for the human being, understanding a complex image is earlier than a computer, especially it is difficult to understand a image by a computer when the sample image does not exists. In many case, it is important that computer image processing for flaw detection and control the quality of a product.We verify image processing mathematically and to make a computer understand a image like a human being.

Shidama Lab

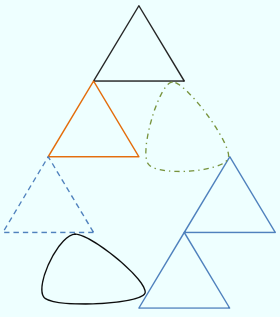
Hiroshi Yamazaki
Research Associate
Has been on the faculty int the Dept. of Computer Science nad Engineerint since 1997.
Are interested in Formalization of Mathematics, Computer Aided Verification and Mathematical Image Understanding.

In the Future

On verification of mathematical morphology and image processiong, we participate in an international investigation project, that aim is to make library of formalized theorems and the proof of all mathematics. And we systematizing this knowledge on mathematics.
The image processing is a technique to be required in many fields and very important.

After Graduation

A computer science engineer they have logical and mathematical thinking skills. They can solve any problem and create new things.



How many triangles is there?

Computer Science & Engineering

Formal Verification of Cryptosystems

We conduct research in cryptology. The cryptology is one of the essential infrastructures that supports the ICT society. However, it is hard to understand the cryptology because the it is based on various technical fields such as the information theory, the computation theory and mathematics, etc. Our aim is to prove the security of the cryptosystems using the computer-aided formal verification system.

Okazaki Lab

Hiroyuki Okazaki
Assistant Professor
He received his Doctor of Engengineering from Kyoto Institute of Technology. His research interests include, cryptology, formal verification

In the Future

Security proofs for cryptographic systems are very important. The ultimate objective of our study is to prove the security of cryptographic systems using computer-aided proof checking systems.

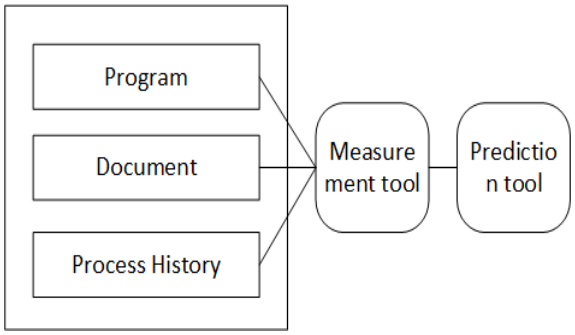
After Graduation

We hope our students will be engineers who can apply theories and knowledge after they graduate.

Computer Science & Engineering

Support efficient software development

We are software engineers, and our objective is to apply the engineering discipline to software development. Our current research interests are traceability and metrics. Traceability is the relation between software documents, and by tracing these relations, we can understand and maintain the software. The purpose of metrics is to visualize the current software status and to enable the prediction of the future status. We are cooperating with several enterprises.



A variety of documents are created, and they are measured. Based on these measurements, software processes are predicted.

Kaijiri Lab

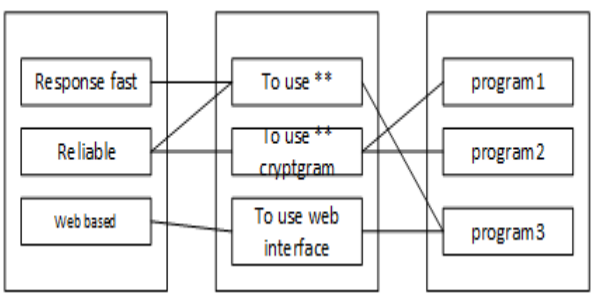
Kenji Kaijiri
I have studied and developed software for about forty years. Software is changing drastically, but the fundamental discipline has not changed.

In the Future

Software has relations with various systems, so it requires knowledge of other domains in order to develop each system. However, the fundamental knowledge is the same. And this fundamental knowledge is at the basis of software engineering. Thus you can develop any kind of software, if you fully understand this knowledge.

After Graduation

Software will change the world, so we hope that our graduates develop novel software that can change the world

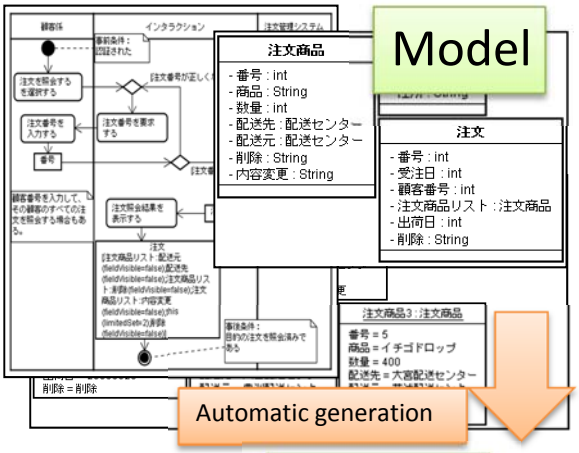


A variety of documents have many relations with each other. These relations are key factors in software maintenance

Computer Science & Engineering

Model-Driven Engineering for Enhancing Software Usability

Our researches focus on how to enhance software usability systematically and efficiently at an early stage of software development. The Validation and Verification (V&V) of software requirements are very important. However, their cost is expensive because of frequent manual inspections and/or prototype creation, etc. Therefore, V&V activity support at the early stage is needed. We have challenged to realize tools such as “model-based usability evaluation tool” and “prototype generation tool”, etc. so that usability can be evaluated efficiently.



Prototype generation tool: the Web app. model in Unified Modeling Language is transformed into User Interface prototype

Ogata Lab

Dr. Shinpei Ogata
Assistant Professor since 2012. He received PhD degree in engineering from Shibaura Institute of Technology. His research areas are model-driven engineering and requirements engineering,

In the Future

Various devices such as sensors and/or touch display, smartphones, etc. have been used in business widely. Therefore, the usability of the Applications using various devices will be very important in the future. Our research will contribute to the efficient construction of usable software.

After Graduation

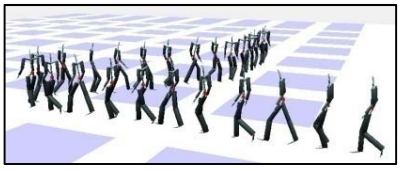
Modeling requires an abstraction ability. Enterprises for software development look for engineers with this ability. You can train this ability in our lab.

Computer Science & Engineering

Improving image understanding performance by learning from examples

In Maruyama Lab., our research focuses on image understanding, content based image search, pattern recognition, 3D recovery from images, and computer graphics. Especially we are very interested in techniques to improve image understanding and pattern recognition performance by learning from examples.
We can easily recognize and understand the contents included in the image. This ability is improved through learning from our everyday experience. Our research goal is to providing such significant ability of learning to recognize various kinds of information to computer.





We also study on computer graphics techniques such as photo-realistic rendering algorithms, semi-automatic character animation synthesis via reinforcement learning etc.

