KANAGAWA UNIVERSITY

2022

Laboratory and Facility Guide

Faculty of Engineering
Faculty of Architecture and Building Engineering
Graduate School of Engineering
Research Institute for Engineering

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Field of Mechanical Engineering/Graduate School

[Graduate (M.C. and D.C.)]

Department of Mechanical Engineering/Undergraduate

Mechanical Engineering Courses/Graduate School
Department of Mechanical Engineering/Undergraduate

Thermal Energy Engineering Laboratory

Hiroyuki Ito (Professor) Office: 8-515 Ext.: 3436
Laboratory: 8-451 Ext.: 3427

Education／H. Ito (e-mail: itohiro@kanagawa-u.ac.jp)
03/1995, Ph.D., Hokkaido University
03/1992, M.S., Hokkaido University

Research Field: Combustion Engineering, Thermal Engineering.

Research Overview: Studying combustion characteristics of highly densified biomass briquettes. Developing optical measurements of soot in diffusion flames. Studying the heat transport mechanism in pulsating heat pipes (PHPs).

Combustion of Highly Densified Biomass Briquettes

Biomass fuels have attracted much attention because they can reduce fossil fuel consumption, helping to prevent global warming. There are few studies on combustion of biomass briquettes and pellets and on instruments for measuring their combustion, whereas there are many studies assessing the cost and efficiency of pelletizing and briquetting. In particular, the combustion of highly densified biomass briquettes, which have great advantages in storage and transport, should be investigated. In this laboratory, we are developing a new combustion method that can control the combustion rate of biomass briquettes based on producing biomass briquettes of different shapes. The combustion characteristics of the method have been investigated.

Figure 1 Biomass briquettes made of Japanese cypress.

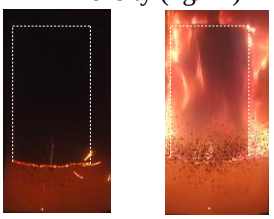

Figure 2 Combustion behavior of single fuel block.

High-performance Heat Transport Devices

The power dissipation of semiconductor chips has increased dramatically, and thus small, highly efficient heat transport devices are required. PHPs are a promising high-performance heat transport device. The thermal-hydraulic phenomena in PHPs are complicated, and we are investigating the heat transport mechanism in PHPs.

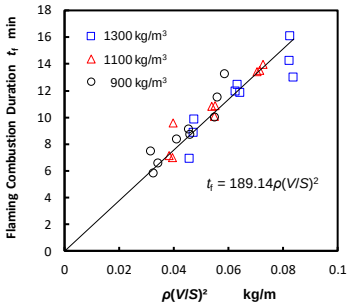

Figure 3 Relation between flaming combustion duration and briquette density and specific surface area

Publications:

1) “Influence of biomass raw material on the flaming combustion behavior of highly densified biomass briquette,” *Transactions of the JSME*, 85(879), pp.1–11 (2019) (in Japanese). 2) “Study on liquid film formed with liquid column oscillation in pulsating heat pipe (Measurement of liquid film thickness using forced oscillation system),” *Transactions of the JSME*, 85(879), pp.1–13 (2019) (in Japanese). 3) “Influence of size and density of highly densified biomass briquette on combustion behavior,” *Transactions of the JSME*, 83(852), pp.1–13 (2017) (in Japanese). 4) “Experimental investigation of heat transport with oscillating liquid column in pulsating heat pipe using forced oscillation system,” *International Journal of Heat and Mass Transfer*, 106, pp. 997–1004 (2017). 5) “Study on one-dimensional steady combustion of highly densified biomass briquette (bio-coke) in air flow,” *Proceedings of the Combustion Institute*, 35(2), pp. 2415–2422 (2015).

Affiliated Academic Organizations:

The Japan Society of Mechanical Engineers, Combustion Society of Japan, The Japan Institute of Energy (Biomass Division), Japan Society for Design Engineering, The Heat Transfer Society of Japan, Japanese Society of Latent Heat Engineers.

Current members: Professors: 1; Postgraduates: 1; Undergraduates: 12

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Robotics Laboratory

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Education／Hun-ok Lim (e-mail: holim@kanagawa-u.ac.jp)
03/1999 Ph.D., Waseda University
03/1990 M.E., Waseda University

Research Field: Robotics, Mechatronics, Control Systems, Intelligent Mechanical Systems

Research Subjects: Humanoid Robots, Medical and welfare robots, Entertainment robots, Human friendly robots, Flying robots, Personal motor rollers, Tele-robots, In-pipe inspection robots, Object recognition, Biped Humanoid Robot, Human-Robot Coexistence Robot

Introduction:

(1) Humanoid Robot

Humanoid robots are expected to be used in homes, offices and disaster areas in the near future. Thus, we have developed the Kanagawa Biped Humanoid Robot (KBHR) that consists of 42-DOF: 2-DOF in each ankle, 1-DOF in each knee, 3-DOF in each hip, 3-DOF in the waist, 3-DOF in each shoulder, 1-DOF in each elbow, 3-DOF in each wrist, 5-DOF in each hand, and 3-DOF in the head (refer Fig.1). Its weight is 55.4 [kg] and its height is 1.66 [m]. The KBHR can walk forward, backward and sideward using a real time pattern generator. Its hands can grasp many different kinds of objects such as a plastic bottle of mineral water, a cube-shaped object, a spherical rubber ball, and other complex shapes. The mechanisms and control methods for walking and working in different environments, such as one with humans, are currently being studied.

Fig.1 BHR

(2) Human Friendly Robot

Almost all robots have been constructed under the assumption that collisions with the environment do not occur. For human safety, the robots have various sensors; however, in a situation where a collision occurs with a human due to a failure of the sensor systems and/or the power supplies are suddenly turned off, the human may be severely injured. Therefore, a Human Friendly Robot (HFR) that does not use sensory information for human safety has been developed (refer Fig.2). The HFR consists of a 4-wheeled omni-directional base, a trunk, two arms and air cushion covers. A Collision Force Suppression Mechanism (CSM) that is comprised of a transmission rack, a clutch gear, and compression springs is installed at the joints of the waist and the arms of the HFR. When the robot collides with a human, the arms and the waist will automatically move in the collision direction to reduce impact and collision forces without any electronic control. The base will also move depending on the magnitude of the collision force. Research for more reliable human safety mechanisms is being conducted.

Fig.2 HFR

Publications:

1) Direct Perception and Action Decision for Unknown Object Grasping, International Journal of Artificial Life Research, Vol.7, Issue 1, pp.38-51(2017). 2) Joint Mechanism That Mimics Elastic Characteristics in Human Running, Machines, Vol. 4, Issue 1, Art. 5, 15 pages (2016). 3) A Novel Design for Adjustable Stiffness Artificial Tendon for the Ankle Joint of a Bipedal Robot: Modeling & Simulation, Machines, Vol. 4, Issue 1, 22 pages (2015). 4) Utilization of Human-Like Pelvic Rotation for Running Robot, Frontiers in Robotics and AI, Vol. 2, Art. 17, 9 pages (2015).

Affiliated Academic Organization:

IEEE, The Japan Society of Mechanical Engineering, The Robotics Society of Japan, The Society of Instrument and Control Engineers

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Current member: Professors: 1; Postgraduates: 8; Undergraduates: 11

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Robotic Control Systems Laboratory

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Education/T. Egami (e-mail: egami@kanagawa-u.ac.jp)
03/1987, Ph.D., Hokkaido University
03/1984, M.S., Hokkaido University

Research Field: Robotics, Mechatronics, Control Systems.

Research Overview: Development of experimental space elevator climbers, development of welfare robots, vehicle robots and robot hands, theory and application of path control and preview control.

Research Subjects: 1. Development and control of experimental climbers. 2. Development of fictitious power transmission construction support robot system. 3. Development of a robot hand with an iris mechanism. 4. Development of a wheelchair that can be operated by body movement. 5. Development of transport drone using iris robot hand. 6. Path control of a ball & plate device.

Development and Application of Experimental Space Elevator Climbers

A space elevator is a physical connection from the surface of the Earth to a geostationary Earth orbit above an altitude of 36,000 km. Utilizing robot and control technology, we are developing experimental climbers and indoor test equipment to study the mechanism and performance. Currently, we are developing attitude control using a spiral propulsion mechanism for rope-type climbers, and climbers pressing force. We are also developing a fictitious power transmission construction support robot by making use of this technology.

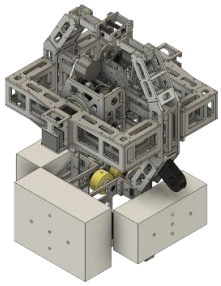

Figure 1Spiral propulsion climber.

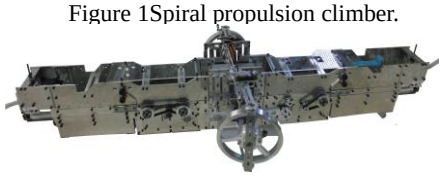

Figure 2 Experimental space elevator climber.

Development and Control of Electrical Wheelchairs that can be Operated by Body Movement

We are developing an electric wheelchair that can move forward and backward and can rotate according to the movement of the user's center of gravity. Wheelchair robots are targeted for inverted pendulum type and general electrical wheelchair type. These are actively exhibited at exhibitions, etc., with the aim of putting them into practical use.

Figure 3 Experimental wheelchair.

Publications:

1)T.Egami and T.Tsuchiya, "Modern control engineering –From basic to applied–," *Sangyo Tosho Publishing Co. Ltd.*(2020-9) (in Japanese). 2)T.Egami et.al., "Points to keep in mind when entering the space business, new technologies and new materials required, " *The Technical Information Institute Co. Ltd.*(2020-4) (in Japanese). 3)R.Takahashi, T.Goto, Y.Nonaka and T.Egami, "Development of an H-type climber for infrastructure inspection and an optimal synchronous control system, " *Transactions of The JSME,* vol. 87, no.902(2021-9) (in Japanese). 4) K.Umemoto, T.Endo, F.Matsuno and T.Egami, "Stability analysis of a control system with nonlinear input uncertainty based on disturbance observer, " *International Journal of Robust and Nonlinear Control* (2020-4). 5)M.Sarieva, L.Yao, K. Sugawara and T.Egami, "Synchronous position control of robotics system for infrastructure inspection moving on rope tether, " *Journal of Robotics and Mechatronics*,vol.31, no.2, (2019-4)

Affiliated Academic Organizations:

The Society of Instrument and Control Engineers, The Institute of Electrical Engineers of Japan, The Robotics Society of Japan, The Japan Society of Mechanical Engineers, IEEE, Japan Space Elevator Association (Fellow).

Current members: Professors: 1; Postgraduates: 8; Undergraduates: 13
Facilities: NC milling machines, 3D printer, robot manipulators, electric wheelchair

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Intelligent Machine Laboratory

Bin Zhang (Assistant Professor) Office: 12-24 Ext.: 3472
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Education／Bin Zhang (e-mail: zhangbin@kanagawa-u.ac.jp)
03/2017 Ph.D., University of Electro-Communications
09/2013 M.E., University of Electro-Communications

Research Field: Intelligent robotics, intelligent mechanical systems, autonomous driving, intelligent information processing, artificial intelligence.

Research Subjects: Autonomous robots, guide dog robots, education assistance systems, robot vision, auditory information processing, autonomous driving, machine learning.

Introduction:

(1) Guide Dog Robots that Provide an Audio Description of the Visual Environment

Because the demand for guide dogs outstrips supply, an alternative is required, and research on guide dog robots that providing guiding services to visually impaired people is attracting increasing interest. However, existing guide dog robots have difficulty considering the social needs of the user when they are guiding, so visually impaired people do not have the opportunity to enjoy the surrounding environment and scenes in cities.

In this research, a guide dog robot that can sense the visual environment around the user, understands scenes in cities, and provides an audio description is proposed. A database containing images of scenes of daily life and captions data is built, and a long short-term memory network is used to translate the visual environment into text. An interaction function that can explain the scene specified by the user by voice is designed. This robot is expected to improve the social acceptance of guide dog robots.

Fig. 1 Guide dog robot.

(2) Autonomous Mobile Robots that Consider the Potential Occupied Spaces of Objects

Robots working in the daily living environment need to coexist with the surrounding environment and move around autonomously. They not only need to avoid collisions with surrounding objects (obstacles and people) for safety, but also to maintain optimal social distance and avoid unnatural behaviors that make people uncomfortable. This ability is vital for the development and popularization of robots. In this research, the attributes of objects are considered in the daily living environment, and the spaces that are potentially used (called potential occupied spaces), including those without real objects, are analyzed. Then, the spatial risk map is generated and a method to allow the robot to maintain a social distance and act autonomously is proposed. It is expected that robots that coexist with humans will be used in daily living environments, such as homes and offices.

Fig. 2 Mobile robot.

Publications:

1) Development of Easier Understanding Teaching Method for an Educational Assisting Robot, IEEJ Transactions on Electrical and Electronic Engineering, vol. 142, no. 1, pp. 90-99, 2022. 2) Collision Force Suppression System for Human‐Friendly Robot, IEEJ Transactions on Electronics, Information and Systems, vol. 141, no. 9, pp. 1016-1022, 2021. 3) PID Control for 4 Rotor Flying Robot Using Neural Network for Automatic Adjustment of PID Gains, IEEJ Transactions on Electronics, Information and Systems, vol. 141, no. 3, pp. 464-470, 2021. 4) Robust 2D Mapping Integrating with 3D Information for the Autonomous Mobile Robot under Dynamic Environment, Electronics, vol. 8, no. 12, 1503, pp. 1-11, 2019. 5) A Framework for Adaptive Motion Control of Autonomous Sociable Guide Robot, IEEJ Transactions on Electrical and Electronic Engineering, vol. 11, no. 6, pp. 786-795, 2016.

Affiliated Academic Organizations:

IEEE, The Japan Society of Mechanical Engineering, The Robotics Society of Japan, The Institute of Electrical Engineers of Japan.

Current members: Assistant Professors: 1

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Aerospace Structure Laboratory

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Ryuta Kitamura (Assistant Professor) Laboratory: 6-107 Ext.: 3301
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11/2009, Ph.D., The University of Tokyo
03/1999, M.S., Yokohama National University
Education/R. Kitamura (e-mail: ft102093gj@kanagawa-u.ac.jp)
03/2015, Ph.D., Yamaguchi University
03/2012, M.S., Yamaguchi University


A. Takano


R. Kitamura

Research Field: Spacecraft Structure, Structural Design, Mechanics of Materials, Statistical Prediction of Strength, Composite Materials, Finite Element Method.

Research Overview: Investigation of buckling and brazier instability. Design and analysis of adhesive joints and bolted joints. Development of statistical methods for material and structural strength. Design and development of micro-rockets.

Research Subjects: 1. Structural analysis and design. 2. Composite structure and testing. 3. Bolted joints. 4. Statistical analysis.

Introduction:

Aircraft and spacecraft design; Aircraft and spacecraft require light, reliable structures, and thus structure design must be improved. Although computational analysis has advanced, there are still no satisfactory design criteria for predicting buckling of thin-walled structures, and bolted and adhesive joints for composites and honeycomb sandwich panels. We are currently tackling this area of research.

Statistical prediction for material and structure strength; A- and B-basis values are used to predict whether a material is suitable for aircraft and spacecraft structures; however, there is no statistical method for evaluating the differences between calculated and experimental results, similar to buckling. Hence, we are developing statistical methods that can be applied to materials and structures.

Design and development of micro-rockets; University labs have developed and launched micro-satellites by piggybacking on large rockets. There are limited opportunities for launch using this method. We are developing micro-rockets for micro-satellites to allow cheaper, faster launches.

Publications:

1) Takano, “Inferential Statistical Method for Structural Design,” *AIAA Journal*, Vol. 55, No. 3, pp. 1026-1030 (2017). 2)Takano, “Closed-Form Solutions of Thin Anisotropic Cylinders under Torsion, Axial Compression and Combined Load,” *Transactions of JSME, Series A,* Vol. 80, No. 812, SMM0085 (2014). 3) Takano, Matsubayashi, Matsuda, Obata and Morikawa, “Long-Term Preload Measurement and Prediction for Ti-6Al-4V and A286 Bolts”, *Transactions of JSME, Series A,* Vol. 79, No. 804, pp. 1201-1209 (2013). 4) Takano, Morinaga and Inoue, “One-Sided Tolerance Limit on Analysis of Variance (for Unbalanced Data),” *Transactions of JSME, Series A,* Vol. 79, No. 800, pp. 455-462 (2013). 5) Takano, “Interaction between Euler Buckling and Brazier Instability,” *J Solid Mech Mater Eng*, Vol. 7, No. 1, pp. 92-101, Jan., 2013. 6) Takano, “Statistical Knockdown Factors of Buckling Anisotropic Cylinders under Axial Compression,” ASME *J Appl Mech*, Vol. 79, 051004, doi: 10.1115/1.4006450 (2012). 7) Takano, “Simple Closed-Form Solution for the Buckling of Moderately Thick Anisotropic Cylinders,” *Aerospace Technology of Japan*, Vol. 10, pp.17-26 (2012). 8) Kitamura, Yamaguchi and Goda, “Formulation of Off-Axial Interfacial Debonding and Sliding Problem by Constrained Conditional Finite Element Method”, *Adv compos Mater*, Vol. 26, No. 4, pp. 363-373 (2016).

Affiliated Academic Organizations:

A. Takano: The Japan Society for Aeronautical and Space Sciences, The Japan Society of Mechanical Engineers, The Society of Material Science.

R. Kitamura, The Japan Society of Mechanical Engineers, Japan Society of Composite Materials.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 2; Undergraduates: 11

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Composite Materials Laboratory

Kenichi Takemura (Professor) Office: 12-37 Ext.: 3488
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Education/K. Takemura (e-mail: takemura@kanagawa-u.ac.jp)
03/1994, Ph.D. (Engineering), Doshisha University

Research Field: Strength of Materials, Composite Materials, Fracture Mechanics.

Research Overview: Investigation of strength, fracture toughness, fatigue, creep, and molding methods for composites.

Research Subjects: 1. Creep properties of carbon fiber reinforced plastics. 2. Interfacial properties at fiber/resin interfaces in composites. 3. Creep properties of green composites containing natural fibers. 4. Interfacial and fatigue properties of green composite containing natural fibers.

Introduction: Fiber-reinforced plastics (FRPs) are usually an epoxy resin or thermoplastic resin reinforced with glass fiber, carbon fiber, or natural fibers. So, FRPs have the excellent mechanical properties of their components.

Carbon Fiber-reinforced Plastic (CFRP)

CFRP is used for airplane parts because it has high specific strength and high specific stiffness. We investigate the interlaminar fracture toughness and creep property of CFRP, and we design and manufacture CFRP joint parts for electronic vehicles by using the finite element method.

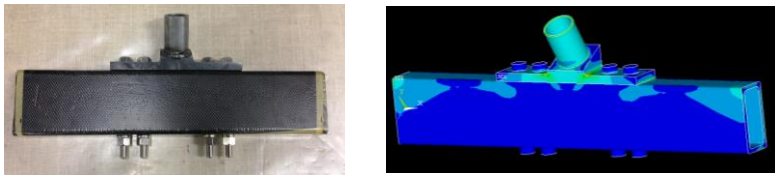

Figure 1. CFRP joint parts for electronic vehicles

Natural Fiber-reinforced Plastic (NFRP)

NFRPs, which consist of natural fibers in thermoplastic resin, are alternative materials to glass fiber-reinforced plastic. In Europe, hemp fiber is mainly used for buildings and automobile parts. However, we examine the mechanical properties of NFRPs containing jute, kenaf, and bamboo fibers.

Green Composites

Green composites are NFRPs made from a biodegradable thermoplastic resin like PLA that address the problem of plastic waste. We examine the mechanical and biodegradable properties of green composites.

Publications:

1) H. Katogi and K. Takemura, “Flexural Properties of Flax Sliver Reinforced Green Composite by Molding Pressure and Chitosan Fiber Addition”, *WIT Transactions on Engineering Sciences*, Vol.124, pp.93-99, (2019-5)
2) K. Matsumoto, T. Ishikawa and T. Tanaka, “A Novel Joining Method by Using Carbon Nanotube-based Thermoplastic Film for Injection Over-molding Process”, *Journal of Reinforced Plastics and Composites*, Vol.38(13), pp.616-627, (2019-3).
3) H. Katogi, Y. Shimamura, K. Tohgo, T. Fujii and K. Takemura, “Effect of Matrix Ductility on Fatigue Strength of Unidirectional Jute Spun Yarns Impregnated with Biodegradable Plastics”, *Advanced Composite Materials*, Vol.27(3), pp.235-247, (2017-10)
4) H. Katogi and K. Takemura, “Interfacial shear strength of resin particles added to carbon fiber/maleic anhydride grafted polypropylene in a hot-wet environment,” *WIT Transactions on Engineering Sciences*, vol.116, pp.299–307, (2017-10).
5) H. Katogi and K. Takemura, “Creep Rupture of Water-Absorbed Green Composite”, *WIT Transactions on Engineering Sciences*, Vol.116, pp.281-288, (2017-10).

Affiliated Academic Organizations:

The Japan Society of Mechanical Engineers, The Society of Materials Science, Japan, Japan Society for Composite Materials.

Current members: Professors: 1; Undergraduates: 11

Facilities: Universal tensile tester (Shimadzu and A&D). fatigue tester, micro fatigue tester, creep tester, heat press machine, milling machine, and injection molding machine.

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Functional Material Processing Laboratory

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Laboratory: 5-132 Ext.: 3064

Education/T. Terajima (e-mail: terajima@kanagawa-u.ac.jp)
03/2005, Engineering Ph.D., Tokyo Institute of Technology
03/2002, Engineering M.S., Tokyo Institute of Technology

Research Field: Material Engineering.

Research Overview: Non-equilibrium materials, joining and welding, material processing.

Research Subjects: 1. Au-based bulk metallic glass with an extremely low glass transition temperature. 2. Fiber laser machining.

Introduction: Recent research has focused on bulk amorphous alloys, which are generally called metallic glasses. Our research covers the development of new alloys, and their material processing, fibers (Fig. 1), nanoparticles, surface modification, and fiber laser machining (Fig. 2).