Maruyama Lab

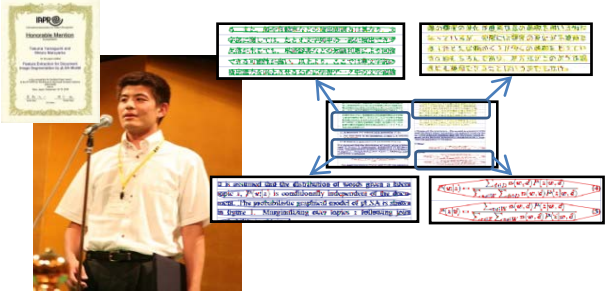
Minoru Maruyama
Professor
Since 1996, he is with Shinshu Univ. Before joining Shinshu Univ., he was with Mitsubishi Electric Corp. 1990-1991, he was a visiting scientist of MIT AI Lab.

In the Future

We are investigating methods for image understanding such as image modeling based on probabilistic topic models, image segmentation via energy minimization, recovery of 3D structure from image sequence, Our research interest also include computer graphics such as photo-realistic rendering algorithms. These techniques can be used for various kinds of applications including content based image query on the web, human-computer interaction,

After Graduation

Over half of the graduates go to graduate school (master program of Shinshu University).
Graduates of our lab are employed by electronics companies, IT companies, including video game companies etc. Many graduates are working as software/IT engineers.

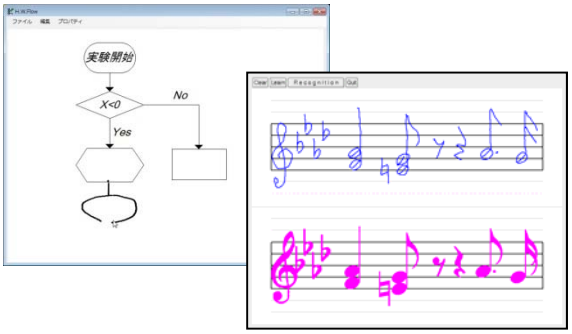


Our work on the application of topic models to pattern classification received best paper award honorable mention at the International Workshop on Document Analysis Systems 2009 (DAS2009).

Computer Science & Engineering

Information processing for pen and touch interfaces

Nowadays, tablet PCs and smartphones are used everywhere and are equipped with touch screen and pen devices. In my laboratory, we have developed application software which functions by using these interfaces. For example, in their applications, objects handwritten with a pen device can be sequentially recognized, arranged, and outputted by a computer automatically. We collaborate closely with Prof. Maruyama's group, so please refer to the description of his laboratory.



Handwritten flowchart recognition system and handwritten music score recognition system with a pen device

Miyao Lab

Hidetoshi Miyao
Associate Professor
He received the Ph.D. from Shinshu University in 1997. His research interests are pattern recognition and human computer interaction.

In the Future

We are planning to construct an environment to enhance human creativity by computer. For example, when a user writes a note or a music symbol, the computer creates it on the screen without interrupting the flow of the user's thoughts by using automatic symbol recognition techniques.

After Graduation

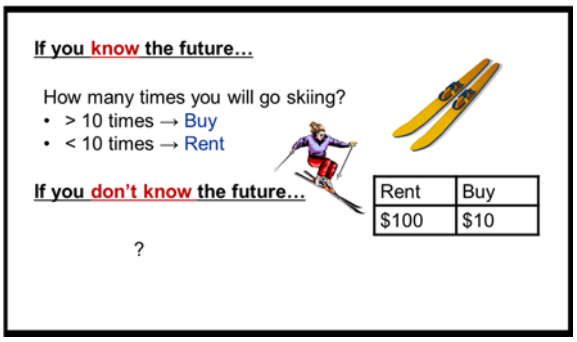
About the half of the alumni and alumnae go on to graduate schools, and the other half work in industries as software developers, system engineers, etc, using their experiences in my laboratory.

Similar image search system by using a touch interface on a smartphone

Computer Science & Engineering

Managing the uncertainty of the future

We sometimes have to make a decision immediately, with no information about the future. For example, "which is the better, to rent or to buy a ski gear?" Or, "how to pack loads that are arriving one after another into trucks?" If you knew about the future, you could make a good choice exploiting that information. But, it is often the case that "no one knows what may happen tomorrow." In our laboratory, we reveal the nature underlying such situations and study strategies and algorithms that run without future information.



The "ski-rental problem" is equivalent to the choice of a strategy of automatically turning off the backlight on a mobile phone.

Fujiwara Lab

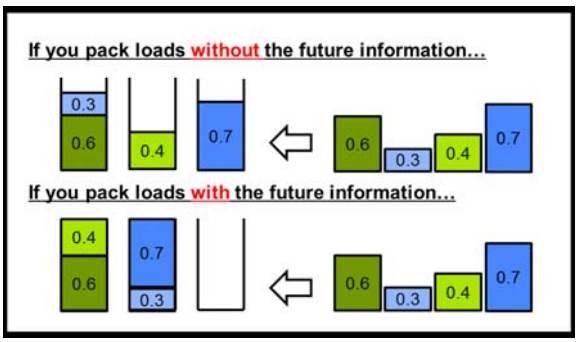
Hiroshi Fujiwara
Associate Professor
Ph.D. from Kyoto Univ.
During his career, he visited Univ. Freiburg and UESTC, China. His research interests include algorithms and optimization.

In the Future

Our aim is to design strategies and algorithms that output the "best possible choice" for each moment under the setting that one can have hopelessly little information about the future like "no one knows what may happen tomorrow." Furthermore, we clarify the nature of the inherent value of information, by theoretically comparing the cases with or without future information.

After Graduation

In our laboratory the students acquire and polish up their comprehensive skill to solve problems. Specifically, the skill consists of (1) to grasp the nature underlying the problem precisely, and (2) to consider what tools or approaches lead us to a solution.

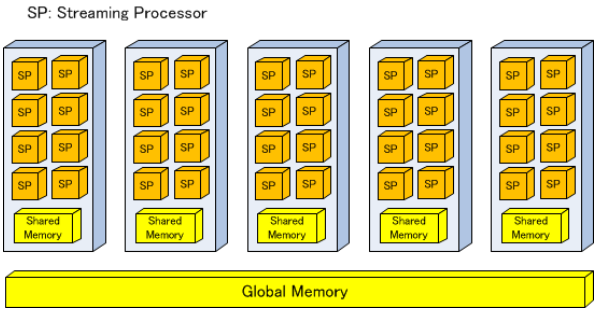


The "bin-packing problem" has application in several areas such as logistics or distributed systems.