Metallic glasses possess unique properties, such as high mechanical strength, low elastic coefficient, small solidification shrinkage, and high resistance to corrosion. These properties originate from the amorphous structure and are not found in crystalline alloys. Usually, metallic glasses exhibit a large viscous flow in the supercooled liquid region. The flow can be exploited to fabricate three-dimensional shapes such as semispheres and small gears. These features open up new applications for this next-generation engineering material.

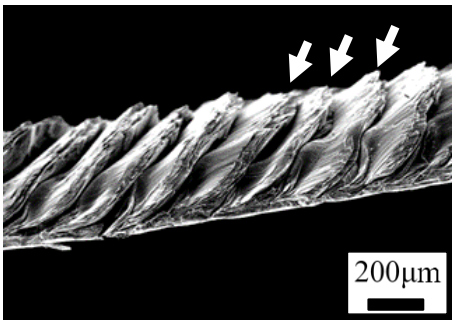

Figure 1 Surface morphology of $Zr_{55}Al_{10}Ni_5Cu_{30}$ metallic glass wool (fiber).

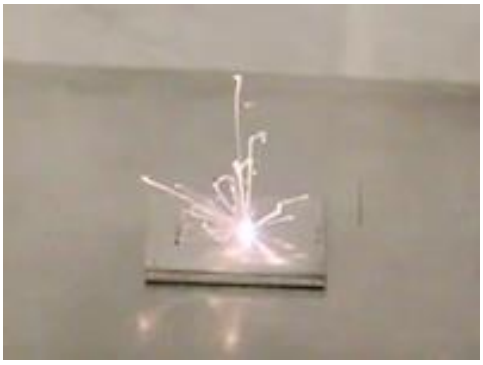

Figure 2 MOPA fiber laser machining.

Publications:

1) T. Terajima, “Cu metallization of the Surface of Cu-Zr-based Metallic Glass,” *J. Alloys Compd*, vol. 536S, S113-S116 (2012).
2) T. Terajima, "Development of Cu-Clad Metallic Glass for Soldering,” *Mater. Sci. Forum*, vol. 706-709, 1343-1347 (2011).
3) T. Terajima, H. Kimura, and A. Inoue, “Cu-Zr based bulk amorphous alloy surface-metallized with Cu,” *Frontier of Appl. Plasma Technol*., vol. 4, 103-107 (2011).
4) T. Terajima, F. Takeuchi, K. Nakata, S. Adachi, K. Nakashima, and T. Igarashi, “Composite coating containing WC/12Co cermet - Fe-based metallic glass deposited by high-velocity oxygen fuel spraying,” *J. Alloys Compd*., vol. 504S, S288-S291 (2010).
5) Y. Kawahito, Y. Niwa, T. Terajima, and S. Katayama, “Laser direct joining of glassy metal $Zr_{55}Al_{10}Ni_5Cu_{30}$ to engineering plastic polyethylene terephthalate,” *Mater. Trans*., vol. 51, 1433-1436 (2010).
6) T. Terajima, K. Nakata, H. Kimura, and A. Inoue, „laser butt welding of the Mg-based metallic glass,” *Ceramics Trans*., vol. 219, 55-60 (2010).

Affiliated Academic Organizations:

The Japan Society of Mechanical Engineers, The Japan Institute of Metals, The Society of Materials Science Japan, Institute of Applied Plasma Science, The Japan Society of Applied Physics

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Current members: Associate Professors: 1; Undergraduates: 10

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Ultra-Precision Machine Systems Laboratory

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Jumpei Kusuyama (Assistant Professor)
Laboratory: 12-26 Ext.: 3475

Y. Nakao J. Kusuyama

Education/ Y. Nakao (e-mail: nakao@kanagawa-u.ac.jp)
01/1997, Ph.D., Tokyo Institute of Technology
03/1988, M.S., Kanagawa University

Education/ J. Kusuyama (e-mail: kusuyama@kanagawa-u.ac.jp)
08/2018, Ph.D., National Institution for Academic Degrees and Quality Enhancement of Higher Education
03/2018, Completion, National Defense Academy

Research Fields: Machine Tools, Precision Engineering, Control Engineering, Water Hydraulics.

Research Overview: Development of ultra-precision machine tools. Reducing the energy consumption of machine tools.

Research Subjects: 1. Development of a water-driven spindle and stage. 2. Development of feedback control systems for water-driven systems. 3. Thermal stability of machine tool spindles. 4. Displacement control of hydrostatic bearings with nanoscale resolutions. 5. Rotary grinding of semiconductor material.

Introduction: The Ultra-Precision Machine Systems Laboratory (UMSL) develops state-of-the-art technology for ultra-precision machine systems, including ultra-precision machine tools, their components and control systems. The UMSL also designs and develops machine tools, and researches manufacturing and water hydraulics. We focus on high-performance and precise spindle systems. We are also investigating energy reduction strategies for machine tools.

High-performance and precision spindle systems for ultra-precision machine tools

Ultra-precision machining using a single-crystal single-point diamond-cutting tool can create precise parts for advanced technology in areas such as medical and optoelectronic. The machining accuracies required are several tens of nanometers or less. Spindles with aerostatic bearings are widely used in advanced industries; however, the spindle performance is limited by air compression. UMSL has developed several spindle systems that use water hydrostatic bearings and water cooling. The spindle system shown in Fig. 1 has high-stiffness bearings, small runout, and higher thermal stability.

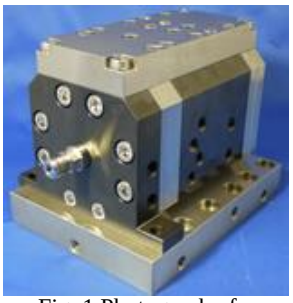

Fig. 1 Photograph of a UMSL spindle system

Reduction of machine tool energy consumption

Reducing the energy consumption of various facilities is an important global concern. In manufacturing, many products are designed by computer-aided design systems and machined by computer-aided manufacturing (CAM) systems and numerical control machine tools. However, even for products with the same shape, the energy consumption of the machine tool motion depends on the tool path generated by the CAM system. UMSL is seeking an effective design strategy for generating optimum tool paths that minimize energy consumption during machining.

Publications:

1) “Rotational speed control system of water driven spindle considering influence of cutting force using disturbance observer”, *Precision Engineering*, 51, pp. 88-96, (2018).
2) “Energy consumption of drive system in NC machine tools during peripheral milling operation,” *J. of JSPE*, 81(5), pp. 429–434 (2015).
3) “Tool path evaluation based on electric power consumption of feed drive systems in NC machine tool,” *J. of JSPE*, 80(7), pp. 699–704 (2014).
4) “Feasibility study on design of spindle supported by high-stiffness water hydrostatic thrust bearing,” *Intl. J. of Automation Technology*, 8(4), pp. 530–538 (2014).
5) “Rotary-type flow control valve for control of fluid-driven spindle,” *Trans of JSME, C*, 77(774), pp. 514–526 (2011).
6) “Angular position-control of fluid-driven bi-directional motor,” *IMechE, Pt. C: J. Mech. Eng. Sci.*, 224(C11), pp. 2350–2362 (2010).

Affiliated Academic Organizations: Y. Nakao: The Japan Society of Mechanical Engineers, The Japan Society for Precision Engineering, The American Society of Mechanical Engineers, The Japan Fluid Power System Society, Japanese Society for Artificial Organs.
J. Kusuyama: The Japan Society of Mechanical Engineers, The Japan Society for Precision Engineering, The Japan Society of Abrasive Technology.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 8; Undergraduates: 10

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Fluid Engineering Laboratory

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Taishi Yano (Assistant Professor) Laboratory: 5-222 Ext.: 3120

Education/Y. Nakanishi (e-mail: nakanishi@kanagawa-u.ac.jp)
12/1993, Ph.D., Yokohama National University
03/1990, M.Eng., Yokohama National University
Education/T. Yano (e-mail: t-yano@kanagawa-u.ac.jp)
06/2015, Ph.D. in Eng., Yokohama National University
09/2011, M.Eng., Yokohama National University


Y. Nakanishi


T. Yano

Research Field: Y. Nakanishi: Fluid Engineering, Computational Fluid Dynamics.
T. Yano: Flow Visualization, Microgravity Science.

Research Overview: Development and applications of numerical analysis methods for flow with vortices and free surfaces. Development of numerical evaluation methods for hybrid rocket internal ballistics.

Research Subjects: 1. Studying jet interactions in multi-nozzle Pelton turbines. 2. Studying flow in Turgo impulse turbines. 3. Analyzing vortex flow with the vortex method. 4. Studying Marangoni flow.

Introduction:

Study of Hydroelectric Power

We study flow characteristics in hydraulic turbines to utilize small hydro energy. Figure 1 shows the apparatus for a Turgo impulse turbine with 3 nozzles.

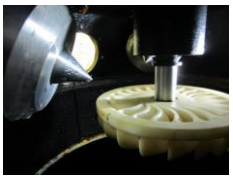
Fig. 1 Turgo impulse turbine

Analysis of Tidal Power Unit

We research numerical simulations of a counter-rotating type power unit moored with a cable in tidal stream. Figure 2 shows the numerical result of flow around the power unit whose nacelle axis is set in the horizontal flow direction.

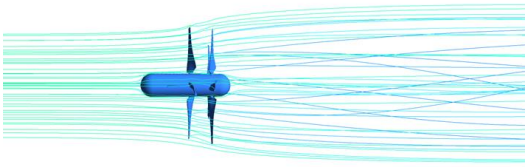
Fig. 2 Streamlines around a tidal power unit

Study of Marangoni Convection

We investigate the flow driven by surface tension difference, which is so-called Marangoni convection. Figure 3 shows the flow field measured with small tracer particles. The flow directed from the cooler side toward the warmer side can be recognized near the free surface.

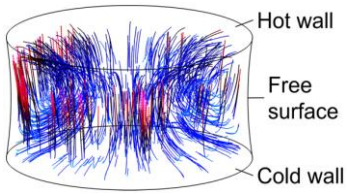

Fig. 3 Marangoni flow observed in space

Publications:

1) A New Simplified Performance Conversion Method for Hydraulic Turbines and Pump Turbines, Turbomachinery, Vol. 49, No. 4 (2021-4) 2) Non-Contact Laser Measurement of Water Jet Spreading Widths for Impulse Turbines (Effect of Internal Structure of Nozzle), ISAIF14, (Gdansk, 2019-7) 3) Counter-Rotating Type Horizontal-Axis Bidirectional Propellers for Tidal Stream Power Unit, Journal of Power and Energy Engineering, Vol.5, No.7, pp.34-44, (2017-7) 4) Numerical Study on the Effects of Convective and Radiative Heat Transfer on Thermocapillary Convection in a High-Prandtl-Number Liquid Bridge in Weightlessness, Advances in Space Research, Vol. 66, pp.2047-2061 (2020-7) 5) Report on Microgravity Experiments of Dynamic Surface Deformation Effects on Marangoni Instability in High-Prandtl-Number Liquid Bridges, Microgravity Science and Technology, Vol. 30, No. 5, pp.599-610 (2018-3)

Affiliated Academic Organizations:

Y. Nakanishi: Japan Society of Mechanical Engineers, Turbomachinery Society of Japan, IAHR, Japan Society of Fluid Mechanics.
T. Yano: The Japan Society of Mechanical Engineers, The Japan Society of Microgravity Application, The Heat Transfer Society of Japan, The Visualization Society of Japan

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Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 1; Undergraduates: 13
Facilities: GPU-based parallel computing system, Turgo impulse turbine, water jet assembly

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Thermal Science Laboratory

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03/1984, Ph.D., The University of Tokyo
03/1981, M.S., The University of Tokyo
Education/T. Morokuma (e-mail: t-morokuma@kanagawa-u.ac.jp)
03/2015, Ph.D., Yokohama National University
03/2012, M.S., Kanagawa University


Y. Haramura


T. Morokuma

Research Field: Boiling Heat Transfer, Thermal Science and Engineering.

Research Overview: Investigating the critical heat flux of boiling, heat transfer in transition boiling, design parameters of Stirling cycle machines, heat transfer in nucleate boiling and coalescence of bubble.

Research Subjects: 1. Heat transfer mechanisms in high-heat flux boiling. 2. Heat transfer characteristics of transition boiling. 3. Measurement of microlayer thickness. 4. Enhancement of heat transfer with phase change.

Introduction: High heat flux is required in cooling of electronics power devices and high-speed computer IC. Boiling is one of the selections. Boiling heat transfer is excellent until the wall temperature is 20-30°C higher than the saturation, but it gets worse remarkably beyond. This maximum, the critical heat flux abbreviated to CHF, is very important in the application utilizing high flux boiling. To enhance the CHF it is necessary to know its mechanism. So we are planning to measure local and instantaneous heat flux together with the observation of fluid behavior near the CHF point including higher temperature region, i.e. transition boiling region, where drying and wetting of the wall occurs repeatedly. Since heat transfer gets smaller with wall temperature, temperature control is necessary to keep steady transition boiling. The spatial instability due to heat removal concentrated to a cooler region also takes place even when the temperature is successfully controlled. We have there- fore prepared the boiling surface shown in Fig. 1. This surface is divided into five parts the temperature of which is individually controlled. The temperature is successfully kept constant as shown in Fig. 2 up to the negative gradient designated.

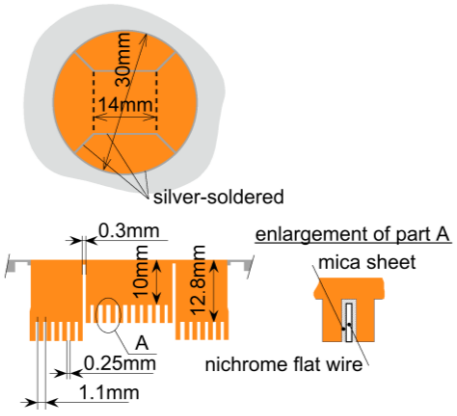

Fig. 1 Heat transfer surface consisting five parts to keep temperature uniformity

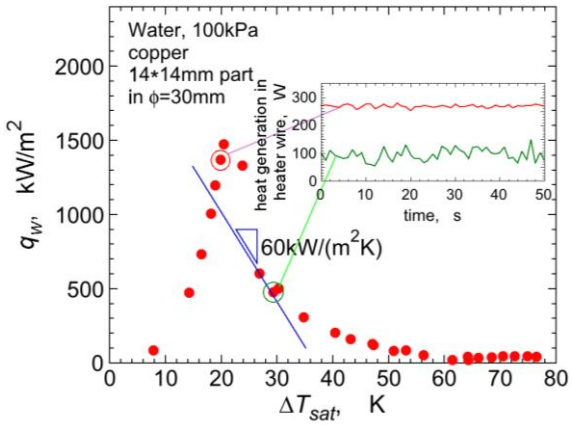

Fig. 2 Measured heat transfer (Stabilized up to designated negative slope of −65 kW/(m^{2}K))

Publications:

1) Inverse heat conduction solution utilizing the difference method with an exact matching rule, Thermal Science & Engineering, Vol.29, 33, 2021. 2) Y. Haramura, "Heat transfer characteristics of spherical heat pipe to cool LED device," *Thermal Science & Engineering*, Vol.26, 22, 2018. 3) Visualization of flow in a cylinder during the expansion process induced by an annular jet along the cylindrical wall, 17th International Stirling Engine Conference (Newcastle upon Tyne, 2016). 4) Y. Haramura and N. Kuboki, "A Proposal of Cooling Source on Full Power Loss in Nuclear Reactors," *Trans. JSME* (in Japanese), Vol.81, 15-00117, 2015. 5) Local heat removal by liquid film on the expansion of dry area on a superheated copper wall, Procs. 15th International Heat Transfer Conference, IHTC15-9048, 2014. 6) Heat Transfer During Compression and Expansion of Gas, J. Heat Transfer, Vol. 130, No.3, 032801 (2008). 7) Combination of laser interferometric and laser extinction methods for precise thickness measurement of liquid film between coalescing twin air bubbles, Int. J. of Heat and Mass Transfer, Vol. 127 (2018)

Affiliated Academic Organizations:

Y. Haramura: Japan Society of Mechanical Engineers, Heat Transfer Society of Japan, Japan Society of Design Engineering.
T. Morokuma: Japan Society of Mechanical Engineers, Heat Transfer Society of Japan, JSRAE

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 1; Undergraduates: 15

Field of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Mechanical Dynamics Laboratory

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Education／T. Yamazaki (e-mail: toru@kanagawa-u.ac.jp)
12/1997, Ph.D., The University of Tokyo
03/1995, M.S., The University of Tokyo
Education／K. Kurihara (e-mail: ft102125tx@kanagawa-u.ac.jp)
03/2020, Ph.D., The University of Kyushu
03/2017, M.S., The University of Kyushu


T. Yamazaki


K. Kurihara

Research Field: Mechanical Dynamics, Mechanical Vibration, Acoustics

Research Overview: For development of design procedure for quiet machine, modelling and analysis method of mechanical noise and vibration problems have been studied. Also, structure of musical instruments are investigated to derive an idea of vibration propagation structure.

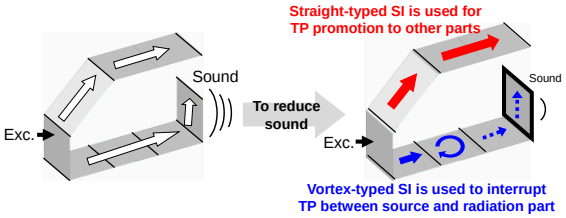

Figure 1 Energy Flow for Low Noise and Vibration

Research Subjects: 1) Modelling and prediction of mechanical noise and vibration based on Statistical Energy Analysis (SEA) and Structural Intensity (SI); Development of conceptual design procedure for structure-borne sound. **2)** Scientific analysis of musical instruments and design of low noise structure for mechanical systems. **3)** Development of Analysis Method using signal processing for non-linear vibration of musical instruments and for diagnoses of machine and human.

Figure 2 Tested Violins

Introduction: Vibration power flow for low noise and vibration is vortex-typed (Fig.1). The comparison of power flows between two violins gives the effective knowledge for low vibration transmission using the bridge structure (Fig.2). Time-frequency analysis is used to identify the vibration model of real machine (Fig.3).

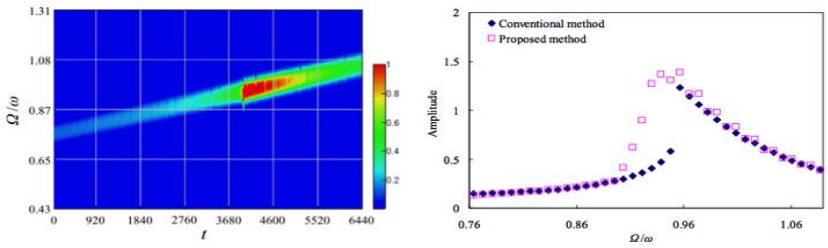

Figure 3 Time-Frequency Analysis for Nonlinear Vibration

Publications:

1) Improvement calculation accuracy of blade-shaft coupled torsional vibration by including axial shaft motion, Transactions of the JSME (in Japanese), No.19-00500, Vol.85, No.879, 2019.
2) Extension of experimental statistical energy analysis to structural vibration with low modal density, Transactions of the JSME (in Japanese), No.19-00185, Vol.85, No.878, 2019.
3) Scale-model tests of railway rolling noise, JSME Mechanical Engineering Journal, Vol.6, No.6, Paper No.19-00073, 2019.
4) Study of analysis method of interior noise in railway cars by means of ray tracing method, JSME Mechanical Engineering Journal, Vol.6, No.5, Paper No. 18-00449, 2019-6
5) Robust vibration control of an overhead crane by elimination of the natural frequency component, Proc. of the 18th Asian Pacific Vibration Conference (APVC 2019), Paper No.53, 2019.

Affiliated Academic Organization:

T. Yamazaki: Society of Automotive Engineers of Japan, Japan Society of Mechanical Engineers, Acoustical Society of Japan, Institute of Noise Control Engineering of Japan, Japan Fluid Power System Society, Institute on Noise and Vibration Technology for Next Generation
H. Nakamura: Society of Automotive Engineers of Japan, Japan Society of Mechanical Engineers, Acoustical Society of Japan,

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Current members: Professors: 1; Assistant Professors: 1; Visiting Professors: 6; Postgraduates: 10; Undergraduates: 12
Facilities: Analyzers and sensors for Sound and Vibration Measurement, Anechoic Chamber, Environmental Test Chamber

Course of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Precision Machining Laboratory


A. Yui K. Suzuki

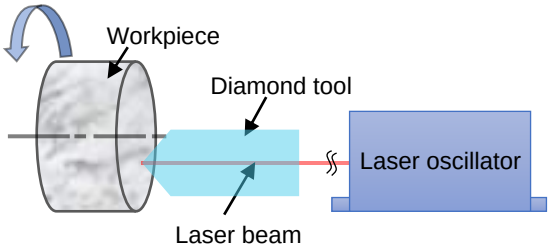
Akinori Yui (Professor) Office: 8-514 Ext.: 3435
Laboratory: 8-452 Ext.: 3426
Kenji Suzuki (Assistant Professor) Office: 12-38 Ext.: 3484
Education/A. Yui (e-mail: yui@kanagawa-u.ac.jp)
03/1989, Ph.D., Chiba University
Education/K. Suzuki (e-mail: suzuki@kanagawa-u.ac.jp)
05/2009, D. Eng., Tokyo Institute of Technology
03/1995, M. Eng., Kanagawa University

Research Fields: Precision Machining, Machine Tool, Mechanical Elements, Submerged Solar Power Generation.

Research Overview: Laser-assisted microfabricating of hard and brittle materials using diamond tools, Development of constant flow water hydrostatic bearing, High-efficient grinding of heat-resistant nickel-alloy based turbine blades, Development of submerged solar power generation system, Blast dressing of ultra-abrasive wheels.

Laser-assisted microfabrication of hard and brittle materials using diamond tools

Diamond tools are generally used to perform micro-cutting of hard and brittle materials. However, improving of machining efficiency is very difficult due to the tool wear and chipping of the cutting edge. Therefore, UV laser transmitted through diamonds are irradiated directly to the processing point, and high-efficiency and high-precision micro diamond cutting is performed.



Development of a table using fixed-flow water static bearings

We propose a table system for semiconductor wafer processing using static bearings. The working medium use clean, environmentally friendly water. In general, water is prone to bacteria and there is a worry that it will clog into the orifice and capillary of constant pressure type static pressure bearings. Therefore, we fabricated a constant flow method hydrostatic bearing that does not have a stenosis and mounted on a table to evaluate its performance.

Grinding of heat-resistant nickel alloys

Heat-resistant nickel alloys used in turbine blades of jet engines are well known as difficult-to-cut materials due to their high strength and low thermal conductivity. Until now, creep feed grinding with a large amount of grinding depth of cut and a low machine feed rate was the mainstream. In creep feed grinding, the machine cost is expensive and the optimal processing conditions are narrow. Therefore, we propose high-speed stroke grinding, which increases the workpiece feed rate by using a linear motor driven table and continuously cuts the grinding wheel, and conducts grinding experiments taking into account the influence of grinding fluids and grind wheels.

Development of underwater installation solar power generation system

Solar power generation is expanding around the world as a renewable energy source. However, since there are few vast open areas in Japan, large-scale mega-solar power generation is difficult. On the other hand, we have an exclusive economic zone with the 8th largest size in the world. When solar panels are installed on land or on the sea, airborne objects and salt damage contaminate the panel surface and reduce power generation efficiency. Therefore, we have developed solar panels with panel textures that are resistant to marine contamination and have little solar turbulence, and conduct demonstration experiments on the Islands directly below the equator.

Publications:

1) Study on wheel cover safety for grinding machines -Prediction of cover material safety based on tensile test, Journal of Abrasive Technology, Vol.65, No.3, (2020-3). 2) Study on workpiece temperature in the side milling of CFRP, Proc. of euspen2019, (2019-6). 3) Effective Grinding of CMSX4 under Constant Removal Rate, Proc. of ISAAT2019, (2019-12).

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 3; Undergraduates: 12

Course of Mechanical Engineering/Graduate School
Department of Mechanical Engineering/Undergraduate

Mechanical Engineering Factory

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Sho Uekusa (Technical Assistant)
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Yasunori Sasaki (Technical Assistant)
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Management and Policy:

The mechanical engineering faculty and staff run our factory. Our main tasks are to support the classes “Mechanical Engineering Training” and “Machine Dissection” and to make prototype parts for R&D. In addition, we check students’ drawings and teach them how to use our equipment. We welcome requests from other departments in the university.

Equipment:

1) NC Machining Room (23-B101)

- Lathe, 1 units (AM-20, Ikegai)
- Lathe, 6 units (TIPL-4, Tongil)
- NC-Lathe, 1 unit (LB3000EX Ⅱ, Okuma)
- Wire electrical discharge machining (EDM), 1 unit (α-C400iC, FANUC)
- Machining center, 2 unit (ROBODRILL 3 /5 axis)
- Machining center, 1 unit (UVM-C450C(H), SHIBAURA)
- Numerical control (NC)-milling machine, 1 unit (YZ-75R, Yamazaki)
- NC-milling machine, 1 unit (KE 55, Makino)
- NC-training machine, 4 units (TDC-10, Takisawa)
- Band saw, 1 unit (H-350SA, Amada)
- Counter machine, 1 unit (NCC-500LE, Nicotec)
- Milling machine, 2 units (TMV-0, Tongil)
- Milling machine, 1 units (IVQ-780, Hokushin)
- Shirring machine, 1 unit (Noguchi)
- Double-headed grinder, 1 unit (TG-2558, Mitsubishi)

2) **Precision Machining Room (23-B108)**

- Surface grinding machine, 2 units (PSG-52BN, PSG-52DX, Okamoto)
- Surface roughness measurement instrument (SJ-210, Mitsutoyo)
- Fine cut machine, 1 unit (N-7, Heiwa Technica)
- Small hole drilling EDM, 1 unit (ED-α, Mikuni)
- Drilling machine, 6 units (NSD-13R, Kira)

3) Welding Room (23-B106)

- Arc welding machine, 3 units (AF-200, Osaka)
- AC-arc welding machine, 3 units (BS-250S, Osaka)
- CO_2-arc welding machine, 2 units (CPXC-200, Osaka)
- CO_2-arc welding machine, 1 unit (CPTE-200, Osaka)
- TIG-welding machine, 1 unit (CPTS-180, Osaka)

4) Heat Treatment Room (23-B107)

- Electric furnace, 2 units (Tachibana)
- Rockwell hardness testing machine, 2 units
- Shore/Rockwell hardness testing machine, 4 units
- Wet polishing table, 1 units
- Polishing table 1 units
- Tensile testing machine, 1 unit (Shimadzu)
- micro Vickers testing machine, 1 unit (Shimadzu)
- Crystal cutter, 1 unit (Nova-1, Maruto)
- 3D Printer, 1 unit (F170, stratasys)
- 3D Printer, 3 unit (Replicator+, MakerBot)

5) Measuring Room (23-B103)

- CMM, 1 unit (REGE X 322, Mitsutoyo)
- Digital microscope, 1 unit (VHX-5000, Keyence)
- 3D Digital microscope, 1 unit (VR-3200, Keyence)
- 3D Scanner, 1 unit (VL-500, Keyence)
- FFT analyzer, 1 unit (OS-3000, Onosokki)
- Tod dynamometer, 1 unit (9119AA2, Kisler)

Field of Electrical, Electronics, and Information Engineering/Graduate School [Graduate (M.C. and D.C.)] Department of Electrical, Electronic and Information Engineering /Undergraduate

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Information Network and Media Laboratory

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03/1987, M.S., Tokyo Institute of Technology
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03/2008, Ph.D., Institute of Information Security
03/1981, M.S., Tokyo University of Science


H. Kinoshita

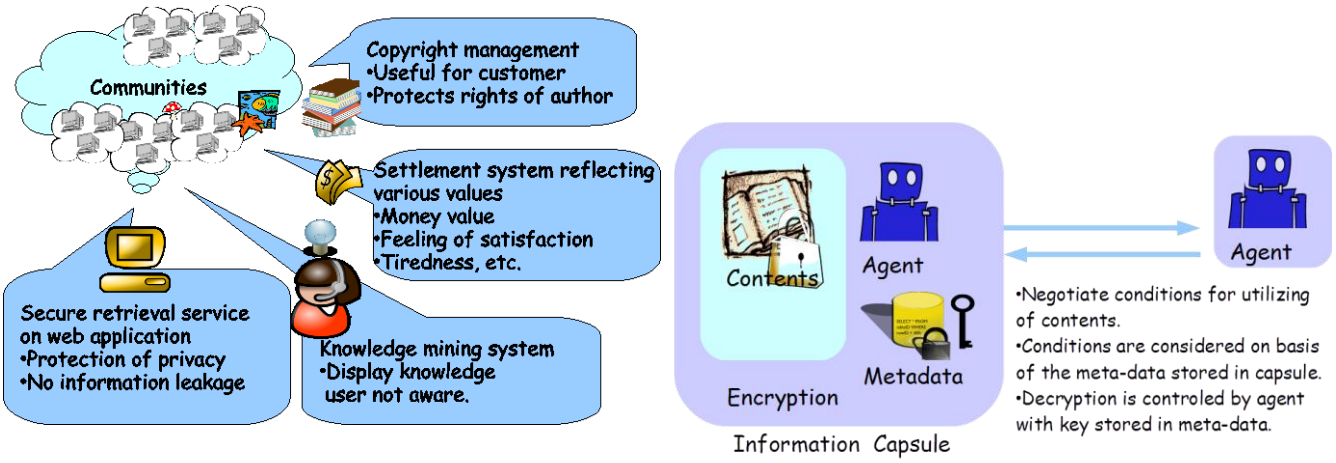

T. Morizumi

Research Field: Information Security, Digital Archives.

Research Overview: Personal Information Protection, Copyright Management, E-commerce, Information Retrieval and Access Control Models.

Research Subjects: 1. Management systems for copyrights and personal information using information capsule agents. 2. Collecting information about access rights and protection against information leakage. 3. Watermark systems for the distribution of multimedia information. 4. Digital archive systems based on ontologies and self-organized file systems.

Introduction: Information security is fundamental for safety on networks and computers. This technology prevents crimes on the Internet, and protects copyright for images on websites and personal information stored in databases managed by schools or governments. We investigate security systems and resolve problems arising from specific activities in various communities. For example, information capsules are a copyright management system based on mobile agents that resolves the problems of copyrights automatically.



Publications:

1) S. Nakamura, K. Suzuki, T. Morizumi, S. Miyata, and H. Kinoshita, “Detecting covert channels using a transitive closure algorithm,” *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, vol. J96-A(4), pp. 175–183 (2013).

2) “A hypergraph-based model against information leakage by inference,” *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, vol. J95-D(4), pp. 812–824 (2012).

3) S. Miyata, H. Kinoshita, T. Morizumi, and L. Chao, “Game theoretic analysis of the value exchange system,” *2013 IEEE 37th Annual Computer Software and Applications Conference Workshops (COMPSACW)*, July 2013.

4) S. Miyata, K. Suzuki, T. Morizumi, and H. Kinoshita, “Access control model for the My Number national identification program in Japan,” *2014 IEEE 38th International Computer Software and Applications Conference Workshops (COMPSACW)*, July 2014.

Affiliated Academic Organizations:

H. Kinoshita: IEEE, IEICE, IPSJ
T. Morizumi: IEICE

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 4; Undergraduates: 10
Facilities: Experimental cloud file systems.

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Microwave Electronics and Wireless Communication Laboratory

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Laboratory: 23-513 Ext.: 3761
Takaharu Hiraoka (Associate Professor)
Laboratory: 23-601 Ext.: 3790
Education/C.-P. Chen (e-mail: chen@kanagawa-u.ac.jp)
07/2004, Ph.D., Shanghai University
Education/T. Hiraoka (e-mail: hiraoka@kanagawa-u.ac.jp)
09/2009, Ph.D., Kanagawa University
03/1996, M.S., Kanagawa University


C.-P. Chen


T. Hiraoka

Research Field: Microwave/Light-wave circuits for 6G, Wireless power transfer, Dielectric measurement, high-frequency signal processing and intelligent optimization algorithms.

Research Overview: Our laboratory seeks to benefit society by developing high-performance microwave and optical devices for the next-generation wireless communication systems.

Research Subjects: 1. Microwave, millimeter and THz-wave functional devices for 6G using M-PhC structures. 2. Synthesis of ultra-wideband (UWB) filters. 3. EMC/EMI in microwave circuits. 4. Measurement of EM parameters of microwave materials. 5. Optimal design of high-frequency (HF) circuits with optimization algorithms. 6. Development of microwave circuit and EM field simulators. 7. Wireless power transmission technology for HF circuits.

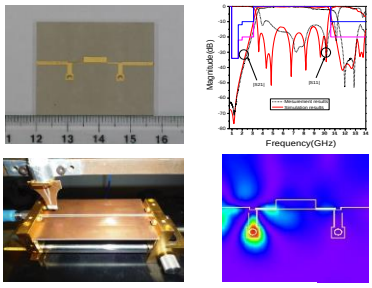


Fig.1 Proposed novel UWB filter and EM-field mapping system.

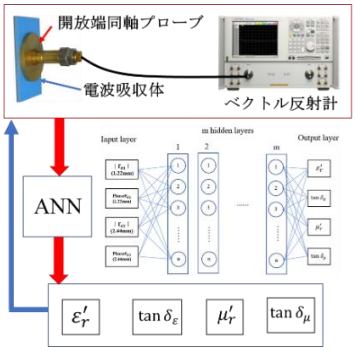


Fig.2 Automatic UWB measurement system for materials' EM-parameters based on AI/ANN.

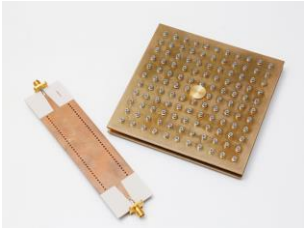


Fig.3 Novel millimeter and THz devices based on metallic photonic crystal (MPhC) structures.

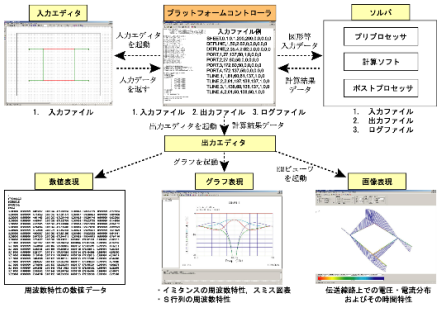


Fig.4 Development of electromagnetic field simulators.

Introduction: Our laboratory is devoted to studying light-wave and EM circuits and related technologies for next-generation (Beyond 5G/6G) wireless and optical communication. Our studies span from the design and fabrication of hardware circuits to the development of EM simulators. We are studying UWB and ultra-high-speed passive circuits, photonic crystal-based devices used in millimeter and THz bands, and leakage radiation related EMC/EMI techniques. We are also developing the UWB measurement system for determining the EM-parameters of low and high-loss materials based on AI/ANN technology. Our goal is to establish a GPU-accelerated parallel-processing computer-based large-scale virtual factory for the automatic design of EM and optical circuits through the integration of light-wave, millimeter-wave, and microwave simulation software into a common platform.

Publications: 1) "Application of Novel Metallic PhC Resonators in Theoretical Design of THz BPFs," IEICE Trans. Electron., Vol.E101-C, No.8, pp.655-659, Aug. 2018. 2) "Simulation and Measurement of Properties of Metallic Photonic Crystal Point-Defect-Cavities with a Centrally-loaded Rod", IEICE Trans. Electron., Vol.E101-C, No.1, pp. 91-95, Jan. 2018. 3) Synthesis Scheme for Wideband Filters Consisting of Three-Coupled-lines Including the Cross-Coupling Between Non-Adjacent Lines, IET Microwave, Antennas and Propagation, Vol. 9, No. 14, pp. 1558 - 1566, Nov. 2015.

Affiliated Academic Organizations:
C.-P. Chen: IEEE (MTT), IEICE of Japan, IEE of Japan
T. Hiraoka: IEICE

Current members: Associate Professor: 1; Professor emeritus: 1; Assistant Professor: 1; Research fellow: 1; Postgraduates: 3; Undergraduates: 15
Facilities: Agilent network analyzer (~67 GHz), LPKF PCB prototyping machine.

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Biological and Environmental Measurement Laboratory

T. Tsuchiya J. Mori

Takenobu Tsuchiya (Associate Professor)
Office: 23-515 Ext.: 3763
Junichi Mori (Assistant Professor)
Laboratory: 23-604 Ext.: 3793
Education/T. Tsuchiya (e-mail: kenshin@kanagawa-u.ac.jp)
10/2005, Ph.D., Tokyo Institute of Technology
Education/J. Mori (e-mail: j-mori@kanagawa-u.ac.jp)
3/2014, Ph.D., Chiba Institute of Technology

Research Field: Applications of Ultrasonic Measurement Technology, Medical Ultrasonics, Underwater Acoustics.

Research Overview: Research on the fundamentals and applications of ultrasonic measurement technology. Analysis and measurement of sound propagation in humans and oceans. Development of an acoustic camera with a lens for use in oceans.

Research Subjects: Simulation of sound propagation in oceans, and development of an analytical method for sound propagation, Development of a method for estimating temperature rises in the human body. Development of an acoustical camera with a lens.

Introduction:

Figure 1 Acoustic lens of our acoustic imaging camera based on ultrasonic technology. The imaging camera can capture images underwater without light.

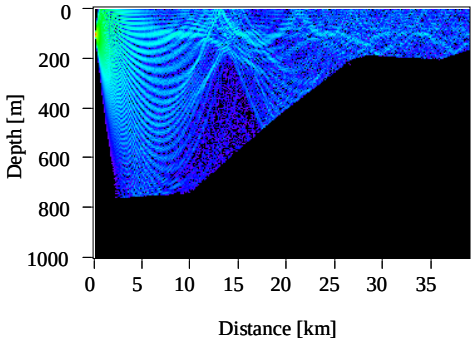


Figure 2 Sound pressure distribution in the Arctic and Antarctic Oceans estimated by the parabolic equation method.

Figure 3 Image of a fetus obtained by an ultrasound diagnostic imaging system known as ultrasonic tomography.

Publications:

1) “Three dimensional analysis of temperature rise in soft tissue with bone near the focal area caused by focused ultrasonic radiation,” *Acoustic Science and Technology*, vol. 36(2), pp. 178–181 (2015). 2) “Relationship between spatial distribution of noise sources and target scatterings observed in the 2010 sea trial of ambient noise imaging,” *Japanese Journal of Applied Physics*, vol. 52(7B), 07HG02 (6 pages) (2013). 3) “Experiment and numerical analysis of temperature rise in phantom caused by high-intensity focused ultrasonic irradiation,” *Japanese Journal of Applied Physics*, vol. 52(7B), 07HF09 (5 pages) (2013). 4) “Basic study of properties of planate acoustic lens constructed with phononic crystal structure, *Japanese Journal of Applied Physics*, vol. 51(7B), 07GG11 (5 pages) (2012). 5) “Simulation of sound propagation in shallow water of Antarctic Ocean using numerical analysis method: Characteristics of sound propagation at observed line L in winter season, *Transactions of the Institute of Electronics, Information and Communication Engineers. A*, vol. J94-A (11), 862–869 (2011). 6) “Measurement of temperative-dependent sound velocities in acoustic lens material using sing-around method,” *Journal of the Marine Acoustics Society of Japan*, vol. 38(4), pp. 195–202 (2011).

Affiliated Academic Organizations:

T. Tsuchiya: Acoustical Society of Japan, The Japan Society of Ultrasonics in Medicine, The Marine Acoustic Society of Japan, Institute of Electronics, Information and Communication Engineers, Acoustical Society of America.

J. Mori: Acoustical Society of Japan, The Institute of Noise Control Engineering of Japan, Symposium on Sensing via Image Information, The Society for Bioacoustics.

Current members: Associate Professors: 1; Assistant Professors: 1; Postgraduates: 4; Undergraduates: 14

Facilities: Acoustic intensity measurement system, scanning laser Doppler system, ultrasound diagnostic imaging system

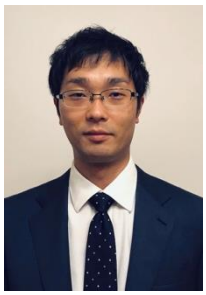
Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Information and Communication Engineering Laboratory

Akira Nakamura (Associate Professor)
Office: 23-615 Ext.: 3803

Takashi Komatsu (Research Associate)
Laboratory: 23-618 Ext.: 3806

A. Nakamura (akira-nakamura@kanagawa-u.ac.jp)
D.Eng., The Tokyo University of Science (Mar. 2014)
T. Komatsu (komatt01@kanagawa-u.ac.jp)
M.Eng., Kanagawa University (Mar. 1985)


A. Nakamura

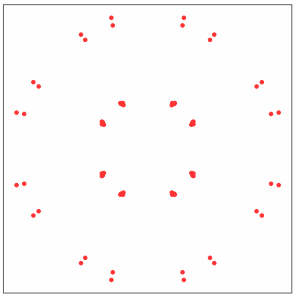

T. Komatsu

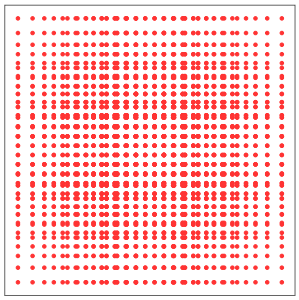
Research Field: Communication Engineering, Signal Processing (A. Nakamura); Image Processing (T. Komatsu)

Research Overview: Digital modulation schemes, next-generation mobile communications systems, and next-generation broadcasting systems

Research Subjects: 1. Improving schemes for ICI cancellers in MIMO-OFDM systems; 2. Improving detection in MIMO systems; 3. Detection schemes for non-orthogonal modulation schemes; 4. Improving performance of mobile reception in next-generation digital terrestrial television broadcasting.

Introduction: Orthogonal frequency division multiplexing (OFDM) modulation is used to improve communication technologies such as wireless local area networks, mobile communications (e.g., 4G, 5G), and digital terrestrial television broadcasting. In addition, OFDM modulation will be applied to next-generation digital terrestrial television broadcasting of 4K/8K content. In the future, the further enhancement of communication technologies will be required. In this laboratory, we aim to realize improvements in transmission capacity and reception characteristics. Topics of research are shown as follows.


NU-64QAM(ATSC3.0)


NU-4096QAM(ATSC3.0)

1. Improving the scheme of reception characteristics for mobile reception of OFDM signals
2. Demodulation scheme for non-orthogonal frequency division multiplexing modulation
3. Improving the accuracy of signal detection in MIMO systems

We study elemental technologies that will form the foundation of future communication systems. In addition, we evaluate the communication performance of next-generation communication systems and broadcasting systems. We examine schemes for improving reception characteristics and evaluate the effectiveness of our schemes.

Publications:

1) A study on dual-polarized MIMO-ICI canceller with complexity reduction under the mobile reception of OFDM signals. *IEEE Transactions on Broadcasting*. 2019; 65(3): 589–600.
2) Study on improving performance of UWB radar system with inter-vehicle communication. *Journal of Signal Processing*. 2018; 22(4): 185–188.
3) Efficient channel estimation scheme under impulsive noise environment. *ITE Transactions on Media Technology and Applications*. 2016; 4(2): 177–185.

Affiliated Academic Organizations:

A. Nakamura: Institute of Electronics, Information and Communication Engineers, Institute of Image Information and Television Engineers, Institute of Electrical and Electronics Engineers
T. Komatsu: Institute of Electronics, Information and Communication Engineers, Institute of Image Information and Television Engineers

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Current members: 1 associate professor, 1 research associate, 10 undergraduates
Open positions: visiting researcher

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Quantum Device Laboratory

Akiyoshi Nakayama (Professor) Office: 23-707 Ext.: 3835

Norimichi Watanabe (Assistant Professor)
Laboratory: 23-602 Ext.: 3791

Education/A. Nakayama (e-mail: nakayama@ee.kanagawa-u.ac.jp)
03/1985, Ph.D., The University of Tokyo
03/1983, M.S., The University of Tokyo
Education/N. Watanabe（e-mail:ft102002ho@kanagawa-u.ac.jp）
03/2007, Ph.D., Kanagawa University


A. Nakayama


N. Watanabe

Research Field: Superconducting Devices, Applications of Magnetic Materials, Magnetic Sensors.