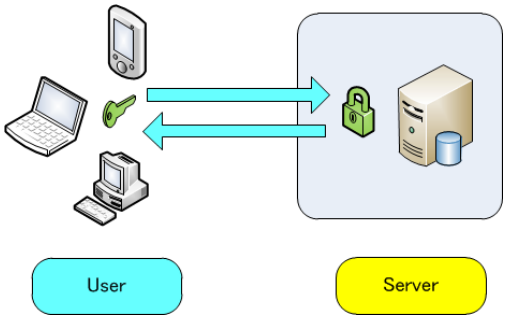
Computer Science & Engineering

Study on Secure and efficient Searches

Yamamoto Lab. is studying on developing algorithms for secure and efficient search and XML data. A secure search technique is one of the most important technologies in cloud computing because it can preserve a privacy and sensitive data. Also a search technique for XML (eXtensible Markup Language) data is a critical issue because XML is becoming a standard languages over the Internet. Therefore we aim at developing efficient search algorithms for these issues.



GPU (Graphical Processing Unit): A GPU has many cores, and plays an important role in developing efficient algorithms.



Searchable encryption system: A user sends an encrypted query to a server. The server searches for documents using the encrypted query.

Yamamoto Lab

Hiroaki Yamamoto
Professor
In 1988, he joined Shinshu University. His research interests include pattern matching algorithms, automata theory, and information retrieval.

In the Future

In ubiquitous network society, a secure search technique for preserving a privacy and sensitive data is one of the most important technologies. Furthermore a search technique for XML data is also a critical technology. Yamamoto Lab. is aiming at developing new methods for these issues.

After Graduation

Students get mainly jobs related to the information technology.

Computer Science & Engineering

Image processing for more clear image creation

Do you have a regrettable experience that your best shot is actually not so good? In particular, dark place photographing or backlight photographing are difficult for us. However, the difficulty of hardware can be addressed by software. For example, If you take another image and make a pair of flash and no-flash images, you can obtain a noise-less and blur-less clear image using a recent computation method. Our laboratory develops methods to obtain more natural and high resolution images like we are feeling.

Denoising by synthesizing textures of a flash image (left) and colors (also shadows) of a no-flash image (middle), and its output clear image (right).

Shirai Lab

Keiichiro Shirai
Assistant Professor received the Ph.D. degree from Keio University in 2006. The research filed is multi-dimensional signal processing dealing with 2D image and 3D model.

In the Future

Image processing, especially the category of image restoration, still has a mountain of problems to address. For example, deblurring of images taken with handheld camera is still difficult one. However, if they can be solved, we can obtain more clear and high resolution images. In addition, the benefits improve the accuracy of its application fields such as image recognition for robotics and security system.

After Graduation

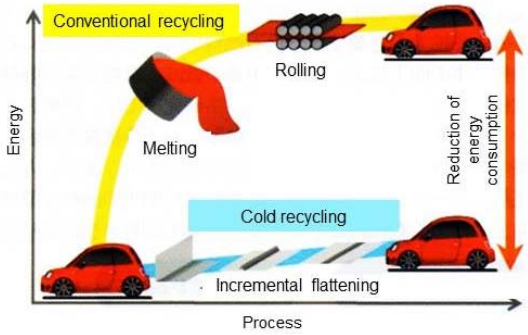
Mainly image processing is associated with makers producing cameras, projectors, printers, and scanners. The demand, however, is spreading in industry along with the demands of image recognition. Our alumni is now active in electronics and car manufactures.

Creation of images based on human perceptual feeling. In an original image (left), the regions of photographic subjects (middle) are enhanced while other background regions are blurred.

Environmental Science & Technology

Cold recycling; Transparent compressed wood

The environmental problems such as the global warming became the serious problem to threaten a sustainability of the human development. To reduce environmental impacts occurring at each stage of the life cycle of products, three new techniques have been developed in our laboratory. The first is a technique of the incremental forming for the purpose of the small lot production of the sheet metal product. The second is a technique of compression forming for the purpose of the production of eco-product which contributes to fixation for a carbon long term with biomass as raw materials, such as chaff, bamboo and thinning wood. The third is a technique of the cold recycling of sheet metal products for the purpose of the reduction of the greenhouse gas emission.



The cold recycling enables large reduction of energy consumption and the greenhouse gas emission in comparison with conventional recycling.

Kitazawa Lab

Kimiyoshi Kitazawa
Professor
Research Interest: Technology of plasticity; Eco-materials; Recycling; Eco-mind
Awards: 1989 Paper prize (JSTP); 2005 Award of the Ministry of Education (JSEE)

In the Future

The incremental forming enables us to break away from the society of mass production, mass consumption and mass disposal. The product prepared by the compression forming is harmless for natural ecosystem and the health of the person in all stages of the life cycle of product. The sheet metal restored by the cold recycling has the formability that is equal to sheet metal restored by the conventional recycling including the melting process. Recycling not to dissolve metal is becoming the reality.

After Graduation

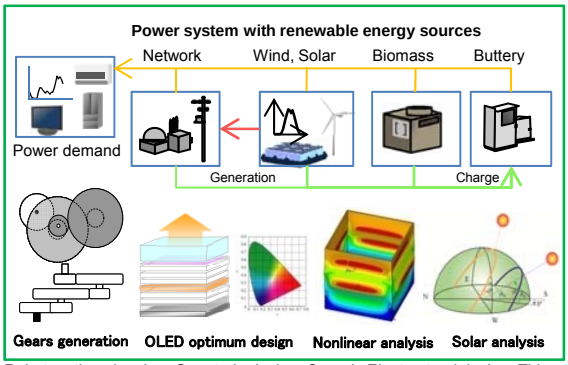
Graduates who performed experimental study of the eco-technology plays an active part as an engineer in makers such as the electric electronic equipment, car, precision instrument and metal.

Transparent compressed wood made from Japanese cypress (*Chamaecyparis obtusa* Sieb. et Zucc.) .

Environmental Science & Technology

"Optimization" for Sustaining the Environment and "Design" for Creating the Future World

Designing machines and systems is the process in which many types of knowledge in the fields of material properties, mechanics of materials, environmental consciousness and design methods are synthesized. Optimal design is essential for achieving high efficiency and performance of machines, saving costs, and reducing energy consumption. Sustainable design is needed for the entire process from manufacture to usage, disposal, and reuse of materials including maintenances. In our laboratory, we are actively working to develop optimization techniques, optimal designs for X, and sustainable design processes in the fields of mechanical engineering and engineering optics,



Robot motion planning, Gear train design, Organic EL structural design, Thin films for solar energy control, Intelligent power network, Community design, LCA, Nonlinear structural analysis, Thermal radiation analysis

Nakamura Lab

Masayuki Nakamura
Professor
Research filed: Design Eng., Computational Mechanics. Lecture course: Mechanics of Materials, Engineering Optics, Optimum Design Engineering, Renewable Energy Engineering.

In the Future

Optimization technique is a technology essential for utilizing energy and resources efficiently. And environmentally-friendly design promoted all over the world and model-based development using ultra-high-speed computers are essential for such efficient development and they will also conserve the global environment and ensure safety.

After Graduation

Graduates are working as engineers and researchers, in various fields; auto mobile, general machine, information equipment, construction machinery, medical equipment, electronics manufacturer, plant engineering, and civil service. About 80% of students have gone to graduate schools.