Research Overview: Fabricating thin films of niobium and aluminum by DC sputtering. Measuring the electrical and magnetic properties of quantum devices.

Research Subjects: 1. Josephson tunnel junctions. 2. Superconducting quantum interference device.

Introduction:

Josephson current can flow between two superconducting electrodes of a tunnel junction without voltage drop. To fabricate superconducting niobium tunnel junctions, niobium and aluminum thin films were deposited in separate vacuum chambers by a DC magnetron sputtering vacuum system with a load-lock chamber. The tunnel oxide of niobium/aluminum-oxide /niobium tunnel junctions was formed by natural oxidation of the surface of the aluminum film in a pure oxygen atmosphere. The junction areas were defined by a selective niobium anodization process.

The junction size was 50 μm × 50 μm. To obtain the magnetic field dependence, the external magnetic field for the junction was produced by three pairs of Helmholtz coils (Fig. 1). Two pairs of Helmholtz coils produced magnetic fields, H_x and H_y, parallel to the junction plane and the third pair produced a magnetic field, H_z, perpendicular to the junction plane.

The maximum fields that Helmholtz coils produced, were 3000 A/m for H_x and H_y, and 8000 A/m for vertical field H_z. The Helmholtz coils were driven by using a DC power supply and controlled by personal computer and general purpose interface bus system.

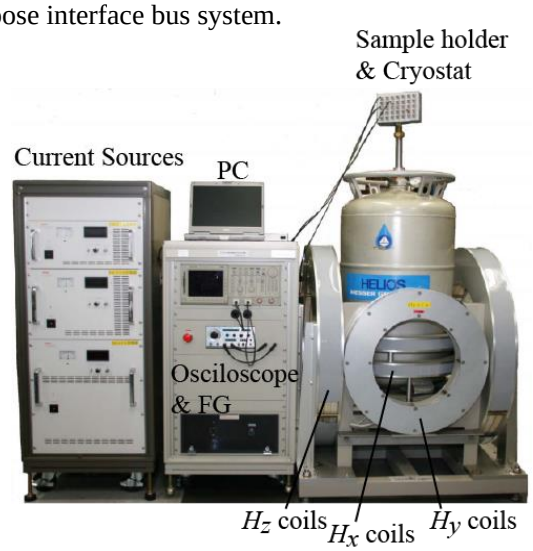


Figure 1 Measuring System

Publications:

1) N. Watanabe, A-S. Ebana, S. Abe, A. Nakayama," Influence of the position of the Josephson junction in the base Nb layer on modulation characteristics of the Josephson current" Physica C: Superconductivity and its applications, Vol. 591, 1353969 (2021). 2) T. Hikosaka, N. Watanabe, S. Abe, A. Nakayama, "Influence of the thickness of the base Nb layer in a Josephson junction on magnetic flux trapping" Physica C: Superconductivity and its applications, Vol. 587, 1353897 (2021). 3) K. Kobayashi, A. Nakayama, S. Abe, N. Watanabe, "Influence of the Al thickness of Nb/Al-AlO_x/Nb Josephson junction on the magnetic field dependence of the Josephson current" Physica C: Superconductivity and its applications, Vol. 579, 1353754 (2020).

Affiliated Academic Organizations:

A. Nakayama: The Institute of Electronics, Information and Communication Engineers (IEICE), The Japan Society of Applied Physics.
N. Watanabe: The Institute of Electronics, Information and Communication Engineers (IEICE), The Japan Society of Applied Physics.

Current members: Professors: 1; Associate Professors: 1; Postgraduates: 1; Undergraduates: 9

Facilities: DC magnetron sputtering system, system for measuring 3D magnetic field dependence of Josephson current.

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Power and Energy System Laboratory

S. Negishi

Shintaro Negishi (Associate Professor) Office: 23-613 Ext.: 3801

Kosei Sato (Technical Assistant) Laboratory: 23-612 Ext.: 3800
Education/S. Negishi (e-mail: negishi@kanagawa-u.ac.jp)
03/2018, Ph.D., Osaka Prefecture University
Education/K. Sato (e-mail: fs112043go@kanagawa-u.ac.jp)
03/2015, M.S., Nagaoka University of Technology

Research Field: Power system engineering, operations research.

Research Overview: Our research activities are realizing power and energy systems that are adaptive to environmental changes. (Keywords: optimization and forecasting in power system operation, energy-economic simulations, optimal control of renewable energy systems, prescriptive analysis, statistical machine learning based on small data).

Research Subjects: 1) The optimal energy mix for achieving carbon-neutral status, 2) power supply and demand adjustment control of energy resources to support further introduction of renewable energy, and 3) an optimization model for operation planning of renewable energy systems.

Introduction: We conduct research on system modeling and social design to realize energy systems that adapt to environmental changes. Traditional energy supply systems have consisted of a large number of power plants and control devices and their integrated control systems. Recently, however, energy supply systems have become more complex with the introduction of renewable energy for realizing a low-carbon society and the use of demand-side energy devices to adjust supply and demand. Therefore, we aim to create methods for analyzing, controlling, and operating systems that supply energy more wisely and efficiently by using information technology.

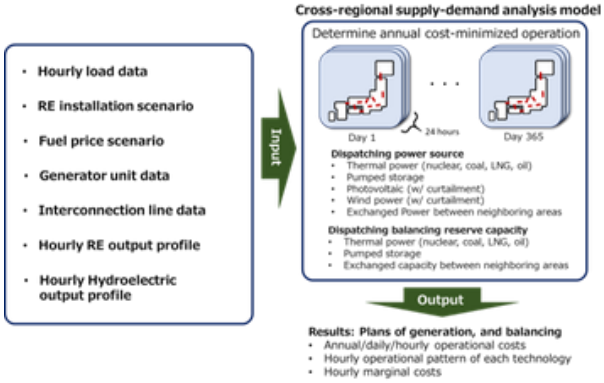


Fig. 1 Optimization method for energy mix.

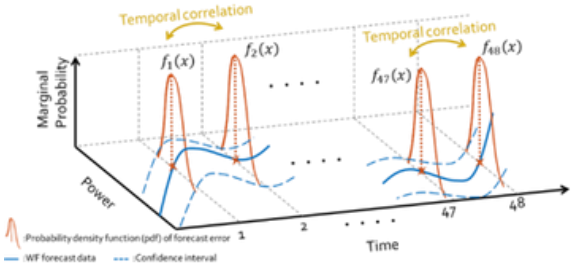


Fig. 2 Optimal operation simulation for renewable energy.

Our technology: Our laboratory has the following computer simulation environments: 1) a long-term energy mix optimization simulation (Fig. 1) and 2) a renewable energy optimal operation simulation based on the probability distribution function of output forecasting (Fig. 2).

Publications:

1) “Cross-regional power supply-demand analysis model based on clustered unit commitment,” Electrical Engineering in Japan, 215(1), e23368 (2022), 2) “Robust Scheduling for Water Pumping in Water Distribution System under Uncertainty of Activating Regulation Reserves,” Energies, 14(2), 302 (2021), 3) “A Stochastic Scheduled Operation of Wind Farm Based on Scenarios of the Generated Power with Copula,” Electrical Engineering in Japan, 205(3), 41-54 (2018), 4) “Daily Peak Load Forecasting by Taguchi's T Method,” Electrical Engineering in Japan, 201(1), 57-65 (2017).

Affiliated Academic Organizations:

S. Negishi: IEEJ, JSER, ORSJ, JSAI, and IEEE.

Current members: Professors: 1; Technical Assistants: 1; Undergraduates: 13
Facilities: One server for scientific and technical calculations.
Open positions: visiting researcher.

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Intelligent Information Systems Laboratory

Masato Noto (Professor) Office: 20-327 Ext.: 4554
Laboratory: 20-328 Ext.: 4555
Jiacheng Li (Assistant Professor) Laboratory: 20-310-B Ext.: 4569

Education/M. Noto (e-mail: noto@kanagawa-u.ac.jp)
03/1996, Ph.D., Hokkaido University
Education/J. Li (e-mail: lijiacheng@kanagawa-u.ac.jp)
03/2020, Ph.D., Hosei University

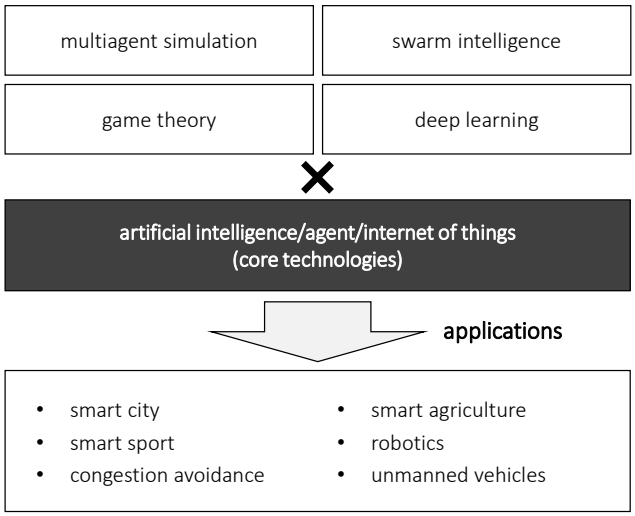

M. Noto

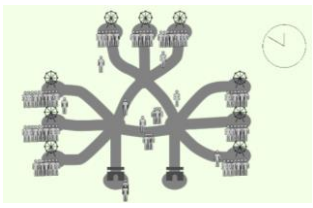

J. Li

Research Field: Intelligent Informatics, Systems and Information Engineering, Artificial Intelligence

Research Overview: Basic and applied research on intelligent information processing in the fields of artificial intelligence and computer science, with a focus on software and networks

Introduction:




Load balancing in amusement parks using multiagent simulation.

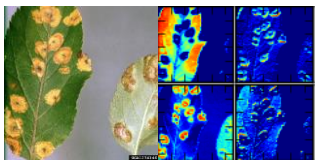


Image-based plant disease detection using deep convolutional neural network.

We are developing intelligent software that uses artificial intelligence technology and has advanced functions similar to the human brain. We research applications of artificial intelligence technology to the Internet of Things (IoT) environment. For example, we are investigating software agents, which are intelligent anthropomorphic programs that are aware of their surroundings and act autonomously. Agents can act on behalf of people, performing secretarial work and other complex tasks.

Using artificial intelligence, software agents, and IoT as core technologies, we incorporate cutting-edge technologies such as deep learning in order to carry out research aimed at realizing software that benefits society. In these studies, we focus on developing technologies that can be applied in everyday life, including autonomous vehicles, agriculture, sports, smart cities, and infrastructure. We plan to actively share the obtained results with society for its benefit.

Publications:

1) J. Tsuji and M. Noto, "Visiting-time-shortening framework considering Pareto optimality in theme park problem," *Transactions of the Japanese Society for Artificial Intelligence*, vol.33, no.2, pp.C-H98_1–9, 2018 (in Japanese).
2) M. Noto, H. Kannabe, T. Morizumi, and H. Kinoshita, "Agent-based social simulation model for analyzing human behaviors using particle swarm optimization," *International Journal of Computer and Information Technology*, vol. 2, no. 5, pp. 850–859, 2013.
3) M. Noto and S. Yoneda, "Optimal sink node allocation for balancing communication load in a wireless sensor network," *International Journal on Smart Sensing and Intelligent Systems*, vol. 6, no. 4, pp. 1533–1558, 2013.

Affiliated Academic Organizations:

M. Noto: Information Processing Society of Japan, The Institute of Electronics, Information and Communication Engineers, The Japanese Society for Artificial Intelligence, Japan Society for Software Science and Technology, Japan Society for Fuzzy Theory and Intelligent Informatics, The Institute of Electrical Engineers of Japan.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 2; Undergraduates: 13

Number of alumni: Undergraduates: 224; Postgraduates (M.C.): 22..

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Signal Analysis Laboratory

Kensuke Fujinoki (Associate Professor) Office: 23-625 Ext.: 3814

Education/K. Fujinoki (e-mail: fujinoki@kanagawa-u.ac.jp)
03/2013, Ph.D., Hiroshima City University
03/2007, M.S., Tokyo Denki University

Research Field: Signal processing, applied mathematics, financial engineering.
Research Overview: Research on theoretical aspects of signal processing and analysis, and efficient representation of a variety of signals and data, including sounds, images, and financial time series data.
Research Subjects: 1. Frame theory and its applications. 2. Application of harmonic analysis to financial engineering.
Introduction: Our research interests focus on theoretical aspects of signal processing, which supports the foundation of information and communication technologies, and on applied research on numerical simulation of actual signals or data. We deal with a wide variety of multidimensional signals, such as sounds, images, computer graphics, medical images, and financial time series data. We mainly study the method for feature extraction and an efficient representation of signals using harmonic analysis tools, such as Fourier analysis, time-frequency analysis, sampling theory, sparse signal processing, frame analysis, and inverse problems. In addition, as an application of signal processing to financial markets, we also conduct research on financial engineering, such as analysis of financial time series data and market simulations using harmonic analysis, machine learning, optimization theory, and other techniques.

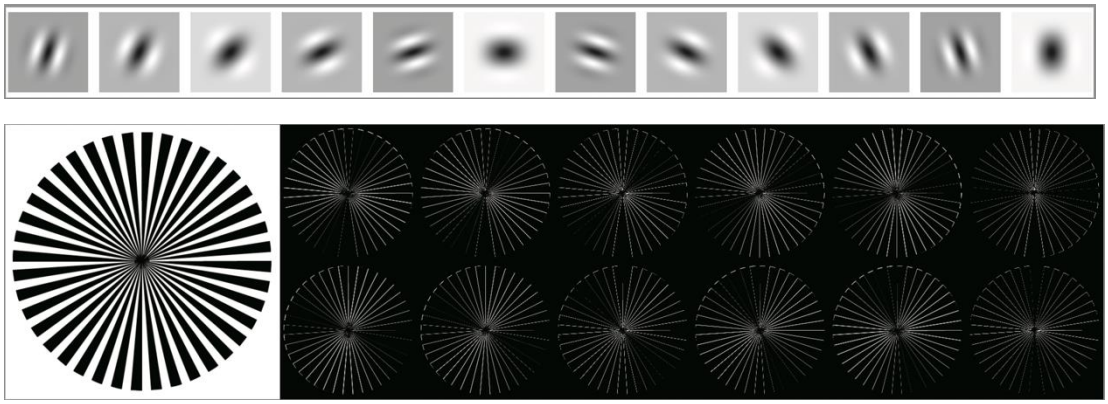


Figure: Frames and orientation analysis of a test image

Publications:

1) K. Fujinoki, Frames and Multirate Perfect Reconstruction Filter Banks in Multiple Dimensions, Current Trends in Analysis, its Applications and Computation, P. Cerejeiras, M. Reissig, I. Sabadini, J. Toft (Eds.), Birkhauser, 2022.
2) K. Fujinoki, H. Hashimoto and T. Kinosita, On Directional Frames Having Lipschitz Continuous Fourier Transforms, International Journal of Computer Mathematics, Vol. 7, No. 240, (2021).
3) K. Fujinoki, Two-Dimensional Directional Lifting Schemes, in: Analysis, Probability, Applications, and Computation. Trends in Mathematics, K. Lindahl, T. Lindstrom, L. Rodino, J. Toft, P. Wahlberg (Eds.), Birkhauser, pp. 525-531, 2019.
4) K. Fujinoki, Wavelet Constructions with Lifting Scheme, Transactions of the Japan Society for Industrial and Applied Mathematics, Vol. 2, No. 2, pp. 72-133 (2018) (in Japanese).

Affiliated Academic Organizations:
K. Fujinoki: JSIAM, MSJ, IEICE, JSAI, IEEE.

Current members: Associate Professors: 1; Postgraduates: 0; Undergraduates: 9

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Future Energy Technologies Laboratory

Nobuyuki Matsuki (Associate Professor) Office: 23-514 Ext.: 3762

Tomomasa Sato (Research Associate) Laboratory: 23-603 Ext.: 3792
Education/N. Matsuki (e-mail:matsuki@kanagawa-u.ac.jp)
09/2000, Ph.D., Tokyo Institute of Technology
03/1997, M.S., Tokyo Institute of Technology
Education/T. Sato (e-mail: satout2@kanagawa-u.ac.jp)
03/1989, M.S., Kanagawa University


N. Matsuki


T. Sato

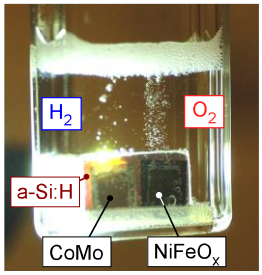
Research Field: Energy Conversion Devices, Thin-film Electronic Materials, Solid-state Electronics.

Research Overview: Development of photovoltaic devices, flexible electronic devices, sustainable functional thin-film materials, innovative thin-film fabrication processes, and thin-film characterization techniques.

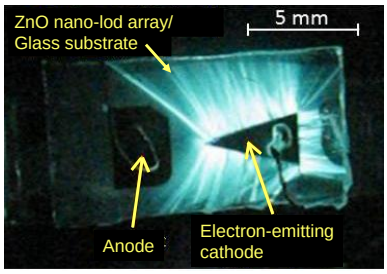
Research Subjects: (1) Perovskite/poly-Si heterojunction solar cells, (2) π-conjugated polymer/inorganic semiconductor heterojunction photovoltaic devices, (3) thin-film electronic devices on flexible substrates, (4) external-field-assisted deposition, (5) electron-field-emission light-emitting devices.

Introduction: Global environmental destruction and climate change problems caused by mass consumption of fossil fuels have become critical as the global population has grown exponentially. Therefore, there is an urgent need to develop alternative energy sources to build sustainable societies.

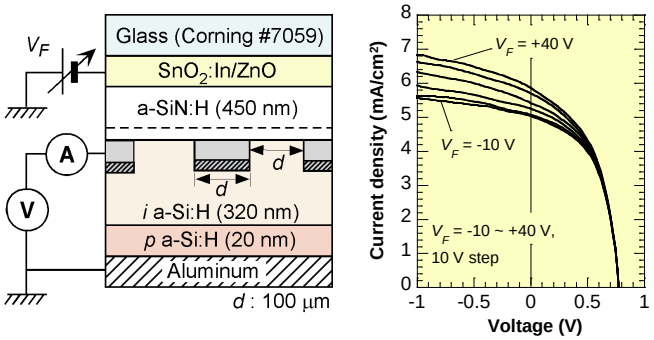
We are developing innovative technologies for harnessing various renewable energy sources. In particular, we focus on energy conversion devices that generate electricity from solar light (solar cells) and solar thermal energy, and that can harvest small amounts of energy, such as waste light, waste heat, and vibration, from domestic and public environments. In addition, we are investigating fabrication methods and process and characterization techniques for energy conversion materials to achieve our main research target.



Water-splitting multi-layer thin-film photocatalyst



Lateral-direction electron-field-emission light-emitting device



Field-effect solar cell and its *J-V* characteristics

Publications: 1) A Novel optical characterization of a-Si:H/c-Si interface microstructures based on data of positron annihilation spectroscopy, *ECS Transaction* **92**, 21-24 (2019). 2) Combinatorial screening of halide perovskite thin films and solar cells by mask-defined IR laser molecular beam epitaxy, *Sci. and Technol. of Adv. Mater.* **18**, 307-315 (2017). 3) M. Tamakoshi and N. Matsuki, "Impact of sputter-induced ion bombardment at the heterointerfaces of a-Si:H/c-Si solar cells with double-layered In_2O_3:Sn structures", *Jpn. J. Appl. Phys.* Vol. 54, pp. 08KD09-1~6 (2015). 4) Y. Tanaka, N. Matsuki and H. Fujiwara, "Characterization of a-Si:H thin layers incorporated into textured a-Si:H/c-Si solar cell structures by spectroscopic ellipsometry using a tilt-angle optical configuration," *Thin Solid Films*, vol. 569, pp. 64–69 (2014). 5) N. Matsuki and H. Fujiwara, "Nondestructive characterization of textured a-Si:H/c-Si heterojunction solar cell structures with nanometer-scale a-Si:H and In_2O_3:Sn layers by spectroscopic ellipsometry," *Journal of Applied Physics*, vol. 114, pp. 043101-1–5 (2013). 6) N. Matsuki, Y. Irokawa, Y. Nakano, M. Sumiya, "π-Conjugated polymer/GaN Schottky solar cells," *Solar Energy Materials and Solar Cells*, vol. 95, pp. 284–287 (2011).

Affiliated Academic Organizations:
N. Matsuki: Japan Society of Applied Physics, Institute of Electronics, Information and Communication Engineers.
T. Sato: Institute of Electronics, Information and Communication Engineers.

Current members: Associate Professors: 1; Research Associates: 1; Postgraduates: 1; Undergraduates: 12
Facilities: Infrared-laser deposition system, Electron-beam deposition system, Resistive heating deposition system, Spin-coating equipment, Photovoltaic properties characterization system, Hall effect measurement system.

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Communication Engineering Laboratory

Kazumitsu Matsuzawa (Professor) Office: 23-624 Ext.: 3813

Hiroshi Amanuma (Technical Assistant) Laboratory: 23-621 Ext.: 3810

Education/K. Matsuzawa (e-mail: matsuzawa@kanagawa-u.ac.jp)
03/2002, Engineering Dr., Tokyo Institute of Technology
03/1977, Engineering M., Tokyo Institute of Technology
Education/H. Amanuma (e-mail: amanuma@kanagawa-u.ac.jp)
03/1984, B.Eng., Kanagawa University


K. Matsuzawa

Research Field: Communication Engineering (Artificial Intelligence, Natural Language Processing).

Research Overview: Communication engineering helps facilitate communication between people and supports mutual understanding between human and computers. Our research extracts knowledge from the vast amount of information on the Internet to advance smooth collaboration between people with different ideas.

Research Subjects: A system for collecting reliable knowledge from the Internet, studies of mechanisms to evaluate miscellaneous knowledge comprehensively, a method for predicting whether advance story from fragments of conversation, a system that uses the sense of words in the selection of goods, and elucidation of the intelligence required for communication.

Introduction: To understand human words, computers require data similar to the common sense that human beings have. For example, the content of human languages can be translated, and it is evaluated with the knowledge that different words can point to the same thing. Therefore, we have built a database of the common-sense meanings of words by using the language knowledge on the Internet. This is called the Concept-Base. With the Concept-Base, the degree to which the meaning of certain words resembles other words can be calculated as a number between 0 and 1. By using this calculation (RUIJING), computers will be able to understand human language better.

However, humans are also sensitive to the sound of words. For example, you might associate a word in a conversation with another similar-sounding word, even though the meanings might be different. This association can spread to the main topic of conversation. New ideas can also arise. We created a mechanism to calculate the degree to which the sound of certain words resembles other words as a number between 0 and 1. By using this calculation (DAJARENG), computers can apply human words to various situations.

Furthermore, combining our two systems can better aid communication between humans and between humans and computers. Using these support technologies, communication engineering aims to realize a society where humans and computers can cooperate closely.

Publications:

1) N. Inago, K. Kasahara, and K. Matsuzawa, “A method for judging the semantic similarity between nouns by using noun-noun co-occurrence in compound words,” *Journal of Information Processing Society of Japan*, vol. 41(8), pp. 2291–2298 (2000).
2) K. Fujimoto, H. Kazawa, H. Sato, A. Abe, and K. Matsuzawa, “DSIU systems: Decision support for Internet users: Providing hot choice by using information on the Internet,” *Journal of The Japanese Society for Artificial Intelligence*, vol. 15(1), pp. 261–64 (2000).

Affiliated Academic Organizations:

K. Matsuzawa: The Institute of Electronics, Information and Communication Engineers (IEICE), Information Processing Society of Japan, The Japanese Society for Artificial Intelligence, The Association for Natural Language Processing.

Current members: Professors: 1; Technical Assistants: 1 ; Postgraduates: 1 ; Undergraduates: 14

Field of Electrical, Electronics, and Information Engineering/Graduate School
Department of Electrical, Electronics and Information Engineering/Undergraduate

Semiconductor Engineering Laboratory

Shigeo Yamaguchi (Professor) Office: 23-511 Ext.: 3759

Seiji Yoneda (Associate Professor)

Laboratory: 23-630 Ext.: 3818

Education/S. Yamaguchi (e-mail: yamags18@kanagawa-u.ac.jp)
03/1997, Ph.D., Kyoto University
03/1993, M.S., Kyoto University
Education/ S. Yoneda (e-mail: yoneds01@kanagawa-u.ac.jp)
03/2000, Ph.D., Keio University

S. Yamaguchi

S.Yoneda

Research Field: Materials Science and Engineering.

Research Overview: Semiconductor-related devices.

Research Subjects: Development of devices and systems integrating inorganic and organic materials.

Introduction:

Figure 1 shows a photograph of our Peltier device embedded in a thermal cycler. The P- and N-type thermoelectric bulks are located between Cu heat sinks, which also serve as electrodes. Our device has a copper well block placed between the P- and N-type bulks. The well block is formed by transforming an electrode so that it partially protrudes from the matrix bulks, and the well block is used to cool or heat objects directly.

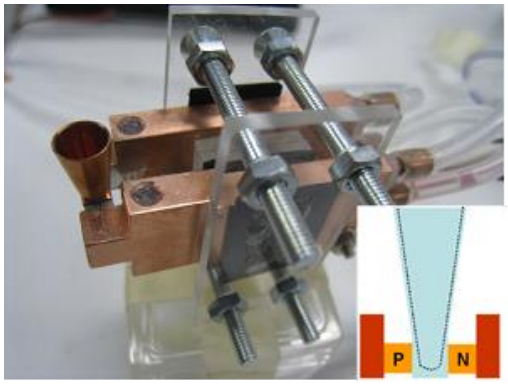


Fig.1 Photograph of our Peltier device and (inset) schematic structure of our PN-sandwiched well block.

Figure 2 shows our Peltier device set in a thermal cycler that is electrically connected to a temperature controller and a power supply. To induce the Peltier device radiation, water flows through the copper electrodes. The power supply, which is a driver for our Peltier device, was laboratory-built to make it suitable for the low voltage and high current required by the device.

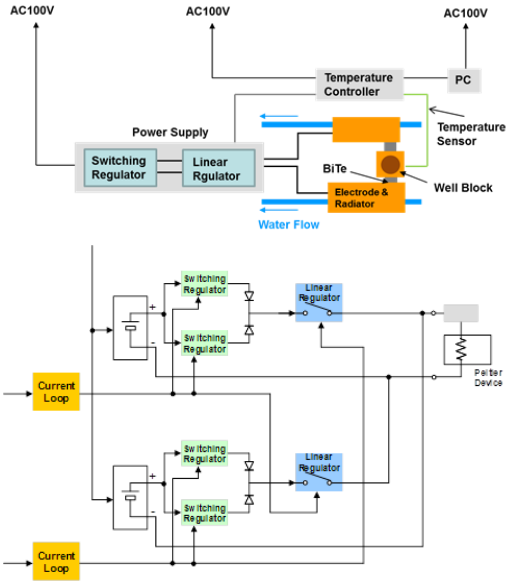


Fig. 2 Schematic structure of our PCR system

Publications: 1) S. Yamaguchi, T. Suzuki, K. Inoue, and Y. Azumi, “DC-driven thermoelectric Peltier device for a precise PCR system,” *Japanese Journal of Applied Physics*, vol. 54, 057001-1 (2015).
2) S. Yamaguchi and H. Homma, “Fabrication of a unipolar Peltier device using a pair of N-type thermoelectric materials,” *Microelectronic Engineering*, vol. 129, pp. 77–80 (2014).

Affiliated Academic Organizations:

S. Yamaguchi: Japan Society of Applied Physics, The Institute of Electrical Engineers of Japan

S. Yoneda: American Physical Society, The Institute of Electrical Engineers of Japan, The Thermoelectrics, Materials Science Society of Japan, Information Processing Society of Japan, The Japanese Society for Artificial Intelligence

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Current members: Professors: 1; Associate Professors: 1; Postgraduates: 2; Undergraduates: 16

Facilities: RF sputtering system, microchip electrophoresis system for DNA/RNA analysis.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School [Graduate (M.C. and D.C.)]

Department of Material and Life Chemistry/Undergraduate

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Soft Materials Physics Laboratory

Takayuki Ikehara (Professor) Office: 23-722 Ext.: 3849

Shuta Hara (Assistant Professor)
Laboratory: 23-721 Ext.: 3848

Education/T. Ikehara (e-mail: ikehara@kanagawa-u.ac.jp)
12/2000, Ph.D., The University of Tokyo
Education/S. Hara (e-mail: ft102160vg@kanagawa-u.ac.jp)
09/2014, Ph.D., Tokyo Medical and Dental University

T. Ikehara

S. Hara

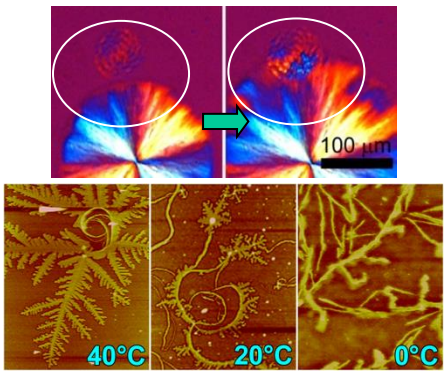
Research Field: Physical properties of polymers, Polymer physics and chemistry.

Research Overview: Investigating and designing nano- and macroscopic structures and physical properties; and dynamics in thin films, grafted layers and multi-component polymeric systems.

Research Subjects: 1. Structures and functions in thin films, grafted layers and multi-component polymeric systems. 2. Analyses and applications of nano-structures in block copolymers. 3. Structural and kinetic studies of interpenetrating spherulites in crystalline/crystalline polymer blends and block copolymers.

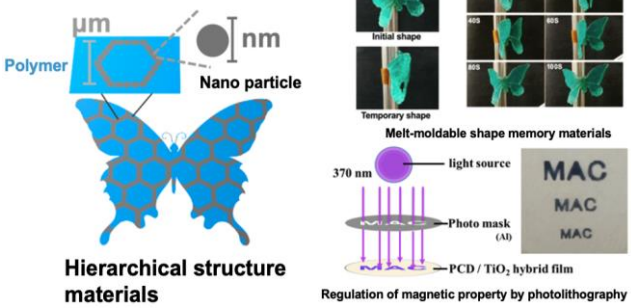
Introduction:

Polymer blends and block copolymers



The relationship between the structures and physical properties of polymer blends and block copolymers with crystalline and biodegradable components are investigated based on the structural formation process, crystallization dynamics, and phase behavior. The results of our fundamental research are applied to developing functional polymeric materials.

Inorganic hybrid polymer materials



By mixing functional inorganic nanoparticles with macromolecules, we are developing materials with new functions. An exciting property of inorganic nanoparticles is that arranging inorganic nanoparticles in a macrostructure can adjust the properties of inorganic nanoparticles and the materials' mechanical strength. The goal is developing functional materials with hierarchical structures from nano to macro.

Publications: 1) "Development of a magnetic hybrid material capable of photoinduced phase separation of iron chloride by shape memory and photolithography", J. Mater. Chem. C. (2022) *in press* 2) "Chiral Nucleating Agents Affecting the Handedness of Lamellar Twist in the Banded Spherulites in Poly(ε-Caprolactone)/Poly(Vinyl Butyral) Blends", ACS Macro Lett., 8, 871−874 (2019). 3) "The degree of crystallinity and segmental mobility in interpenetrating spherulites of poly(butylene succinate) and poly(ethylene oxide)", *Polym. J.*, 50 431–438 (2018). 4) "Diverse morphological formations and lamellar dimensions of poly(ε-caprolactone) crystals in the monolayers grafted onto solid substrates", *Polymer* 112 53–60 (2017). 5) "Diverse morphological formations and lamellar dimensions of poly(ε-caprolactone) crystals in the monolayers grafted onto solid substrates", *Polymer* 112 53–60 (2017).

Affiliated Academic Organizations:
T. Ikehara: The Society of Polymer Science, Japan.
S. Hara: The Society of Polymer Science, Japan, The magneto-Science society of Japan, Japan

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Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 4; Undergraduates: 10
Facilities: Atomic force microscope, polarized optical microscope, phase contrast optical microscope, pulsed NMR, differential scanning calorimeter, gel permeation chromatograph, rheometer.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Catalyst Materials Laboratory

Wataru Ueda (Professor) Office: 23-829-1 Ext.: 3903

Satoshi Ishikawa (Assistant Professor)
Laboratory: 23-827 Ext.: 3902

Education/W. Ueda (e-mail: uedaw@kanagawa-u.ac.jp)
03/1981, Ph.D., Tokyo Institute of Technology
Education/S. Ishikawa (e-mail: sishikawa@kanagawa-u.ac.jp)
09/2015, Ph.D., Hokkaido University

W. Ueda

S. Ishikawa

Research Field: Materials Chemistry, Inorganic Chemistry, Catalysis.

Research Overview: Synthesizing inorganic materials with novel structures to obtain catalysts. Oxidation of lower alkanes to manufacture chemicals. Conversion of biomass-derived materials into chemicals

Research Subjects: 1. Oxidation of C_1-C_4 alkanes for chemical manufacturing. 2. Synthesis of mixed metal oxides with new porous structures.

Introduction: Catalytic oxidation is an important class of reaction, especially for converting fossil fuel resources into energy and useful chemical products. In addition, the demand for high energy and resource efficiency in manufacturing processes has been growing. We are developing new synthetic methods for catalytic materials that can convert chemicals and oxidize alkanes into useful chemicals efficiently.

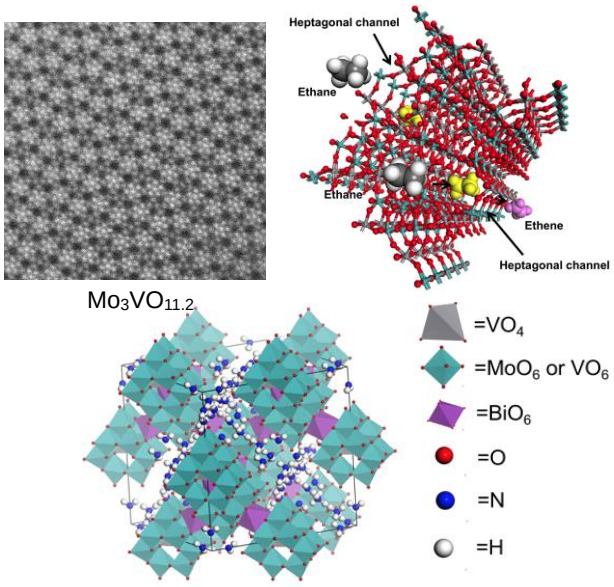


Figure 1. Examples of high-dimensionally structured metal oxide catalysts

Publications:

1) Structural Characterization of 2D Zirconomolybdate by Atomic Scale HAADF-STEM and XANES and its Highly Stable Electrochemical Properties as a Li Battery Cathode" Q. Zhu, Z. Zhang, M. Sadakane, F. Matsumoto, N. Hiyoshi, A. Yamamoto, H. Yoshida, A. Yoshida, M. Hara, W. Ueda, *Inorg. Chem.*, **2017**, 56, 14306-14314. 2) Synthesis of Crystalline Microporous Mo-V-Bi Oxide for Selective (Amm)Oxidation of Light Alkanes, S. Ishikawa, Y. Goto, Y. Kawahara, S. Inukai, N. Hiyoshi, N.F. Dummer, T. Murayama, A. Yoshida, M. Sadakane, W. Ueda, *Chemistry of Materials*, **2017**, *29*, 2939-2950. 3) Synthesis of ε-Keggin-type Cobaltomolybdate-based 3D Framework Material and Characterization Using Atomic-scale HAADF-STEM and XANES, T. Igarashi, Z-X. Zhang, T. Haioka, N. Iseki, N. Hiyoshi, N. Sakaguchi, C. Kato, S. Nishihara, K. Inoue, A. Yamamoto, H. Yoshida, N. Tsunoji, W. Ueda, T. Sano, M. Sadakane, *Inorg. Chem.*, **2017**, *56*, 2042-2049. 4) All-inorganic porous soft-framework by assembly of metal oxide molecular wires, Z. Zhang, M. Sadakane, S-I. Noro, N. Hiyoshi, A.Yoshida, M. Hara, W. Ueda, *Chem. Eur. J.*, **2017**, *23*, 1972-1980. 5) Hydrothermal Synthesis of a Layered-type W-Ti-O Mixed Metal Oxide and its Solid Acid Activity, T. Murayama, J. Hirata, K. Nakajima, K. Omata, E. Hensen, W. Ueda, *Catal. Sci. Technol.*, **2017**, *7*, 243-250. 6) Identification of the catalytically active component of Cu-Zr-O catalyst for the hydrogenation of levulinic acid to g-valerolactone, S. Ishikawa, D. Jones, S, Iqbal, R, Christian, D, Morgan, D, Willock, P, Miedziak, J, Bartley, J, Edwards, T, Murayama, W, Ueda, G, Hutchings, *Green Chemistry*, **2017**, *19*, 225-236.

Affiliated Academic Organizations:

W. Ueda: Catalysis Society of Japan, The Japan Petroleum Institute, The Chemical Society of Japan.
S. Ishikawa: Catalysis Society of Japan, The Japan Petroleum Institute.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 2; Undergraduates: 13

Facilities: X-ray diffractometer, gas-phase catalytic flow reactor, gas chromatograph, high-performance liquid chromatograph, surface area analyzer, Fourier transform-infrared spectrometer, UV-vis spectrometer.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Bioactive Natural Products Chemistry Laboratory

Masahiro Okada (Professor)
Office: 23-727-1, Ext.: 3853
Shimpei Sumimoto (Assistant Professor)
Laboratory: 23-726, Ext.: 3852
M. Okada (e-mail: okada@kanagawa-u.ac.jp)
09/2005, Ph.D., Graduate School of Bioagricultural Sciences, Nagoya University
S. Sumimoto (e-mail: sumi@kanagawa-u.ac.jp)
03/2019, Ph.D., Department of Chemistry, Keio University

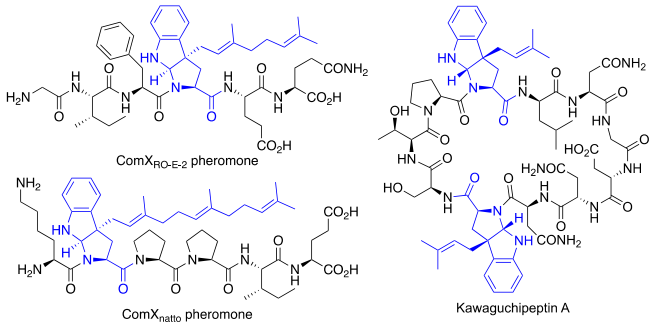

M.Okada


S.Sumimoto

Research Field: Natural products chemistry, Bioorganic chemistry.
Research Overview: Bioactive natural products chemistry; discovery and identification, chemical synthesis, and biosynthesis and function.
Research Subjects: 1. Studies of post-translationally modified peptides. 2. Creation of bioactive metabolites by biosynthetic engineering. 3. Discovery of novel natural products.

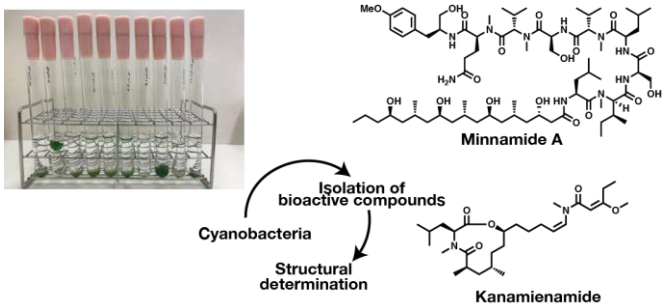
Research Highlights:

Studies on post-translationally isoprenylated peptides



Proteins and peptides are biosynthesized through the translation of RNA, and the RNA is produced through transcription of DNA. The plain proteins and peptides are generally inactive and frequently chemically modified due to activation of the inherent ability, called post-translational modification.
We have identified a novel post-translation modification in a peptide pheromone, namely "posttranslational isoprenylation of tryptophan residue". We now identify the details of the activation mechanism and the biological events in addition to the universality of the modification.

Discovery of novel natural products from cyanobacteria



Microorganisms produce various natural products such as peptide, polyketide, terpenoids. These natural products display interesting biological activities, which depend on their unique structures.
We focus on cyanobacteria for isolation source of bioactive compounds. Cyanobacteria has high species diversity. However, limited cyanobacterial species was used in isolation of bioactive compounds. We have isolated some biological natural products from cyanobacteria. We are investigating discovery of biological natural products, structural determination and mechanism of action.

Publications:

1) Hirooka, S. Shioda, and M. Okada. Identification of critical residues for the catalytic activity of ComQ, a Bacillus prenylation enzyme for quorum sensing, by using a simple bioassay system. *Biosci. Biotechnol. Biochem.*, **2020**, *84*, 347–357. 2) S. Sumimoto, M. Kobayashi, R. Sato, S. Shinomiya, A. Iwasaki, S. Suda, T. Teruya, T. Inuzuka, O. Ohno, and K. Suenaga, Minnamide A, a Linear Lipopeptide from the Marine Cyanobacterium *Okeania hirsuta*, *Org. Lett*., **2019**, *21*, 1187−1190. 3) T. Sugita, M. Okada, Y. Nakashima, T. Tian, and I. Abe. A tryptophan prenyltransferase with broad substrate tolerance from *Bacillus subtilis* subsp. *natto*, *ChemBioChem* **2018**, *19*, 1396–1399. 4) M. Okada, K. Saito, C. P. Wong, C. Li, D. Wang, M. Iijima, F. Taura, F. Kurosaki, T. Awakawa, and I. Abe. Combinatorial biosynthesis of (+)-daurichromenic acid and its halogenated analogue, *Org. Lett.* **2017**, *19*, 3183–3186. 5) M. Okada, T. Sugita, C. P. Wong, T. Wakamoto, and I. Abe. Identification of pyridinium with three indole moieties as an antimicrobial agent, *J. Nat. Prod.* **2017**, *80*, 1205–1209. 6) M. Okada, T. Sugita, and I. Abe. Posttranslational isoprenylation of tryptophan in bacteria, *Beilstein J. Org. Chem.* **2017**, *13*, 338–346.

Affiliated Academic Organizations:

M. Okada: The Japan Society for Bioscience, Biotechnology, and Agrochemistry; The Chemical Society of Japan; The Pharmaceutical Society of Japan; American Chemical Society; The Japan Society of Pharmacognosy.
S. Sumimoto: The Chemical Society of Japan; American Chemical Society; Japanese Society for Chemical Biology.