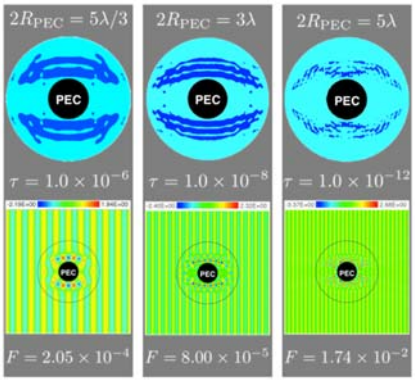
Optimum Design Lab is full of smile and cool ideas ! "Optimization for Sustaining the Environment", "Design Technology for Creating the Future World"

Environmental Science & Technology

Optical cloak of invisibility & Topology optimization

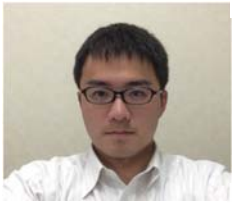
Optical cloaking devices can render objects invisible by controlling the flow of light around the objects without any scattering. Cloaking devices composed of dielectric materials are designed by using topology optimization method. Topology optimization methods enable us to maximize devices performances by designing devices structures. In the optimizations of cloaking devices, the amount of light scattering is minimized and becomes almost zero.

Computing machineries, displays, and UPSs for numerical computations.



Designed optimal cloaking structures and their cloaking performances.

Fujii Lab



Garuda Fujii,
Assis. Prof.,
Dr. Eng. Nagoya Univ. in 2012, Assistant Professor in Akita Prefectural University, April 2012 – September 2013, Assistant Professor in Shinshu University, October 2013 - now.

In the Future

We now try to fabricate optical cloaks by using 3D printers to realize high-performance optical cloaks. STL data are created by FEM data of optimal configurations and experiments for cloaking performance will be carried out.
We also try to improve cloaking performance for frequencies. Designing wide-band cloaks is one of the most important and interesting future works.

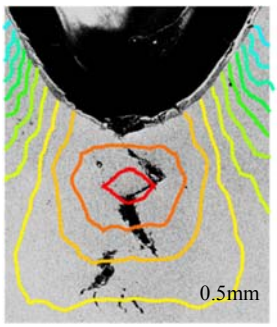
After Graduation

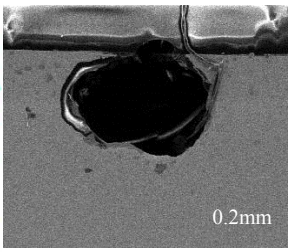
Graduates of our laboratory work in various engineering companies.

Environmental Science & Technology

Improving the reliability of power plant materials

We have been conducting researches on the various corrosion mechanisms and the preventions of the boiler equipment materials and the steam turbine materials for thermal and geothermal power plants. We also research on the creep strengths and fractures of the high-pressure steam turbine rotor materials for thermal power plants for long-term services at higher temperatures. Contribute to the safety improvement of power generations and the effective utilization of geothermal energy.





A pit formed on the specimen surface of a turbine blade steel.

Creep cracks generated near notch-root of a turbine rotor steel and the distributions of mean stress calculated by FEM.

Niu Lab

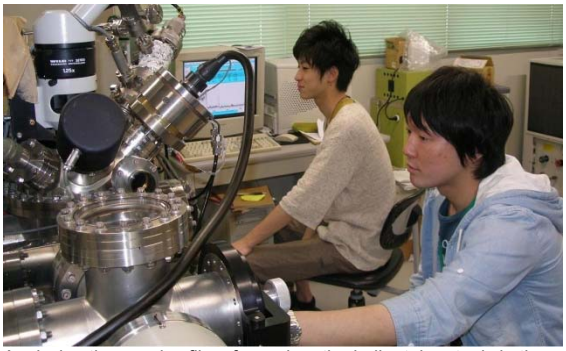
Dr. Li-Bin Niu
Associate Professor
His academic researches span the strengths and fractures of engineering materials.

In the Future

As engineers and scientists in the future we persist in study, experiment, analysis, calculation and discussions in the laboratory, as well as presentations in academic meetings, to acquire practical ability and knowledge on engineering materials.

After Graduation

Many of our graduates are active in the field of research and development, design and production management in the related companies of material, machinery, automobile, power and electrical machinery.



Analyzing the passive films formed on the boiler tube steels in the simulated boiler feed-water of thermal power plants with XPS.

Environmental Science & Technology

『Eco-Friendly Hydraulic Turbine』 ～For Low Head Sites

Hydro power is the highest-potential renewable energy source in Japan. However, there is no room left in Japan for new construction of large hydro electric power plants. On the other hand, we can utilize our Eco-friendly hydraulic turbines in many low head sites . The turbines do not require any civil engineering. These turbines are suitable for rivers and irrigation canals, which have little head but much flow rate or high speed stream. Our approach leads to cheaper power generation without environmental disruptions, compared with that of large-scale hydro electric power plants.

Photo of opened undershot type turbine. The electric power is used for lighting in a house.

Iio Lab

Shouichiro Iio
Associate Professor
Fluid engineering, Eco-friendly hydraulic turbine, Flow measurement and control, Jet flow, Pneumatic system, Hydraulics.

In the Future

Our mission is to provide a solution to save the environment through research of cutting edge, eco-friendly turbine technology. We have developed water turbines to match various water flows, and studied to improve the performance of turbines in the lab. We conduct experiments outside the lab to improve the durability of eco-friendly turbines and their power generation ability by a grid of connected multiple turbines.

After Graduation

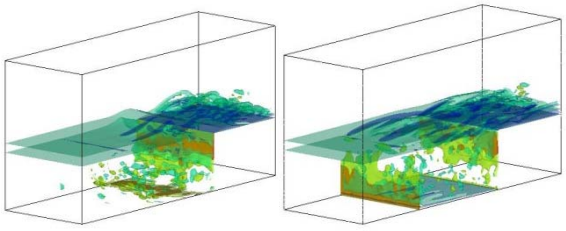
The graduates are active in the environmental, mechanical, automotive, energy, material, electronics/electron and governmental fields in Japan and abroad.

Waterfall type turbine (left) and Jet type turbine (right)
Each electric power is used for an electrified fence and a satellite mobile phone.

Environmental Science & Technology

Numerical simulations of flows using a supercomputer

Our main research interest is computational fluid dynamics. Current research projects are: direct numerical simulations of flows over an open cavity, including studies of the effects of cavity aspect ratio on self-sustained oscillations of separated shear layer and recirculating vortices in the cavity; active control of cavity flow; direct numerical simulations of jet – edge system; direct and large eddy simulations of two-dimensional turbulent jets.



Isosurfaces of vorticity in flow over cavity. The left figure shows an uncontrolled flow and the right figure shows a controlled flow.