Current members: Professor: 1; assistant professor: 1; technical assistant: 1; postgraduates: 7; undergraduates: 7
Facilities: Microwave peptide synthesizer, Anaerobic chamber, Biosafety cabinet, HPLC system, etc.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Designing Organic Reactions Laboratory

Sentaro Okamoto (Professor) Office: 23-731-1 Ext.: 3856

Takeshi Yamada (Assistant Professor)

Laboratory: 23-731 Ext.: 3855

Education/S. Okamoto (e-mail: okamos10@kanagawa-u.ac.jp)
04/1992, Ph.D., Tokyo Institute of Technology
03/1987, M.S., Tokyo Institute of Technology
Education/T. Yamada(e-mail: tyamada@kanagawa-u.ac.jp)
03/2007, Ph.D., Osaka City University


S. Okamoto

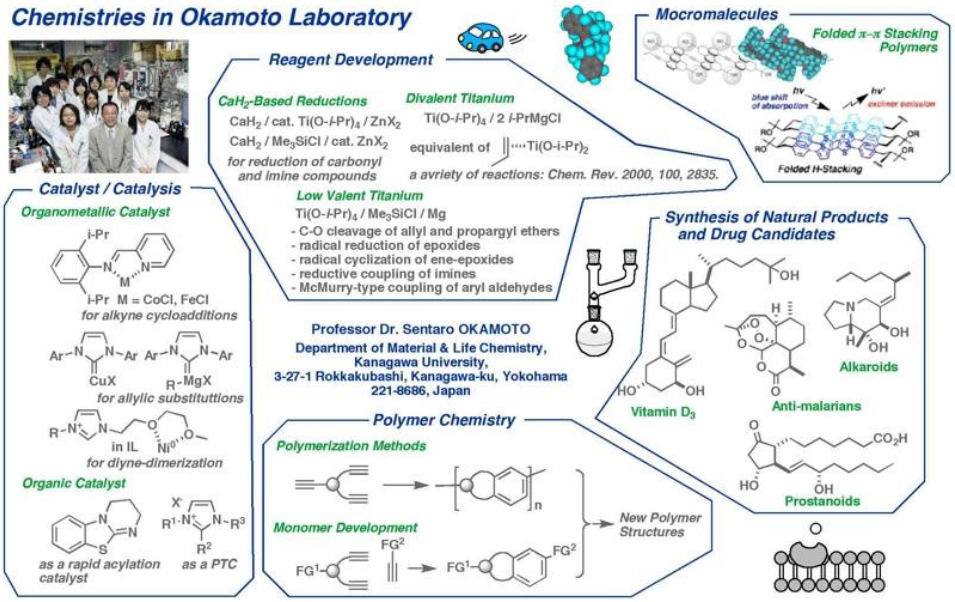

T. Yamada

Research Field: Organic Synthesis, Synthetic Organometallic Chemistry, Polymer Chemistry, Application to Developing Pharmaceuticals and Organic Materials.

Research Overview: Development of efficient molecular transformations by using organometallic reagents and catalysts, and design and synthesis of useful biologically active molecules and organic materials.

Research Subjects: 1. Homogeneous metal-catalyzed reactions. 2. Organometallic reagents. 3. Organic catalysts. 4. Asymmetric synthesis. 5. Synthesis of biologically active natural and artificial compounds for drug discovery. 6. New polymerization methods. 6. Organic molecule-based materials.

Introduction: We are developing new methods for fine-chemical production based on the specific reactivity of transitionmetals. We are focusing on fourth-period transition metals, such as Ti, Fe, Co, Ni, and Cu, because they are cheap, readily available, and less toxic than other metals. We are applying our methods to synthesizing new analogues of biologically active substances and evaluating their activity as drug candidates. We are also developing new polymerization methods to produce macromolecules with unique optical and electronic properties for new materials.



Publications:

(1) Y. Sugiyama, S. Heigozono, S. Okamoto, "Iron-Catalyzed Reductive Magnesiation of Oxetanes to Generate (3-Oxidopropyl)magnesium Reagents," *Org. Lett.* **2014**, *16*, 6278-6281. (2) N. Takekoshi, K. Miyashita, N. Shoji, S. Okamoto, "Generation of A Low-Valent Titanium from Titanatrane and Its Catalytic Reactions: Radical Ring Opening of Oxetanes," *Adv. Synth. Catal*. **2013**, *355*, 2151-2157. (3) Tetsuya S. Y. Sugiyama, S. Okamoto, "Cobalt-Catalyzed Cross Addition of Silylacetylenes to Internal Alkynes," *J. Org. Chem.* **2013**, *78*, 3583-3591. (4) S. Okamoto, Y. Sugiyama, "From Development of Catalysts for Alkyne and Alkyne/Nitrile [2 + 2 + 2] Cycloaddition Reactions to Their Use in Polymerization Reactions," *SYNLETT* **2013**, 1044-1060. (5) Y. Sugiyama, R. Kato, T. Sakurada, S. Okamoto, "Chain-Growth Cycloaddition Polymerization via a Catalytic Alkyne [2 + 2 + 2] Cyclotrimerization Reaction and Its Application to One-shot Spontaneous Block Copolymerization," *J. Am. Chem. Soc*. **2011**, *133*, 9712-9715.

Affiliated Academic Organization: S. Okamoto: The Japan Chemical Society, American Chemical Society, The Society of Synthetic Organic Chemistry, Japan, The Kinki Chemical Society Japan, The Society of Polymer Science, Japan

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Current members: Professors: 1; Technical Assistants: 1; Postgraduates: 7; Undergraduates: 11

Facilities: Laboratory: GC, HPLC, Preparative LC, FT-IR, UV-Vis., PL, React-IR, Glove box, Schlenk line, Plate Reader Assay (TECAN F-200 pro), Resistivity meter, Digital source-meter, Vapor deposition equipment, Spin coater. Department: 400, 500, and 600 MHz NMR (JEOL), X-ray diffraction, CD, Accu-TOF-MS

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Nucleic Acid Chemistry Laboratory

Akira Ono (Professor) Office: 23-818 Ext: 3887

Shoji Fujiwara (Assistant Professor)
Laboratory: 23-826 Ext: 3901

Education/A. Ono (e-mail: akiraono@kanagawa-u.ac.jp)
1986, Ph.D., Hokkaido University
1983, M.S., Hokkaido University
1981, B.S., Hokkaido University
Education/H. Saneyoshi (saneyoshih@kanagawa-u.ac.jp)


A. Ono


S. Fujiwara

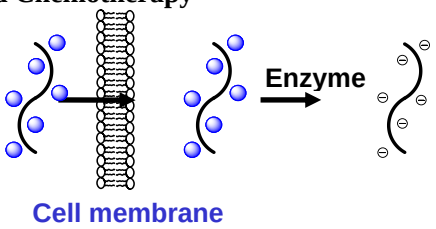
Research Field: Bio-functional Chemistry and Engineering, Nucleic Acid Chemistry, Medicinal Chemistry, Bio-nano Chemistry.

Research Overview: Using skills in nucleic acids chemistry and synthetic chemistry, we are developing new materials and technologies to contribute in life and material sciences.

Research Subjects: 1. Development of oligonucleotide prodrugs. 2. Synthesis, properties, and structures of metallo-DNA duplexes. 3. Development of highly sensitive Hg(II) ion sensors and Hg(II) ion adsorbing materials.

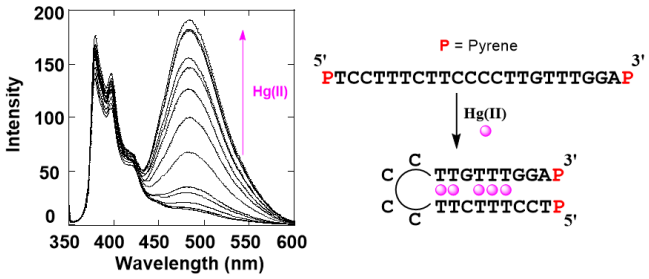
Introduction: Some of our recent results are shown below.

Nucleic Acid Chemotherapy



Oligonucleotide-based therapies promise to be highly specific tools for treating numerous human diseases. However, the multi-anionic nature of oligonucleotides prohibits cellular internalization. In addition, oligonucleotides are sensitive to extra- and intracellular nucleolytic enzymes. To circumvent these drawbacks, we are developing oligonucleotide prodrugs (pro-oligos). Pro-oligos can penetrate cells, where the pro-oligos are activated by cellular functions.

Mercury Ion Detection



Contamination with heavy metal ions may have severe effects on human health and the environment. Mercury contamination is widespread and arises from a variety of natural and anthropogenic sources. We are developing new methods for detecting and isolating mercury ions efficiently in aqueous solution.

Publications:1) A. Ono, T. Sugawara, H. Saneyoshi, J. Kondo, “Crystal structure of a DNA duplex containing four Ag(I) ions in consecutive dinuclear Ag(I)-mediated base pairs: 4-thiothymine–2Ag(I)–4-thiothymine”*Chem. Comm.*, **2017**, *53*, 11747. 2) J. Kondo, Y. Tada, T. Dairaku, Y. Hattori, H. Saneyoshi, A. Ono, Y. Tanaka, "A metallo-DNA nanowire with uninterrupted one-dimensional silver array" *Nature Chemistry*, **2017**, *9*, 956. 3) H. Saneyoshi; Y. Yamamoto; K. Kondo, Y. Hiyoshi, A. Ono, "Conjugatable/Bioreduction Cleavable Linker for the 5′-Functionalization of Oligonucleotides" *J. Org. Chem.*, **2017**, *82*, 1796. 4) H. Saneyoshi,, K. Iketani, K. Kondo, T. Saneyoshi, I. Okamoto, and A. Ono, “Synthesis and Characterization of Cell-Permeable Oligonucleotides Bearing Reduction-Activated Protecting Groups on the Internucleotide Linkages” *Bioconjugate Chem.*, **2016**, *27*, 2149. 5) Y. Tanaka* ----- H. Saneyoshi, ----- A. Ono* “Structures, physicochemical properties, and applications of T–Hg^{II}–T, C–Ag^{I}–C, and other metallo-base-pairs” *Chem. Comm.*, **2015**, *51*, 17343-17360 (Feature Article).

Affiliated Academic Organizations:

A. Ono: The Chemical Society of Japan, The Pharmaceutical Society of Japan, The Society of Synthetic Organic Chemistry, Japan.
H. Saneyoshi: The Chemical Society of Japan, The Japan Society of Analytical Chemistry.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates (M.C.): 5; Undergraduates: 13
Facilities: DNA Synthesizer, high-performance liquid chromatography system, thermal melting system (TMSPC-8, Shimadzu) for measuring thermal denaturation profiles of nucleic acids, fluorescence spectrophotometer.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Organic-Inorganic Hybrid Structure Research Laboratory

Yoshihiro Koide (Professor) Office: 23-819 Ext.: 3888

Sotaro Kusumoto (Assistant Professor)
Laboratory: 23-825 Ext.: 3900

Education/Y. Koide (e-mail: ykoide01@kanagawa-u.ac.jp)
1993, Ph.D., Department of Chemistry, Univ. of North Carolina at Chapel Hill
Education/S. Kusumoto (e-mail: kusumoto@kanagawa-u.ac.jp)
2021, Ph.D., Department of Chemistry, Kumamoto University


Y. Koide


S. Kusumoto

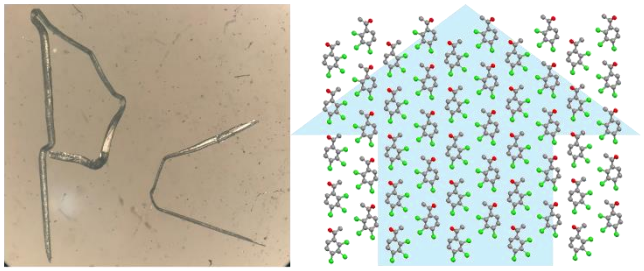
Research Field: Inorganic Photochemistry, Synthesis of Aluminum Complexes, Electrochemistry, Renewable Energy, Stimuli-Responding Materials, Soft Crystal, Functional Molecules.

Research Overview: 1. Research into the synthesis and properties of photofunctional main group and transition metal complexes; 2. Mechanochemical synthesis of Al-containing hybrid materials; 3. Molecular crystals responding to external stimuli; 4. Magnetic and photochemical properties of homo- and hetero-multinuclear complexes.

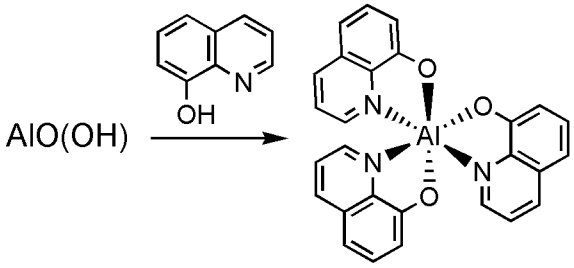
Research Subjects: 1. Thermal and photochemical reactivity of hydride complexes; 2. Synthesis of novel aluminum-cage complexes; 3. Construction of artificial photosynthetic systems for organic semiconductor-transition metal hybrid materials; 4. Fabrication and flexibility of long alkyl-chained molecular crystals; 5. Vapochromism and spin-state change of metal complexes; 6. Crystallography and photochemistry of multidimensional uranium and lanthanide complexes.

Research Highlights: Soft molecular crystals that cause structural changes due to low activation energy in response to external stimuli such as force, light, and temperature have recently attracted much attention. Our research focuses on such unique crystalline materials, especially the development of novel elastic/plastic crystals that can switch magnetism, luminescence, and color. Uranium and lanthanide complexes with one or two kinds of polycarboxylic acids can produce multidimensional unique structures, so their crystallographic and photochemical properties are also our intensive research.

Mechanically responsive polar crystal



Solid state synthesis of facial Alq_3



Publications: 1) "Recrystallization solvent dependent elastic/plastic flexibility of an n-dodecyl-substituted tetrachlorophtalimide" *Chem. Commun.*, 2022, **58**, 5411-5414. 2) "Structural and Magnetic Characterization of Homo- and Heterometallic Trinuclear Ni(II) and Cu(II) Clusters with N_2O_6 Acyclic Polydentate Ligand" *Chem. Lett.*, 2021, **50**, 1945-1948. 3) "A plastically bendable and polar organic crystal" *CrystEngComm*, 2021, **23**, 5560-5563. 4) "1D Mn(III) Coordination Polymers Exhibiting Chiral Symmetry Breaking and Weak Ferromagnetism" *Dalton Trans.*, 2021, **16**, 5428-5432. 5) "Coordinated halide and pseudo halide-dependent structures and photoluminescence of defective double cubane Zn(II) clusters" *Eur. J. Inorg. Chem.*, 2021, **46**, 1160-1164. 6) "Elastic Crystalline Fibres Composed of Ni(II) Complex", *Inorg. Chem.*, 2021, **60**, 1294-1298.

Affiliated Academic Organizations:
Y. Koide: The Chemical Society of Japan, Japanese Society of Coordination Chemistry, and The Japanese Photochemistry Association.
S. Kusumoto: The Chemical Society of Japan, Japanese Society of Coordination Chemistry.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 1; Undergraduates: 8

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Nanostructural Materials Chemistry Laboratory

Ren-Hua Jin (Professor) Office: 23-717 Ext.: 3845

Katsuya Kaikake (Technical Assistant) Laboratory: 23-728 Ext.: 3854
Education/R.-H. Jin (e-mail: rhjin@kanagawa-u.ac.jp)
04/1988, Ph.D., Nankai University
Education/K. Kaikake (e-mail: fs111832kq@kanagawa-u.ac.jp)
09/2013, Ph.D., University of Miyazaki

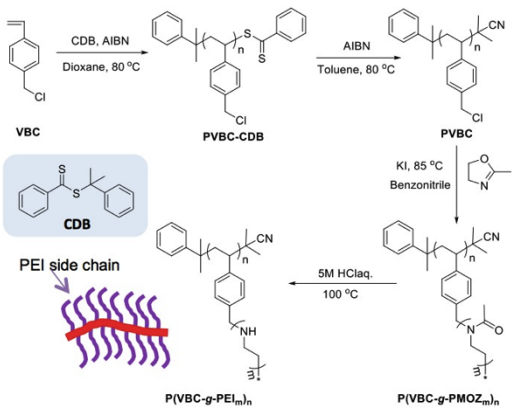

R.-H. Jin

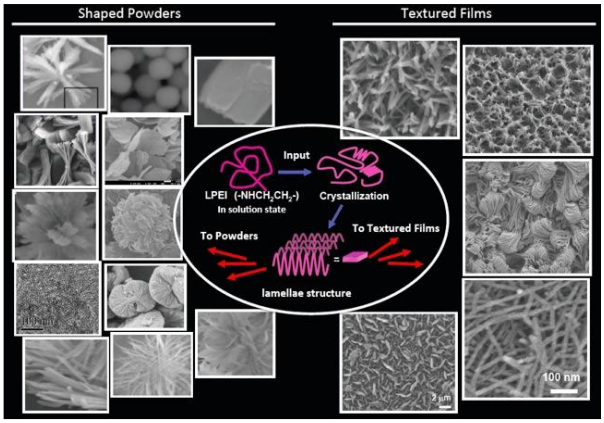
Research Field: Polymer Synthesis, Biomimetic Mineralization, Hybrid Nanomaterials.

Research Overview: Design and synthesis of functional polymers. Construction of hybrid nanomaterials, hierarchical ceramic nanocoating, and chiral ceramics with functional polymers as templates.

Research Subjects: 1. Synthesis of specially structured polyoxazolines and polyethyleneimines. 2. Self-assembly of polymers in aqueous media. 3. Chiral polymeric supramolecules. 4. Temporally and spatially controlled sol-gel reactions. 5. Synthesis of chiral silica and metal oxides. 6. Chiral discrimination and racemic resolution based on chiral ceramics.

Introduction: Shape control, from molecularly structured scales and self-assembled supramolecules entities to hierarchical metal oxides, directed by shaped organics, is important because material functions often depend on morphology. We are particularly interested in the concept of shape control in designing hybrid nanomaterials for new functional materials.





Publications:

1) “Double chiral Organic/inorganic hybrid materials: Formation of chiral phenolic resins on polyamines-associated chiral silica”, ***Chem Lett***, 46, 1518-1521 (2017). 2) “Shaped crystalline aggregates of comb-like polyethyleneimine for biomimetic synthesis of inorganic silica materials”, *Polymer*, 86, 120-128 (2016). 3) “Chiral SiO_2 and Ag@SiO_2 Materials Transferred by Complexes Consisting of Comb-Like Polyethyleneimine and Tartaric Acid”, *Chem. Eur. J.*, 21, 15667-15675 (2015). 4) “Nanosheets-stacked chiral silica transcribed from metal ions- and pH-tuned supramolecular crystalline complexes of polyamine/D-glucarate”, *Chem. Eur. J.*, *20*, 1134 – 1145 (2014). 5) “Synthesis of Free-standing Sub-10 nm Y_2O_3:Eu Particles on Silica Nanowire Matrix and Amplified Luminescent Performance”, *J. Mater. Chem. C*, *1*, 477–483 (2013). 6)“High-temperature-resistant chiral silica generated on chiral crystalline templates under neutral-pH/ambient conditions”, *Angew. Chem. Int. Ed. 51*, 5862 –5865 (2012).

Affiliated Academic Organizations:

R.-H. Jin: The Chemical Society of Japan, The Society of Polymer Science, Japan, The Ceramic Society of Japan, The Society of Silicon Chemisatry. Japan. K. Kaikake: The Chemical Society of Japan, The Society of Polymer Science, Japan.

Current members: Professors: 1; Technical Assistants: 1; Postgraduates: 10; Undergraduates: 12

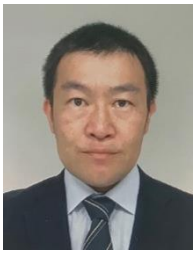
Facilities: UV-Vis spectrometer, FT-IR spectrometer, fluorescence spectrometer, circular dichroism spectrometer, vibrational circular dichroism spectrometer, scanning electron microscope (SEM), gel-permeation chromatography, contact angle meter, thermogravimetric-differential thermal analysis apparatus.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Environmental Forensics Laboratory

Norihide Nakada (Associate Professor) Office: 23-814-1 Ext.: 3880

Education/N. Nakada (e-mail: nakada@kanagawa-u.ac.jp)
03/2003, Ph.D., Tokyo University of Agriculture & Technology
03/2000, M.S., Tokyo University of Agriculture & Technology

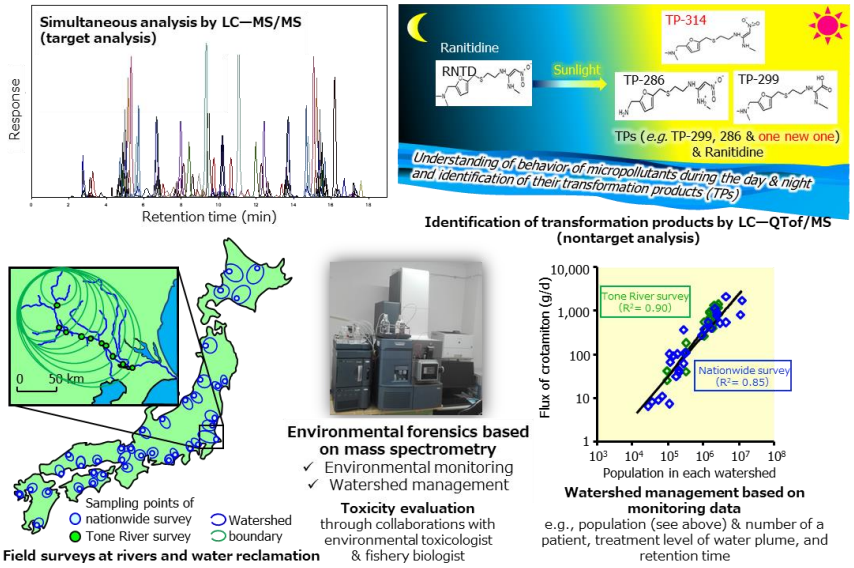


N. Nakada

Research Field: Environmental chemistry, analytical chemistry, environmental forensics.

Research Overview: Monitoring of micropollutants in the aquatic environment and evaluation of watersheds based on

Research Subjects: 1) Development of analytical methods for emerging micropollutants based on mass spectrometry, 2) monitoring of micropollutants in the aquatic environment, including water reclamation facilities, 3) evaluation of current and newly developed water treatment systems for removing micropollutants, 4) evaluation of the occurrence of micropollutants from the perspective of environmental toxicology, and 5) evaluation of watersheds based on the monitoring data.



Introduction: Huge amounts of chemicals are used in our daily life and some of them escape from current wastewater treatments and are discharged to the aquatic environment. Although these chemicals do not show acute or lethal toxicities, pharmaceuticals in particular affect the reproductive organs and behavior of fish. The number of pharmaceuticals used is forecasted to increase due to factors including the aging population and the impact of COVID-19 on mental health. Therefore, we are studying the development of analytical methods for emerging micropollutants and their transformation products by target analysis using LC-MS/MS, identification of unknown transformation products by non-target analysis using LC-QTof/MS, and evaluation of the detected concentration from the perspective of environmental toxicology. In addition, due to the stable usage of pharmaceuticals, we are studying indicators to estimate the population and number of patients in a watershed and the treatment level of water plumes in rivers among the pharmaceuticals analyzed.

Publications:

1) Nakada, N., Hanamoto, S., Jürgens, M.D., Johnson, A.C., Bowes, M.J., Tanaka, H., Assessing the population equivalent and performance of wastewater treatment through the ratios of pharmaceuticals and personal care products present in a river basin: Application to the River Thames basin, UK, *Science of the Total Environment*, 575, pp. 1100-1108, **2017**. 2) Zhao, B., Nakada N., Okumura, K., Zhou, J., Tanaka, H., *N*-Nitrosomorpholine behavior in sewage treatment plants and urban rivers, *Water Research*, 163, 114868, **2019**. 3) Johnson, A.C., Jin, X., Nakada, N., Sumpter, J.P., Learning from the past and considering the future of chemicals in the environment, *Science*, 367, pp. 384-387, **2020**. 4) Zhang, H., Ihara, M.O., Nakada, N., Tanaka, H., Ihara, M., Biological activity-based prioritization of pharmaceuticals in wastewater for environmental monitoring: G protein-coupled receptor inhibitors, *Environmental Science & Technology*, 54, pp. 1720-1729, **2020**. 5) Zhao, B., Zhou, J., Nakada, N., *N*-Nitrosodimethylamine formation potential (NDMA-FP) of ranitidine remains after chlorination and/or photo-irradiation: Identification of transformation products in combination with NDMA-FP test, *Chemosphere*, 267, 129200, **2021**.

Affiliated Academic Organization: Japan Society of Environmental Chemistry, Japan Society on Water Environment.

Current members: Associate Professors: 1; Undergraduates: 3

Facilities: Liquid chromatography–quadrupole time-of-flight/mass spectrometry (LC-QToF/MS) and liquid chromatography–tandem mass spectrometry (LC-MS/MS) (scheduled to be introduced in 2022 and 2023, respectively).

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Biomimetic Coordination Chemistry Laboratory

Shiro Hikichi (Professor) Office: 23-822 Ext.: 3890

Masaya Okamura (Assistant Professor) Laboratory: 23-822 Ext.: 3889

Education/S. Hikichi (e-mail: hikichi@kanagawa-u.ac.jp)
03/1995, Ph.D., Tokyo Institute of Technology
03/1992, M.S., Tokyo Institute of Technology

Education/M. Okamura (e-mail: okamura@kanagawa-u.ac.jp)
03/2016, Ph.D., The Graduate University for Advanced Studies

S. Hikichi

M. Okamura

Research Field: Bioinorganic Chemistry, Coordination Chemistry, Catalytic Chemistry.

Research Overview: Development of biomimetic oxidation catalysts based on coordination chemistry.

Research Subjects: 1. Researching mechanisms of dioxygen activation and oxidation catalysis on transition metals. 2. Development of biomimetic oxidation processes and artificial oxidation enzymes based on coordination chemistry.

Introduction: Design and development of coordination compounds that catalyze selective oxygenation of various organic compounds with environmentally friendly reagents (O_2, H_2O_2, *etc*.) is an attractive but challenging area of green chemistry. In nature, some transition metal-containing enzymes (metalloenzymes) catalyze selective oxidation of hydrocarbons under physiological mild conditions. Therefore, bio-inspired metallocomplex catalysts may be a fruitful approach to green oxidation catalysts.

The following projects are in progress.

(1) Investigation of the reaction mechanism of non-heme metalloenzymes by model complexes.

(2) Design and development of metallocomplex catalysts (homogeneous catalysts and heterogeneous immobilized metallocomplex catalysts) for green oxidation reactions.

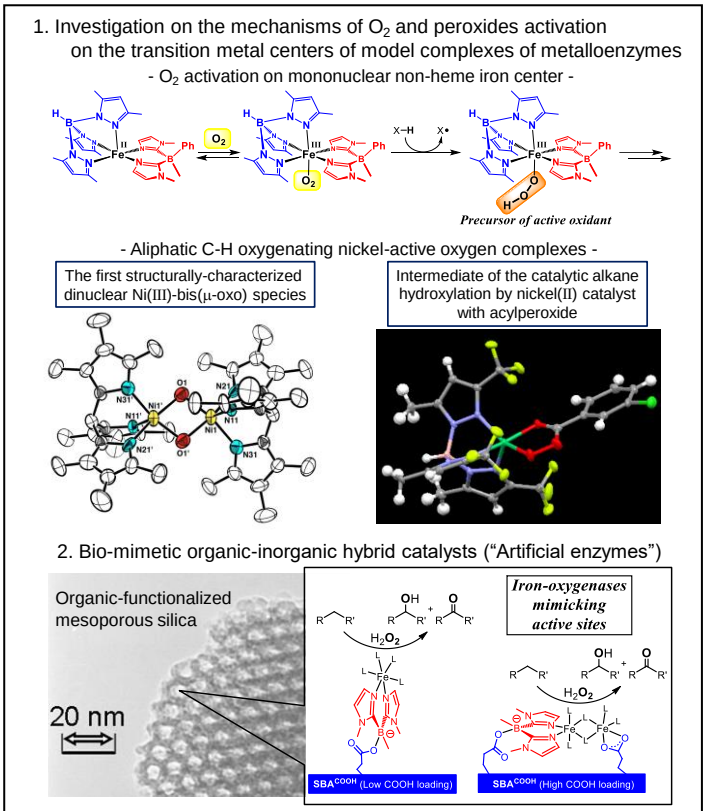


Figure 1. Selected results from our projects.

Publications:

1) T. Izumi, N. Matsuba, J. Nakazawa and S. Hikichi, “Aliphatic C–H hydroxylation activity and durability of a nickel complex catalyst according to the molecular structure of the bis(oxazoline) ligands”, *Molecular Catalysis*, vol. 511, 111718 (2021). 2) I. Terao, S. Horii, J. Nakazawa, M. Okamura and S. Hikichi, “Efficient alkane hydroxylation catalysis of nickel(II) complexes with oxazoline donor containing tripodal tetradentate ligands”, *Dalton Trans.*, vol. 49, 6108–6118 (2020). 3) T. Nishiura, A. Takabatake, M. Okutsu, J. Nakazawa and S. Hikichi, “Heteroleptic cobalt(III) acetylacetonato complexes with N-heterocyclic carbine-donating scorpionate ligands: synthesis, structural characterization and catalysis”, *Dalton Trans.*, vol. 48, 2564–2568 (2019). 4) T. Nishiura, Y. Chiba, J. Nakazawa and S. Hikichi, “Tuning the O_2 Binding Affinity of Cobalt(II) Centers by Changing the Structural and Electronic Properties of the Distal Substituents on Azole-Based Chelating Ligands”, *Inorg. Chem.*, vol. 57, 14218–14229 (2018).

Affiliated Academic Organizations:

S. Hikichi: Chemical Society of Japan, American Chemical Society, Japan Society of Coordination Chemistry, Catalysis Society of Japan, Society of Biological Inorganic Chemistry. M. Okamura: Chemical Society of Japan, Japan Society of Coordination Chemistry.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 4; Undergraduates: 8

Facilities: FT-IR spectrometer, UV-vis-NIR spectrometer, gas chromatograph, gas chromatography-mass spectrometry system, high-performance liquid chromatography system, glove box, organic solvent purification and dispensing system.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Energy and Materials Chemistry Laboratory

Futoshi Matsumoto (Professor) Office: 23-816 Ext.: 3885

Takao Gunji (Assistant Professor) Laboratory: 23-817 Ext.: 3886
Education/F. Matsumoto (e-mail: fmatsumoto@kanagawa-u.ac.jp)
03/1997, Ph.D., Tokyo Institute of Technology
03/1994, M.S., Tokyo Institute of Technology

F. Matsumoto

T. Gunji

Research Field: Electrochemistry, Materials Chemistry, Industrial Physical Chemistry, Inorganic Solid-state Chemistry.
Research Overview: Development of new high energy density and functional materials by high-throughput screening.
Research Subjects: 1. Investigation of new high energy density and functional materials. 2. Development of efficient synthesis methods for functional materials. 3. Estimation of the performance of functional materials for lithium-ion batteries, fuel cells, air batteries, and biofuel cells. 4. Application of functional materials in biosensor nano-electrodes, highly functional nanoparticles, and biomedicine.

Introduction:

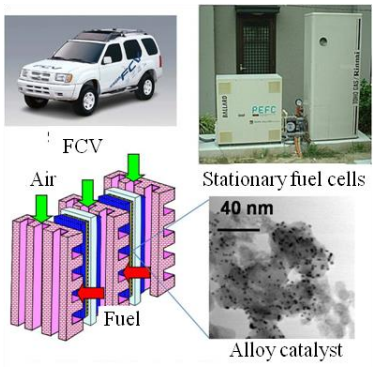


Fig. 1 High performance of fuel cell for our dairy life

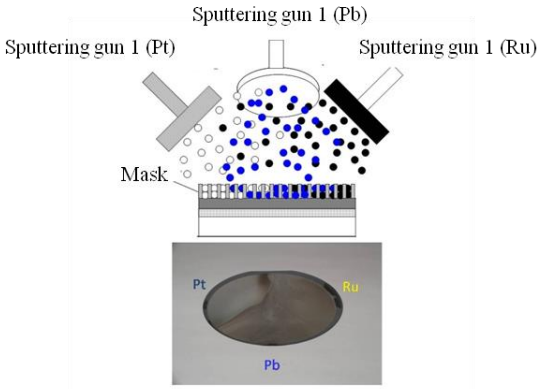


Fig. 2 Sputtered plates with three-guns sputtering equipment to prepare high throughput screening of electrocatalysts for fuel

Our research group investigates materials for energy applications (Fig. 1), with a focus on developing advanced materials for rechargeable and primary batteries. We are developing proprietary high-throughput synthesis and testing platforms to explore new materials rapidly, improve performance, and reduce costs (Fig. 2).

Publications:

1) An Enhanced Electrocatalytic Activity of Carbon-Supported Ordered Intermetallic Palladium-Lead (Pd3Pb) Nanoparticles towards Electrooxidation of Formic Acid, Chemistry of Materials, 129(7), 2906-2913 (2017), 2) Synthesis of Water-Resistant Thin TiOx Layer-Coated High-Voltage and High-Capacity iLiNiaCobAl1-a-bO2 (a > 0.85) Cathode and Its Cathode Performance to Apply a Water-Based Hybrid Polymer Binder Binder to Li -Ion Batteries, Electrochimica Acta, 258, 1348-1355 (2017), 3) Optimization of Calcination Temperature in Preparation of a High Capacity Li-rich Solid-Solution Li[Li0.2Ni 0.18Co0.03Mn0.58]O2 Material and Its Cathode Performance in Lithium Ion Battery, Electrochimica Acta, 269, 321-330 (2018), 4) Improvement of ORR Activity and Durability of Pt Electrocatalyst Nanoparticles Anchored on TiO_2/Cup-Stacked Carbon Nanotube in Acidic Aqueous Media, *Electrochimica Acta*, 232, 404-413(2017).

Affiliated Academic Organizations:

F. Matsumoto: The Electrochemical Society of Japan, The Electrochemical Society, The Surface Finishing Society of Japan, The Ceramic Society of Japan, Catalysis Society of Japan, The Materials Research Society of Japan, Catalysis Society of Japan.

Current members: Professors: 1; Postgraduates: 3; Undergraduates: 11; Visiting Professors: 1 Visiting Researchers: 1
Facilities: Electrochemical scanning tunneling microscope, charge-discharge test device for secondary batteries, AC impedance measuring device.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Functional Ceramics Laboratory

Teruki Motohashi (Professor) Office: 23-808-1 Ext.: 3876

Miwa Saito (Technical Assistant) Laboratory: 23-808 Ext.: 3882

Education/T. Motohashi (e-mail: t-mot@kanagawa-u.ac.jp)
03/2000, Dr. Eng., The University of Tokyo
03/1996, M. Eng., Keio University
Education/M. Saito (e-mail: msaito@kanagawa-u.ac.jp)
03/2010, Dr. Eng., Kanagawa University
03/2007, M. Eng., Kanagawa University

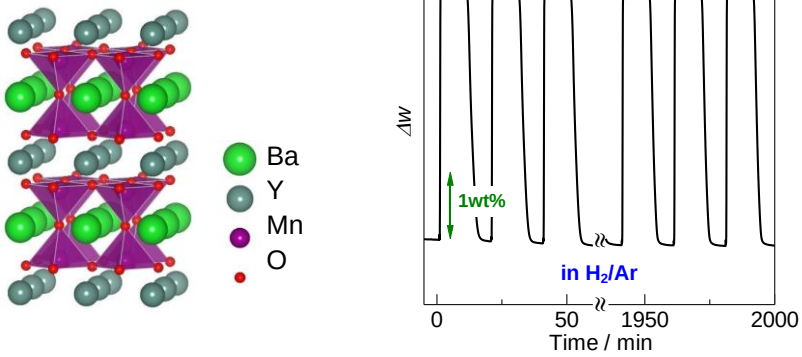
T. Motohashi

Research Field: Solid-state Chemistry, Inorganic Materials Chemistry, Solid-state Physics.

Research Overview: Tailoring functional ceramics for environmental and energy-related applications.

Research Subjects: 1. Tailoring of functional ceramics based on the crystal chemistry approach. 2. Development of oxygen storage materials and their applications in environmental and energy-related fields. 3. Electronic property control of transition metal oxides. 4. Development of proton conductors for solid oxide fuel cells.

Introduction: We are working on functional ceramics for environmental and energy-related applications. Driven by critical global issues, such as environmental destruction and energy depletion, developing innovative functional materials is a major scientific challenge. Our laboratory investigates inorganic materials, especially oxides with significant activity for oxygen-related reactions, because oxygen is a key element in fields such as energy and industry. Our goal is to develop oxygen storage materials that exhibit excellent oxygen intake/release as the temperature and the surrounding atmosphere are changed for future applications such as oxygen gas generation, chemical fuel production, and next-generation batteries.



(Left) Crystal structure of the new oxygen storage material, $BaYMn_2O_{5+\delta}$. (Middle) Weight changes upon oxygen intake/release of $BaYMn_2O_{5+\delta}$. (Right) Comparison of hydrogen generation by the water dissolution reaction with $BaYMn_2O_{5+\delta}$ and its rare-earth-substituted derivatives, $BaLnMn_2O_{5+\delta}$.

Publications: 1) Brownmillerite-type Ca_2FeCoO_5 as a practicable oxygen evolution reaction catalyst, *ChemSusChem* **2017**, *10*, 2864-2868. 2) Significant lanthanoid substitution effect on the redox reactivity of the oxygen-storage material $BaYMn_2O_{5+\delta}$, *Chem. Mater.* **2016**, *28*, 4409-4414. 3) Remarkable oxygen intake/release of $BaYMn_2O_{5+\delta}$ viewed from high-temperature crystal structure, *J. Phys. Chem. C* **2015**, *119*, 2356-2363. 4) Oxygen storage capability of Brownmillerite-type $Ca_2AlMnO_{5+\delta}$ and its application to oxygen enrichment, *Chem. Mater.* **2013**, *23*, 372-377.

Affiliated Academic Organizations: T. Motohashi: The Chemical Society of Japan, The Ceramic Society of Japan, The Physical Society of Japan, The Japan Society of Applied Physics, The Electrochemical Society of Japan, The American Chemical Society.
M. Saito: The Chemical Society of Japan, The Ceramic Society of Japan, The Electrochemical Society of Japan, The Society of Polymer Science, Japan, The Technical Association of Refractories, Japan, The Materials Research Society of Japan.

Current members: Professors: 1; Assistant Professors: 1; Researchers: 2; Postgraduates: 9; Undergraduates: 12

Facilities: X-ray diffractometer, thermogravimetry-differential thermal analysis equipment, surface-area measuring instrument, high-speed micro gas chromatography system, thermoelectric property measurement system, AC impedance meter, potentiostat, ultrahigh-temperature and atmospheric-control electric furnaces.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Molecular Architecture Laboratory

Tsutomu Yokozawa (Professor) Office: 23-718-1 Ext.: 3846

Yoshihiro Ohta (Technical Assistant) Laboratory: 23-719 Ext.: 3847

Education/T. Yokozawa (e-mail: yokozt01@kanagawa-u.ac.jp)
09/1987, Ph.D., Tokyo Institute of Technology
03/1983, M.S., Tokyo Institute of Technology
Education/Y. Ohta (e-mail: y-ohta0112@kanagawa-u.ac.jp)
03/2011, Ph.D., Kanagawa University
03/2009, M.S., Kanagawa University

T. Yokozawa

Research Field: Synthetic Polymer Chemistry, Organic Chemistry.

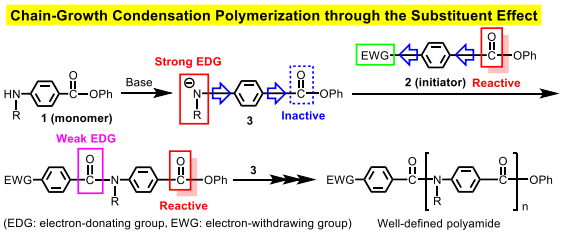
Research Overview: Synthesis and reaction design of functional materials based on organic chemistry.

Research Subjects: Precision synthesis and self-assembly of condensation polymers and π-conjugated polymers.

Introduction: Many natural polymeric materials, such as proteins, are perfectly monodisperse macromolecules, and they are synthesized by the successive condensation of monomers with the polymer end group via selective activation by enzymes. The overall process can be regarded as a chain-growth condensation polymerization (CGCP). In contrast, conventional condensation polymerization proceeds by step-growth polymerization, producing polymers with a broad molecular weight distribution, and control over molecular weight and polymer end groups is difficult. We have achieved CGCP of artificial monomers to obtain well-defined condensation polymers and π-conjugated polymers by the following two approaches.

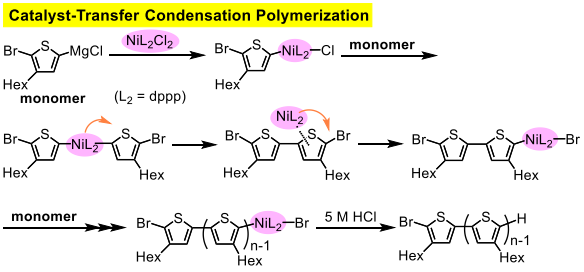
1. CGCP based on the substituent effect

When a substituent effect is changed by bond formation in a monomer, the reaction of a monomer with the polymer end functional group can be faster than that of the monomer with another monomer because the reactivity of the polymer end group is increased by the change in the substituent effect. We have obtained well-defined aromatic polyamides, polyethers, polyesters, and poly(ether sulfone)s by this approach.



2. CGCP by catalyst transfer

Some coupling polymerizations with transition metal catalysts proceed by chain-growth polymerization through the successive intramolecular transfer of the catalyst to the polymer end group, affording well-defined π-conjugated polymers. These polymers have received much attention because of their applications in thin film transistors, organic light-emitting diodes, and organic photovoltaic cells.



Publications:

1) Transformation of Step-Growth Polymerization into Living Chain-Growth Polymerization, *Chem. Rev.*, **116** (4) 1950-1968 (2016). 2) Synthesis of polyester by means of polycondensation of diol ester and dicarboxylic acid ester through ester-ester exchange reaction, *J. Polym. Sci.*, **59** (9) 787-797 (2021). 3) Precision synthesis of a fluorene-thiophene alternating copolymer by means of the Suzuki-Miyaura catalyst-transfer condensation polymerization: the importance of the position of an alkyl substituent on thiophene of the biaryl monomer to suppress disproportionation, *Polym. Chem.*, **12** (48) 7065-7072 (2021). 4) Importance of reversible reaction for the synthesis of telechelic polymer by means of polycondensation using an excess of one monomer, *Polym. Chem.*, **13** (6) 794-800 (2022).

Affiliated Academic Organizations:

T. Yokozawa: The Chemical Society of Japan, The Society of Polymer Science, Japan, American Chemical Society, The Society of Synthetic Organic Chemistry, Japan.
Y. Ohta: The Society of Polymer Science, Japan, The Chemical Society of Japan.

Current members: Professors: 1; Technical Assistants: 1; Post-doctors: 1; Postgraduates: 9; Undergraduates: 10

Facilities: Gas chromatography-mass spectrometry system, gas chromatograph, gel permeation chromatograph, gel permeation chromatography-multi-angle light scattering system, high-performance liquid chromatograph, glovebox.

Field of Applied Chemistry, Field of Bio and Life Engineering/Graduate School
Department of Material and Life Chemistry/Undergraduate

Naoki Arai (Assistant Professor)

Office: 23-812 Ext.: 3879 (e-mail: ft102187uv@jindai.jp)
Education:02/2021, Ph.D., Waseda University

Research Field: Molecular biology, Carnivorous plant.

Research Subjects: Acquisition of carnivory in plants.

Introduction: Carnivorous plants usually grow in nutrient-deficient habitats. They trap and digest insects to obtain nutrition for their survival. Comparing non-carnivorous plants with carnivorous plants, I am studying the molecular mechanism underlying the acquisition of carnivory in plants.

Publications: 1) N. Arai, Y. Ohno, S. Jumyo, Y. Hamaji, T. Ohyama, “Organ-specific expression and epigenetic traits of genes encoding digestive enzymes in the lance-leaf sundew (*Drosera adelae*)”, *J. Exp. Bot.*, **72**, 1946-1961 (2021). 2) N. Arai, E. Nishimura, Y. Kikuchi, T. Ohyama, “Functional analyses of carnivorous plant-specific amino acid residues in S-like ribonucleases”, *Biochem. Biophys. Res. Commun.*, **465**, 108–112 (2015). 3) E. Nishimura, S. Jumyo, N. Arai, K. Kanna, M. Kume, J. Nishikawa, J. Tanase, T. Ohyama, “Structural and functional characteristics of S-like ribonucleases from carnivorous plants”, *Planta*, **240**, 147–159 (2014). 4) E. Nishimura, M. Kawahara, R. Kodaira, M. Kume, N. Arai, J. Nishikawa, T. Ohyama, “S-like ribonuclease gene expression in carnivorous plants”, *Planta*, **238**, 955–967 (2013).