Yoshida Lab

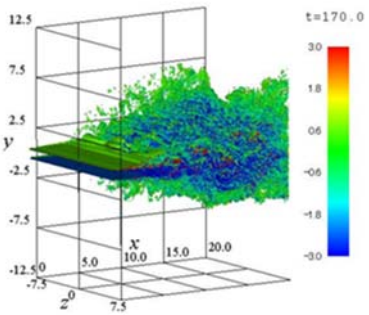
Takashi Yoshida
Associate Professor
PhD Engineering 1995, Nagoya University.
Faculty: Nagoya University, 1994-1997.
Faculty: Shinshu University, 1997-

In the Future

The Navier-Stokes equations, that are the momentum equations of flow, are nonliniear. Thus solving these equations is very difficult. Numerical solutions of the Navier-Stokes equations for complex flows can be obtained from numerical simulations using supercomputers. We can investigate the mechanism of complex flow using advanced supercomputers.

After Graduation

Numerical simulation has been a useful tool for engineering design and analysis. Alumnus from our laboratory are working as mechanical engineers, mechanical designers, software designers, system engineers , etc.

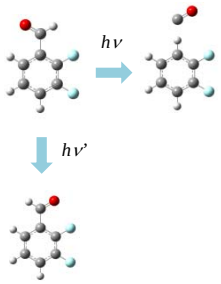


Isosurfaces of vorticity in a two-dimensional turbulent jet.

Environmental Science & Technology

Photochemistry and dynamics of small molecules

From the environmental point of view strongly linked with the depletion of the ozone layer, the photochemistry of halogenated species and their gas-phase reaction with OH radical have attracted much attention both experimentally and theoretically. Research in our group focuses on the photoinduced reaction of halogenated species in low temperature rare gas matrices and the computational elucidation of their oxidation mechanism.



Setup for the matrix isolation study.

Tanaka Lab

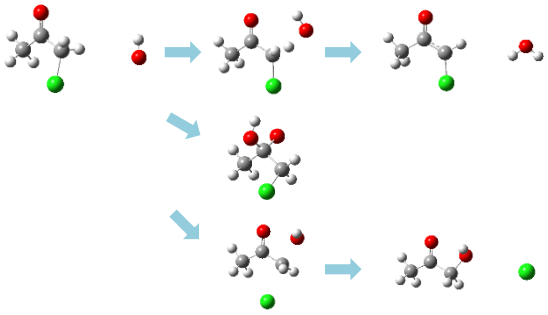
Nobuaki Tanaka
Associate Professor
Photochemistry
Computational Chemistry

In the Future

It is hoped that the study will give a good sight for the treatment of waste halogenated species and computational study will be used for evaluating the possible mechanism of the oxidation.

After Graduation

Graduate school
Chemical industry
Automotive industry
Municipal office
etc



Computational study on the reaction of chloroacetone with OH.

Environmental Science & Technology

Water purification and energy development using forces of nature

Water, air, and soil purification can be ecologically achieved using forces of nature without harming the environment. We study such purification processes utilizing not only photocatalysts, but also natural clay minerals as adsorbents during solar light irradiation. We are also applying the technology of photocatalysis to dye-sensitized solar cells imitating photosynthesis mechanism and to photofuel cells utilizing organic wastes in order to create alternative energy. It is important to develop sustainable energy to establish an ecological society.

Blue dye in water can be degraded during light irradiation using phototcatalysts such as titania .

Nishikiori Lab

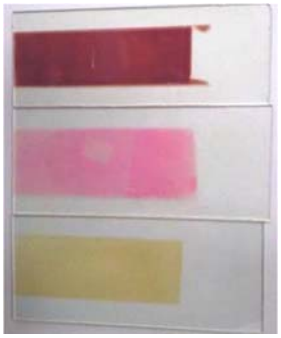
Hiromasa Nishikiori
Associate Professor
Environmental Photochemistry, Photocatalysis

In the Future

We study oxidative degradation of some pollutants and wastes and generation of electricity using the composites consisting of photocatalysts and natural clay minerals. This technology can induce effective adsorption and degradation of the organic substances on the composites. Photofuel cells with the composite electrodes can generate electricity with disposal of the wastes using photocatalytic reaction.

After Graduation

Graduates are working actively in various fields, e.g. environmental management, water and air disposal, and electronics. We educate our students so that they have their own ideas to utilize forces of nature for environmental conservation and development of environmentally-friendly technology.



Electrodes of dye-sensitized solar cells

An example of experiment in water purification

Environmental Science & Technology

Growth of Functional Single Crystals by Flux Method

Various minerals (crystals) are naturally produced on earth such as jewels like diamonds and rubies. Oishi Lab collaborates with Teshima Lab and Wagata Lab. We study the growth of functional crystals by environmentally-friendly flux method, that mimics the mineral growth in nature. Our lab is on the leading edge of the research on crystal growth by flux method into the world. We work on eco-materials & eco-technology for the future generations, being fascinated by beautiful flux-grown crystals.

Ruby crystals grown by environmentally-friendly flux growth; (left) Hart-shaped ruby coating, (right) idiomorphic ruby crystals with hexagonal pyramid shape

Oishi Lab

Shuji Oishi
Professor
He completed graduate school of Gunma Univ., and started to work as an assistant professor in Shinshu Univ. in 1974. He has been assigned at present post from 2000.

In the Future

Crystals consist of three-dimensional periodic aligned-atoms and ions. Their perfect regular alignments offer them ultimate properties. Flux method is a method of growing crystals in a solution. One advantage of this method is that the grown crystals display natural facets. Now we are focusing on the flux growth of functional crystals that can be applied to develop eco technologies. The crystal science and technologies that we learn from the nature have hopes of saving the future of the earth.

After Graduation

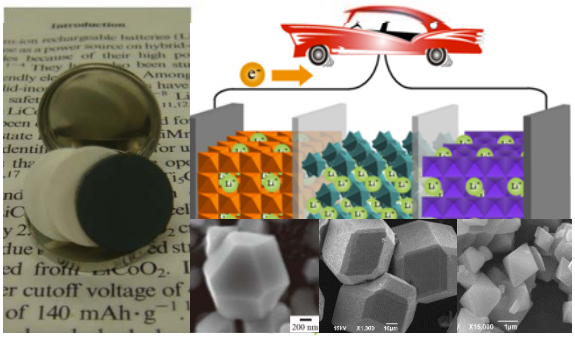
Many students from our lab have become researchers and engineers that hope to change the future with eco materials & eco technology. They are active in various fields that are related to automobiles, electronics, and machinery, as well as materials science and chemistry.

Carbon dioxide fixation by an environmentally-friendly process mimicking the formation mechanism of shells and corals in sea (crystal growth of calcium carbonate)

Environmental Science & Technology

Flux Innovation for Pioneering Energy & Environmental Materials

『For The Future Green Mobility』
Teshima Lab has been working to design new energy & environmental crystalline materials in collaboration with Oishi Lab and Wagata Lab. In particular, we are challenging to construct a new scientific principle in order to develop functional inorganic crystals with hierarchically controlled structures, ranging in size from 0.1nm to 100μm. With this principle, we can achieve the reduction of energy losses and/or the highly efficient energy use of all-solid-state energy conversion devices.



All-crystal-state lithium-ion batteries for electric vehicles; coin-cell type LIB (left), schematics of LIB structure and our crystals

Teshima Lab

Katsuya Teshima
Professor
He completed doctoral degree in Nagoya Univ. and started to work as an assistant professor in Shinshu Univ. in 2005. He has been assigned at present post from 2011.

In the Future

High quality crystals, used in semiconductors and many other applications, are indispensable materials in our lives, because single crystals have potentials to exhibit their near-marginal performances. This is a very important concept in the material development of solid-state energy-conversion devices, next-generation energy storage and production, solar hydrogen generation, and purification of hazardous matters.

After Graduation

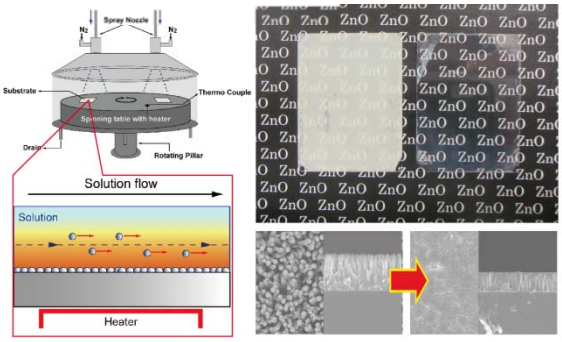
Graduates from our lab are committed to developing eco materials & eco technologies. Therefore, they are active as researchers and engineers in various fields relating to automobiles, energy, electronics as well as materials science and chemistry.

Future scientists presenting in international conferences (in France, Italy, and Korea) and the largest exhibition of university in Japan (students in our lab)

Environmental Science & Technology

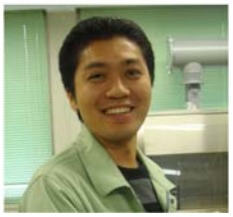
Challenge to Construct an Environmentally-Friendly Method

In Wagata Lab, we collaborate with Oishi Lab and Teshima Lab to create next-generation energy and environmental materials. In particular, we focus on an aqueous solution method for fabrication of inorganic materials. The aqueous solution method is very simple and can produce inorganic materials below 100°C. Chemical reactions seen in the method is similar to those of living organisms on earth. We are trying to create inorganic materials with special structures and/or novel functionalities by studying the process of material creation in nature.



Coating equipment using aqueous chemistry (left), zinc oxide films prepared with the equipment (right). The microstructure of the films can be tuned easily.

Wagata Lab



Hajime Wagata
Assistant Professor
He completed doctoral degree in Tokyo Institute of Technology in 2011. He has been assigned at present post from 2012.

In the Future

An aqueous solution method doesn't require high temperature, high pressure, nor a vacuum. Thus, materials prepared by the method usually contain various impurities, but its advantage is that various composite materials can be easily prepared. We are trying to construct an environmentally-friendly aqueous solution method for fabrication of functional inorganic materials.

After Graduation

In our Lab, students study leading-edge materials science and engineering and learn about environmentally-friendly processes. We hope our graduates will be the experts in various fields making the most out of their experiences in our lab.

Photographs of our laboratory. Students are discussing and advising each other independent on their research theme.

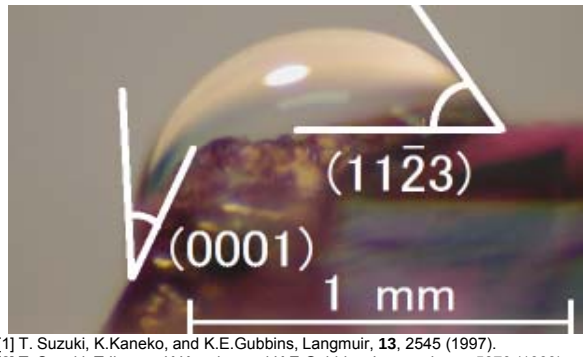
Environmental Science & Technology

結晶の表面張力の実測と結晶表面の熱力学

Main subject of my research is "Measurement of specific surface free energy of synthesized of natural single crystals".

Before I move to Shinshu University, I was studying molecular adsorption on activated carbon materials. Computer simulation of Monte Carlo method was used and compared with experimental results. One of my important works is quasi-symmetry structure of CCl_4 molecular assemblies in a graphitic nanopore [1,2]. I calculated the radial distribution of CCl_4 molecules, and predicted anusual structure of CCl_4 molecules in activated carbon. This prediction was confirmed by measurement of X-ray diffraction experimentally.

Since 2001 I started to study the specific surface free energy of single crystals. Actually, the idea of specific surface free energy is significant to discuss the morphology of single crystal. Especially, the grown length of crystal face is proportional to the specific surface free energy of the crystal face, and this relationship is proposed by Wulff [3] in 1901. Although the Wulff's relationship was theoretically well known, experimental verification was not performed for a century. We (probably) first time determined the specific surface free energy of crystal experimentally [4]. In case of liquid, specific surface free energy is known as surface tension. The specific surface free energy of solid is believed to be impossible. However, the balance of specific surface free energy of liquid and solid face is known as Young's equation. If we measure the contact angle of liquid on crystal face, we can determine the specific surface free energy of the crystal. The students of my group performed experimental determination of specific surface free energy of single crystals of apatite [5], ruby [6], and quartz [7]. We also determined the specific surface free energy of crucible materials for sapphire synthesis.



鈴木研究室

鈴木 孝臣　准教授
東京大学理学部卒、千葉大学助教授を経て2001年より現職。研究分野は固体表面の熱力学。

[1] T. Suzuki, K.Kaneko, and K.E.Gubbins, Langmuir, **13**, 2545 (1997).
[2] T. Suzuki, T.Iiyama, K.Kaneko, and K.E.Gubbins, Langmuir, **15**, 5870 (1999).
[3] G. Wulff, Z. Krist. **34**, 449 (1901).
[4] T. Suzuki, K. Nakayama, and S. Oishi, Bull. Chem. Soc. Jpn., **77**, 109 (2004).
[5] Takaomi Suzuki, Haruka Takemae, Mika Yoshida: J. Crystallization Process and Technology, **3**, 119-122, (2013)
[6] T. Suzuki and M. Oda, J. Cryst. Growth, **318**, 76 (2011).
[7] T. Suzuki and H. Kasahara, Cryst. Res. Technol., **45**, 1305 (2010).

Environmental Science & Technology

Life sciences lab: Creation of systems based on life.

How do you think about life and the application of life system? My lab has been studying life sciences, molecular biology, genetics, cell biology, neuroscience systems biology, synthetic biology. Life is very interesting in the viewpoint of system, design, and philosophy: for example, what is I or we or what is a human being. I believe advanced life sciences that my lab works on is certainly important for our future. Finally I usually welcome students who are eager to join this exciting field.

Practical data handled in Kataoka lab. You can see raw data in the field of molecular biology, biochemistry, structural biology, cell biology and neuroscience, respectively.

Kataoka Lab

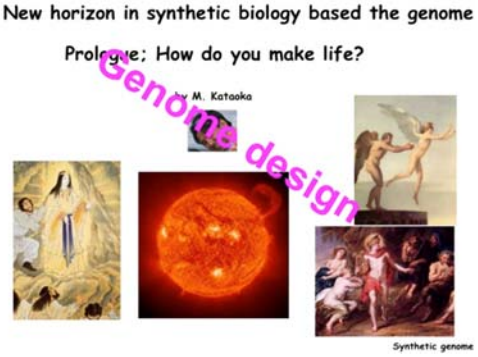
Masakazu Kataoka
Ph. D.
Associate Pfofessor

In the Future

The understanding of life system has progressed dramatically in the past five or six decades. But many mysteries remain and the ultimate goal, that is the complete understanding of life is still far beyond our reach. We aim at the application of knowledge from basic research. The field of application is broad and includes food, medical, pharmacy,

After Graduation

After graduation, students are working at companies in the fields of food, medical, pharmacy and so on. Some are working as domestic civil servants.



Summarized images of the synthetic biology. Can we behave as “the God of Sun”?

Mathematics

Mathematics for Uncertainty and Fuzziness

Over the last fifty years there have been many attempts in extending the theory of classical probability and statistical models to the generalized one which can cope with problems of inference and decision making when the model-related information is scare, vague, ambiguous, or incomplete. Such attempts include the study of nonadditive measures and nonlinear integrals, imprecise probabilities, vector measures, and their applications in information sciences, economics, engineering, and social sciences.

Kawabe Lab

Jun Kawabe, Professor
Doctor of Science (Tokyo Institute of Technology, 1981)
Specialty area: nonadditive measures, nonlinear integrals, and vector measures.

In the Future

Nonadditive measure and nonlinear integral theory refine the mathematical theory of measure and integration and they are closely related to probability theory and statistics. They have been used in expected utility theory, game theory, and some economic topics under Knightian uncertainty.
Vector measures are also useful when studying mathematical models in infinite dimensional systems.

After Graduation

We are producing quality graduates with intellectual creativity and logical thinking power as well as knowledge and skills in their specialized fields.

Some of our recent papers concerning nonadditive measure theory. They are published in English to spread all over the world.

To finish off writing a paper, we always have some hundreds-page research note.

Mathematics

Operator theory and quantum information theory

Quantum information theory is an information theory based on quantum mechanics. Quantum teleportation and a quantum computer are famous and important applications of quantum information theory.
Since quantum states are described by operators and matrices with some properties, it is important to study operator theory and theory of operator algebra. Our group studies quantum information theory mathematically.

Ohno Lab

Hiromichi Ohno
Associate Professor
Ph.D., Information science, Tohoku University, March 2005.
Associate professor at Shinshu University, since 2009.

In the Future

RSA is a cryptosystem based on the difficulty of finding a prime factorization. But if we have a quantum computer, we can find it easily and thus we can crack a code. Quantum teleportation is a new means of communication. When we use quantum teleportation, it is impossible to eavesdrop. Quantum information theory will develop our communication technology.

After Graduation

Graduated students from our laboratory work in various fields as engineers, government employees, teachers, etc.
One of our aims is to improve students' logical thinking skills and problem-solving abilities.

Daily life in our laboratory. Students study and prepare for their seminar.

A scene of a seminar. Students and teachers discuss mathematical problems.

Mathematics

Mathematical Physics : Mathematics sheds light on physical phenomena

My current research interest is the spectra of electrons in hydrogenated *graphenes*. Graphene is a nanomaterial composed of carbon atoms that are arranged in a two dimensional honeycomb lattice. While graphene is a semiconductor with a zero band gap, fully hydrogenated graphene, which is in particular called *graphane* (with an *a*), is an insulator with a band gap. I am interested in the spectra of electrons in partially hydrogenated graphenes.

Suzuki Lab

Akito Suzuki,
Associate Professor
Research Interests:
Mathematical Physics,
Spectral Analysis
Keywords:
Quantum Field Theory,
Discrete Laplacian

The structure of such a material is mathematically described by a graph composed of a set of vertices and edges. Atoms in the material are described by the vertices and atomic bonds by the edges. Then the Laplace operator on the graph becomes the Hamiltonian of an electron moving in the material. The spectrum of this Hamiltonian corresponds to the energy of the electron. The physical properties like electrical conductivity are analyzed via spectral analysis using mathematics such as functional analysis, operator theory, and graph theory. To study the spectra of electrons is an important subject in mathematical physics.

Mathematics

Nonlinear Partial Differential Equations

Many physical, chemical, and biological phenomena can be modeled using differential equations, which are in many cases nonlinear. But, it is difficult to find a solution of the Cauchy problem (initial value problem) for nonlinear partial differential equations (PDEs) because of its nonlinearity. Well-posedness of the Cauchy problem therefore is important and a first step of study for nonlinear PDEs. Here, well-posedness means that the existence of a solution, uniqueness, and continuous dependence of initial data.

In a seminar, not only understanding a theory of mathmatics but also good presentation skills are important.

Okamoto Lab

Mamoru Okamoto
Assistant Professor
He received doctor's degree of science from Kyoto University.
His research interest is nonlinear partial differential equations.

In the Future

Our aim is to obtain low regularity well-posedness of the Cauchy problem for nonlinear partial differential equations (PDEs), especially nonlinear dispersive and wave equations. If nonlinear parts have symmetry, namely is invariant under some transformations, one can expect that the worst interaction is cancelled out. Construction of a theory for these cancellation properties is our goal and that will contribute the evolution of a wide range of nonlinear PDEs.

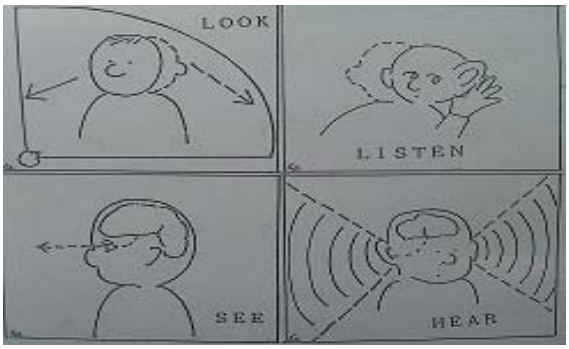
After Graduation

In order to more advanced research, some graduated students of our laboratory enter a graduate school. Other students find a job in companies.

Foreign Language Education

"RUN" is not just "run"

We aim to hypothesize the core meaning (context-free semantic content) of Basic English words. "RUN" is defined as "to move quickly, smoothly and continuously in a certain direction." The sense or contextual meaning may be different in "I have a run in my stocking again (*densen suru*)," "A stream runs in front of my house (*nagareru*)," "My nose has been running for days (*hana ga deru*)," but the core meaning of RUN remains the same. The concept of core meaning is useful to grasp the full extent of the target word and is applied in dictionaries and textbooks for language learners.



Images of the core meaning of LOOK, SEE, LISTEN, HEAR.

Terasawa Lab

Saiki Terasawa
Instructor, Faculty of Liberal Arts, Shinshu University. 1995, Assistant Professor, Faculty of Engineering.
2007, Professor.
Fields of Study: Semantics of Basic English words, Applied Linguistics and Film Studies.

Quiz for you

What is the difference between "see" and "look"? Why does "Can you look at the white house over there?" sound somewhat strange? Why do we say"I looked but didn't see anything" but not "I saw but didn't look at anything"?
"Look" can take "at" "up" "down" "back" "around" and a lot more but "listen" mostly occurs with "to." Why is that? Hints are in the picture on the upper right. Please come find out the answers in class!

Film Analysis class

Learn about life and human nature. Analyze the screen image and scenario and understand the message of the film. Appreciate great films that will remain in your hearts for a long time and enrich your mind. Come and enjoy.

We have a guest speaker today.

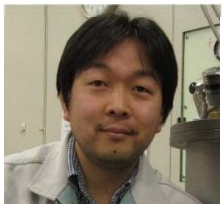
Technical Division

The growth of functional single crystals leads to the future, innovative society!

Main interest of our laboratory is the growth and evaluation of semiconducting and functional oxide single crystals such as silicon (Si) and sapphire. Single crystals are electrically, optically, and mechanically homogeneous materials. For example, Si single crystals are widely used for LSI devices or solar cells. We are one of the leading groups in the field of bulk crystal growth in Japan. Currently, we are conducting various cooperative researches related to "green materials" with Guest Professor Keigo Hoshikawa.

Several typical single crystals, such as silicon (center) and sapphire (left and right side), grown in our laboratory or cooperative companies.

Taishi Lab



Toshinori Taishi
Associate Professor
Main research fields are bulk crystal growth and evaluation of crystalline defects. He was born in Nagano.

In the Future

We are currently working on the growth of various single crystals called "green materials" that contribute to environmental preservation. Sapphire, one of the key materials for our laboratory is used as a substrate for GaN-based LED devices. Thus we study the growth of large-scale and high quality sapphire crystals by vertical Bridgman technique, which is one of the typical melt growth methods.

After Graduation

Students in our laboratory acquire many skills and techniques related to the crystal growth and they learn how to apply them. After graduation, we hope that our skillful students actively work in various companies or academic institutions.

Left: An operator is observing the inside of the Czochralski growth furnace. Right: A germanium single crystal grown from the melt.

Technical Divison

The environment where you can acquire technical skills through experiments and analysis

The Technical Division is organized into four specialized sections (Instrumental analysis section, Measurement research section, Manufacturing technology section, Information processing section). Every technical staff experienced with his/her specialized skills and knowledge is supporting various educational researches.

The staff of the Technical Division

Large Equipment and Instruments for Students and Researchers

You can use large equipment to analyze various materials.

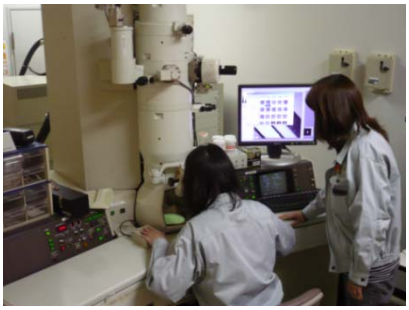
Technical Division is in charge of the maintenance and administration of operation of large equipment and instruments that are installed in Faculty of Engineering for the purpose of education and research. We are also responsible for technical training and consultation of the users. They are actively used by students, faculty, and the researchers of industries as well. We are also responsible for the repair of equipment, trouble shooting, and requested analysis.

Example of equipment

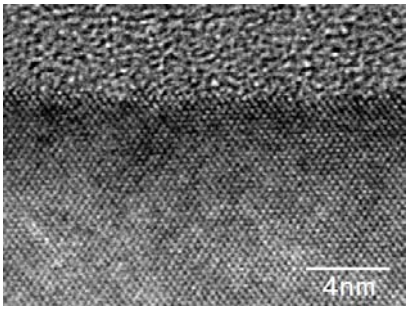
SEM (Scanning Electron Microscope) : This microscope expands the image by irradiating an electron beam to what you want to observe.

XRD (X-Ray Diffractometer) : The crystal structure of a sample is measured from the diffraction angle and intensity by irradiating X-rays to the sample.

EPMA (Electron Probe MicroAnalyzer) : This analyzer analyzes constituent elements of a sample from the wavelength and intensity of the characteristic X-rays emitted when an electron beam is irradiated to the sample.
In addition to these, there are FIB, XPS, FE-SEM, STEM, NMR, GC-MS, etc.



Analysis and observation of the nano-level by transmission electron microscope



Lattice image observation of material

Technical training

Manufacturing Technology Center

You can learn "craftsmanship" by using many machines at Manufacturing Technology Center.

Manufacturing Technology Center is a place where we device and process machines, tools, and experimental devices that are required for education and research. We also train students. We've made lathe, milling machine, drilling machine, welding machine, grinding machine, band sawing machine, shearing machine, NC milling machine, NC grinding machine, machining centre, etc.

We offer students the safety training for how to handle machines and tools at the center, so that the students acquire the basic technical skills.
With certificates of safety training Program, students can perform the processing operation by themselves. We continue to supervise students during the operation, and help students with technical advice. We are very eager to learn with the students when they work on their graduation research projects.

Program processing by NC milling machine for making the experimental device used for a graduation research project.

Many drill machines used at the safety training program.

Many machine tools, such as machining centre, NC milling machine, vertical milling machine and horizontal milling machine are equipped.

Library We support your study!

School of engineering library supports faculty members and students with over 160,000 books in various technical fields. Our aim is to stimulate lifelong thirst for knowledge and learning and foster curiosity in *our students* .
We offer not only a space for book reading, but also many computers with fast internet connections so that students can access academic journals and research papers.

Learning support

Books & More
There are 100,000 books, journals and DVDs in the library. Other stockroom materials are also available. You can also borrow books from other Shinshu University and public libraries by making a request.

24 Hour Study Area
There is a 24 hour open section in the library for registered students.

Student Tutor (Learning Advisor)
Graduate students are in the library on weekdays to help you with your studies.

English Study
We own a lot of materials that you can use to study English: they are not only books related to language tests but also movies, audio books, and comics such as Harry Potter, One Piece, etc.

Twitter
Shinshu University library is now on Twitter. Please follow us @ShinshuUnivLib.

@ ShinshuUnivLib

Support for research

Papers & Theses
34,000 titles of e-journals are available on top of printed journals. You can also access academic databases to search for papers and articles from around the world.

Open Access
Papers by faculty members are accessible on the internet.

Information Literacy
We offer information literacy training. It will help you to find and obtain academic information, including books, papers and articles.

Book hunting tour
Students take part in stocking the library with books they need

2F Group study room
The room is equipped with a projector. You can use it to prepare for presentations.

Study area
There are several types of spaces. Group study area (the lower right photo) is a 24 hour open section.

1F Refresh corner
A relaxing space. Eating and drinking is allowed.

The dean's shelf

Recommended books

Besides these, there are other special topic shelves, such as environmental or English.

1F Moving shelves (Bound journals)

NANA-chan
Nana-chan is a mascot character of a library

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