Affiliated Academic Organizations: The molecular biology society of Japan, The Japanese biochemical society, The botanical society of Japan, The insectivorous plant society (ISP, Japan).

Field of Information Systems Creation/Graduate School

[Graduate (M.C. and D.C.)]

Department of Information Systems Creation/Undergraduate

Field of Information Systems Creation/Graduate School
Department of Information Systems Creation/Undergraduate

Computational Intelligence Laboratory

Masanori Akiyoshi (Professor) Office: 20-325 Ext.: 4556
Laboratory: 20-326 Ext.: 4557

Education/M. Akiyoshi (e-mail: akiyoshi@kanagawa-u.ac.jp)
03/1996, D.Eng., Kyoto University
03/1987, M.Eng., Kyoto University

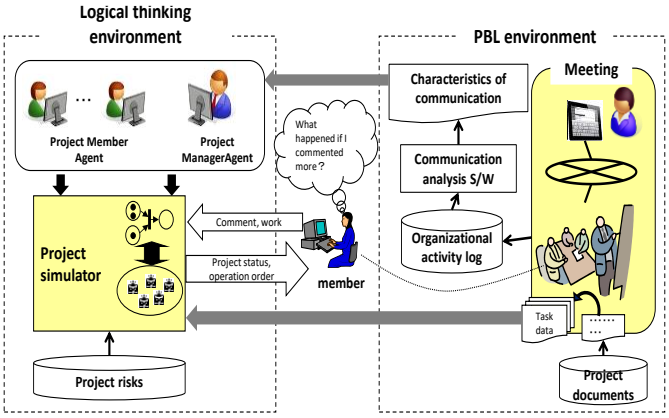
M. Akiyoshi

Research Field: Artificial Intelligence, System Science, Cognitive Science.

Research Overview: Development of ease-of-use computational intelligence such as collaborative agents, Investigation of a mechanism of emotional recognition.

Research Subjects: 1. Organizational learning framework. 2.Generation mechanism of "sense of surprise" embedding. 3. Inclusive design-based systems.

Introduction: Improvements in computing power and network infrastructure allow us to use computers for many everyday tasks. For instance, smartphones are used for communication and business with word processing, presentations, and e-mail, which increases our productivity. In addition, computers are expected to enhance our intelligence. Collective intelligence, based on a network infrastructure and machine learning using massive computation, is being developed. Our work focuses on the emergence of collective intelligence in organizational learning frameworks, cloud-based e-learning with individual adaptation and crowdsourcing, and inclusive design-based systems targeting to ambient infrastructure. We collaborate with companies and other research organizations to verify our research.



Organization learning framework for our information system development projects.

Publications:

1) M. Akiyoshi et al, "Bayesian Network Oriented Transfer Learning Method for Credit Scoring Model", IEEJ Transactions on Electrical and Electronic Engineering, Vol.16, Issue9, 1195-1202 (2021) 2) M. Akiyoshi et al, "Identification Method of Improvements in User Operations on Project Manager Skill-Up Simulator", IEEE Access, 5, 5811-5818 (2017) 3) M. Akiyoshi et al, "A Generation Method of Case Study Data for DEA", *IEEJ Transactions on Electronics, Information and Systems*, vol. 136(3), pp. 318–326 (2016). 4) M. Akiyoshi et al, "An Anomaly Detection Method on Web-based System by Trend Analysis with Autoregressive Model", *IEEJ Transactions on Electronics, Information and Systems*, vol. 133(7), pp. 1410–1416 (2014). 5) M. Akiyoshi et al, "Reference Operation Generation Method on Project Manager Skill-up Simulator", *Communications in Computer and Information Science*, vol. 415, pp. 297–307 (2013).

Affiliated Academic Organizations:

M. Akiyoshi: IEEE, Japanese Society of Artificial Intelligence, IEEJ, Information Processing Society of Japan.

Current members: Professors: 1; Undergraduates: 18

Field of Information Systems Creation/Graduate School
Department of Information Systems Creation/Undergraduate

Information Network Laboratory

Takamasa Imai (Professor) Office: 20-311 Ext.: 4562
Laboratory: 20-312 Ext.: 4563
Shen Qian (Assistant Professor) Laboratory: 20-310-F Ext.: 4573

Education/T. Imai (e-mail: imai@kanagawa-u.ac.jp)
09/1992, D.Eng., Osaka University
03/1982, M.Eng, Osaka University
Education/Shen.Qian (e-mail: ft102111pq@kanagawa-u.ac.jp)
12/2017, D.Inf., Japan Advanced Institute of Science and Technology
10/2017, D.Sci., University of Oulu
03/2014, M.Inf., Japan Advanced Institute of Science and Technology


T. Imai


S. Qian

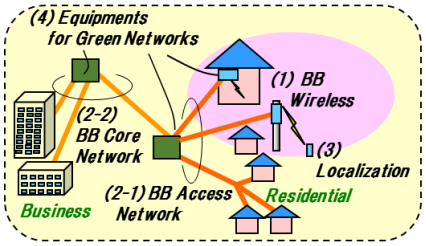
Research Field: Communications Engineering.

Research Overview: Studying broadband networks and green communication.

Research Subjects: 1. Optical wireless communication. 2. Localization systems. 3. Energy efficient networks.

Introduction:

The demand for higher data rates has increased rapidly owing to the widespread use of mobile devices such as smartphones and tablets. To satisfy this demand, technologies for broadband access/core networks and mobile networks are vital. The localization of information terminals is required because of the limited power budget.



Modern sustainable societies also require energy efficient networks.

Therefore, our research is focused on the following four main themes.

(1) Indoor/outdoor optical wireless systems for broadband mobile communication.
(2) Broadband optical access and core networks, including metro/access network integration.
(3) Localization system for broadband mobile communication.
(4) Green wireless and wireline communication protocols.

Publications:

T. Imai: 1) T. Taniguchi, N. Sakurai, K. Kumozaki and T.Imai, "Full-duplex 1.0 Gbit/s data transmission over 60 GHz radio-on-fiber access system based on the loop-back optical heterodyne technique", *IEEE Journal of Lightwave Technology*, vol. 26(13), pp. 1765–1776 (2008). 2) M. Yoshino, S. Kaneko, T. Taniguchi, N. Miki, K. Kumozaki, T. Imai, N. Yoshimoto, and M. Tsubokawa, "Beat noise mitigation of spectral amplitude coding OCDMA using heterodyne detection," *Journal of Lightwave Technology*, vol. 26(8), pp. 962–970 (2008). 3) S. Nishihara, S. Kimura, T. Toshida, M. Nakamura, J. Terada, K. Nishimura, K. Kishine, K. Kato, Y. Ohtomo, N. Yoshimoto, T. Imai and M. Tsubokawa, "Burst-mode 3R receiver for 10-Gbit/s PON system with high sensitivity, wide dynamic range, and fast response," *Journal of Lightwave Technology*, vol. 26(1), pp. 99–107 (2008). 4) T. Taniguchi, N. Sakurai, K. Kumozaki and T. Imai, "Loop-back optical heterodyne technique for 1.0 Gbit/s data transmission over 60 GHz radio-on-fiber uplink," *Journal of Lightwave Technology*, vol. 25(6), pp. 1484–1494 (2007). 5) H. Suzuki, M. Fujiwara, T. Suzuki, N. Yoshimoto, K. Iwatsuki, and T. Imai, "Colorless and plug-and-play technologies for WDM access over existing power-splitter-based infrastructure," *Journal of Optical Networking*, vol. 6(7), pp. 830–839 (2007).

S. Qian: 1) S. Qian, X. Zhou, X. He, J. He, M. Juntti and T. Matsumoto,"Performance Analysis for Lossy-Forward Relaying over Nakagami-m Fading Channels," IEEE Trans. on Vehicular Technol., vol. 66, no. 11, pp. 10035-10043, Nov. 2017. 2) S. Qian, J. He, M. Juntti and T. Matsumoto, "Fading Correlations for Wireless Cooperative Communications: Diversity and Coding Gains," IEEE Access, vol. 5, pp. 8001-8016, 2017.

Affiliated Academic Organizations:

T. Imai: The Institute of Electrical and Electronics Engineers (IEEE), The Optical Society of America (OSA), The Institute of Electronics, Information and Communication Engineers (IEICE), The Japan Society of Applied Physics (JSAP).
S. Qian: The Institute of Electrical and Electronics Engineers (IEEE), Electronics, Information and Communication Engineers (IEICE)

Current members: Professors: 1; Assistant Professors: 1; Undergraduates: 13

Field of Information Systems Creation/Graduate School
Department of Information Systems Creation/Undergraduate

Information Systems Engineering Laboratory

Satoshi Uchida (Associate Professor) Office: 20-329 Ext.: 4552
Laboratory: 20-330 Ext.:4553
Shoji Okuno (Assistant Professor) Laboratory: 20-310-A Ext.:4568

Education/S. Uchida (e-mail: s-uchida@jindai.jp)
09/1995, Ph.D., University of Tsukuba
03/1984, M.S., Aoyama Gakuin University
Education/S. Okuno (e-mail: okuno@kanagawa-u.ac.jp)
03/1995, Dr.Sci., Graduate University for Advanced Studies
03/1991, M.E., Tohoku Gakuin University

S. Uchida

S. Okuno

Research Field: Software Development, Educational Technology.

Research Overview: Development of a full-scale lesson management support system and an e-learning system.

Research Subjects: 1. Software for education. 2. Educational content creation. 3. Software development.

Introduction: We study development technology for educational software and develop software and content for education.

・Full-scale lesson management support system

We have developed WebLec, a full-scale lesson management support system that is programmed in Java. WebLec has been used for education in various universities for more than 10 years, and we introduce improvements annually.

・e-Learning content for programming languages

We have developed e-learning content for programming languages such as Java, C, and C++. We use many animations in the learning content to aid understanding.

・Tools for web applications

We have developed an object-oriented database system for web applications to aid design and development.

・Educational content

We study clear e-learning content by creating and evaluating various types of content.

・E-book creation

E-books are important for education. We propose a new e-book creation style and publish e-books with content that can be altered to match the level of the student.

Publications:

1) Kumi Nakamura, Satoshi Uchida, Shoji Okuno, “A study on recorder-performance training support system in elementary music education”, Journal of Japan Society of e-Learning No. 17, pp.47-61, (2017). 2) S. Uchida, M. Takesawa, Y. Tanaka, and Q. Lou, “A lesson management support system using Ajax,” *International Symposium on Recent Trends in Global E-learning and Collaboration*, Tokyo [CD-ROM](2017). 3) S. Uchida, “WebLec: A full-scale on management support system developed by university students,” *Web-based Learning: Technology and Pedagogy: Proceedings of the 4thInternational Conference*, Hong Kong, pp. 13–21, (2005).

Affiliated Academic Organizations:

S. Uchida: Japan Industrial Management Association, the Japan e-Learning Association, the Japan Society for Management Information, Information Processing Society of Japan, Japanese Society for Information and Systems in Education, Japan e-Learning Association

S. Okuno: Japan Industrial Management Association, Society of Instrument and Control Engineers, Physical Society of Japan, Japan Society of Applied Physics, The Institute of Electronics, Information and. Communication Engineers

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Current members: Associate Professors: 1 Assistant Professors: 1 Postgraduates: 0 Undergraduates: 10

Field of Information Systems Creation/Graduate School
Department of Information Systems Creation/Undergraduate

Operations Research Laboratory

Susumu Shindoh (Professor) Office: 20-305 Ext.: 4542
Laboratory: 20-304 Ext.: 4543
Kei Saito (Assistant Professor) Laboratory: 20-310-G Ext.: 4574

Education/S. Shindoh (shinds01@kanagawa-u.ac.jp)
Ph.D., Tokyo Institute of Technology (Mar. 1987)
M.S., Tokyo Institute of Technology (Mar. 1981)
Education/K. Saito (ft102130ev@kanagawa-u.ac.jp)
Ph.D., Yokohama National University (Mar. 2020)
M.S., Yokohama National University (Mar. 2018)


S. Shindoh


K. Saito

Research Field: Operations Research, Applied Mathematics

Research Overview: Optimization and mathematical finance

Research Subjects: 1. Solution methods for nonlinear optimization problems; 2. Optimal portfolios

Introduction: Operations research uses mathematical and computational techniques to improve the efficiency and decision-making of companies and organizations.

Let's consider the following simplified diet problem involving milk and tomatoes as an example. The nutritional values of milk and tomatoes are displayed in Table 1. The objective is to find a minimum-calorie diet of milk and tomatoes that contains at least 55 g of protein and 600 mg of calcium. We can model the problem as a linear program and solve it with linear program solvers to obtain a reasonable solution.

Table 1: Nutritional values

	Calories (kcal)	Protein (g)	Calcium (mg)
Milk (per 210 g)	141	6.9	231
Tomatoes (per 200 g)	38	1.4	14

The students in our laboratory study the following areas.

- Mathematics, including probability, statistics, and optimization, necessary for modeling problems
- Computer languages, such as C and Java, for simulations

Many graduates from our laboratory work in IT and related fields.


Fig. 1 Operations research lab

Publications:

1) S. Shindoh, Some properties of SINR regions for standard interference mappings. *SICE Journal of Control, Measurement, and System Integration*. 2020; 13(3): 50–56.
2) S. Shindoh, Some properties of eigenvalues for standard interference mappings. *Proceedings of the 10th International Conference on Nonlinear Analysis and Convex Analysis*, 2019.
3) S. Shindoh, A note on signal to interference ratio feasibility problems. *Journal of Nonlinear and Convex Analysis.* 2018; 19(10): 1741–1747.
4) K. Saito, Spectral analysis for a multi-dimensional split-step quantum walk with a defect, *Quantum Studies: Mathematics and Foundations*, 2021; 9(1): 93-112
5) K. Saito, Eigenvalues of two-phase quantum walks with one defect in one dimension, *Quantum Information Processing*, 2021; 20(5).
6) K. Saito, Periodicity for the 3-state quantum walk on cycles. *Quantum Information and Computation*, 2019; 19(13–14): 1081–1088.

Affiliated Academic Organizations:

S. Shindoh: The Operations Research Society of Japan, The Mathematical Society of Japan
K. Saito: The Mathematical Society of Japan, The Operations Research Society of Japan

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Current members: 1 professors, 1 assistant professor, 21 undergraduates

Field of Information Systems Creation/Graduate School
Department of Information Systems Creation/Undergraduate

Design Engineering Laboratory

T. Sugimoto

Takeshi Sugimoto (Professor) Office: 20-302 Ext.: 4540
Laboratory: 20-303 Ext.: 4541

Education/T. Sugimoto (e-mail: sugimt01@kanagawa-u.ac.jp)
03/1990, Ph.D. in Aeronautics and Astronautics, The University of Tokyo
03/1987, M.A., The University of Tokyo

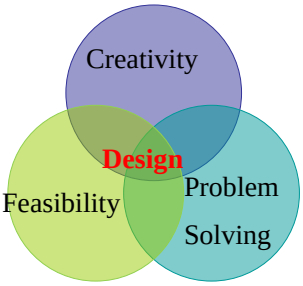
Research Field:

T. Sugimoto: Applied Mathematics and Theoretical Physics, Philosophy of Science.

Research Overview: Study of mathematical biology, mathematical environmentics, and mathematical sociology.

Research Subjects: 1. Mathematical physics of form and function. 2. Dynamics of nonlinear systems. 3. Mathematics of ecology. 4. Creativity literacy. 5. History of science.

Introduction: Design is “to create a new form to solve problems in the course of society developments.” Creativity is “to produce a new value by connecting unrelated concepts.” Feasibility means “to be scientific, manufacturable, and fulfilling design constraints.” To design beautiful, beneficial products, designers should have an overall decision-making philosophy, a vision for a product to make people happy, and concepts to specify the product.



Design is the intersection of creativity, feasibility, and problem solving.

Publications:

T. Sugimoto: 1) The Metallic Right-Triangles, *Forma* (2020), 35, pp.33-35. 2) On Togai Ito's Codex of Maps and a Manuscript Originally Prepared by the Tokugawa-Shogunate Expediters to the Bonin Islands, *Forma* (2020), 35, pp.3-8. 3) The Kepler Triangle and its Kin, *Forma* (2020), 35, pp.1-2. 4) A Note on 'The transit of Mercury observed at St Helena in 1677, *Trans. Soc. Math. Sci.* (2019), 20(1), pp.3-7. 5) The Longitude Problem as the Unification of Space and Time, *Forma* (2018), 33 (Special Issue), pp.S17-S22. 6) Newton’s Principia Revisited: A New Passage of the Solution to the Direct Kepler Problem, *Proc. Acad. Mech. Japan* (2015), 1, pp. 17-27. 7) The Historic Japanese Visitors to St Helena, *Wirebird* (2014), 43, pp.21-33. 8) Discourse on the Latus Rectum in Conics, *Symmetry* (2013), 24 (1-4), pp.295-309.

Affiliated Academic Organizations:

T. Sugimoto: American Institute of Aeronautics and Astronautics, The Society for Mathematical Biology, Ornithological Society of New Zealand, Society for Science on Form, History of Science Society of Japan

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Current members: Professor: 1; Undergraduates: 9

Facilities: Reflection telescope, wind tunnel, 3D printer, 3D scanner, computers.

Field of Information Systems Creation/Graduate School
Department of Information Systems Creation/Undergraduate

Social Information System Laboratory

T. Sekozawa

Teruji Sekozawa (Professor) Office: 20-211 Ext.: 4564
Laboratory: 20-217 Ext.: 4565

Education/T. Sekozawa (e-mail: sekozawa@kanagawa-u.ac.jp)
03/1993, Ph.D., Tohoku University
03/1979, M.S., Tohoku University

Research Field: Social Information Systems.

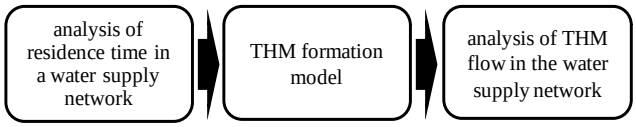
Research Overview: Studying information infrastructure systems and information control systems.

Research Subjects: 1. Information control system operation management. 2. New social infrastructure technology.

Introduction: We investigate decision making that uses information mathematical principle techniques and information

Flow time and volume in large-scale water distribution networks

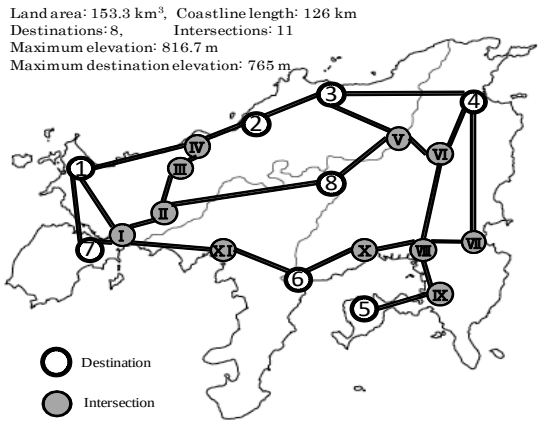
Trihalomethane (THM) formation is related to the time that chlorine used as a disinfectant in water purification plants is in contact with organic substances (THM precursors) in untreated water. We are developing a solution algorithm for analytically calculating water residence time in water purification plants, which determines the time that chlorine is in contact with organic matter, affecting THM formation.



Technology for large-scale social infrastructure including water services, traffic, electric power, and information systems.

Maximization of traveling points by electric vehicles

We are investigating route optimization to maximize the number of points visited by an electric vehicle in a tour beginning and ending at the same point, considering the battery properties and capacity.



Publications:
T. Sekozawa:
1)Sekozawa, "A hybrid solution for an abstract-level daily-volume problem and hourly-level multilayer network problem and hourly-level multilayer network problem", *WSEAS Transactions on systems*, Volume 15, pp.262-274 (2016)
2) Sekozawa, "Demand estimation method using reverse pipe network analysis in water supply network," *International Journal of Systems Applications, Engineering & Development*, vol. 8, pp. 292–300 (2014).
3) Sekozawa, "New method calculating water residence time for trihalomethane in a water supply network," *International Journal of Systems Applications, Engineering & Development*, vol. 7(3), pp. 113–121 (2013).
Y. Ozawa:
1) Ozawa, Murata, "Questionnaire survey of skill acquisition process for nurses of middle standing," *The Japanese Journal of Ergonomics*, vol. 48(6), pp. 313–323 (2012).

Affiliated Academic Organizations:
T. Sekozawa: Institute of Electrical Engineers of Japan Fellow, Society of Instrument and Control Engineers.
Y. Ozawa: Japan Ergonomics Research Society.

Current members: Professors: 1; Assistant Professors: 1; Undergraduates: 10
Number of alumni: Undergraduates: 163; Postgraduates (M.C.): 14

Field of Information Systems Creation/Graduate School
Department of Information Systems Creation/Undergraduate

Information System Verification Laboratory

Koki Nishizawa (Associate Professor) Office: 20-306 Ext.: 4544
Laboratory: 20-307 Ext.: 4545

Education/K. Nishizawa (e-mail: nishizawa@kanagawa-u.ac.jp)
03/2006, Ph.D.(Information Science and Technology), The University of Tokyo
03/2004, Master of Information Science and Technology, The University of Tokyo

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Research Field: Computer Science, Logic, Algebra.

Research Overview: Formal verification of information systems and category theoretical analysis of algebraic structures.

Research Subjects: 1. Abstraction in model checking. 2. Representation theorem of quantales. 3. Stone-type duality.

Introduction: Our laboratory is studying mathematical methods, such as logics, algebras, and model checking, to verify whether given information systems have no bugs.

Abstraction in model checking

We are devising mathematical methods to check that system S satisfies property P. However, if S is large-scale and complicated, a direct check cannot finish in a practical amount of time. Thus, an abstraction is necessary. An abstraction is a mathematical proof to show that all properties satisfied by simpler system T are also satisfied by S.

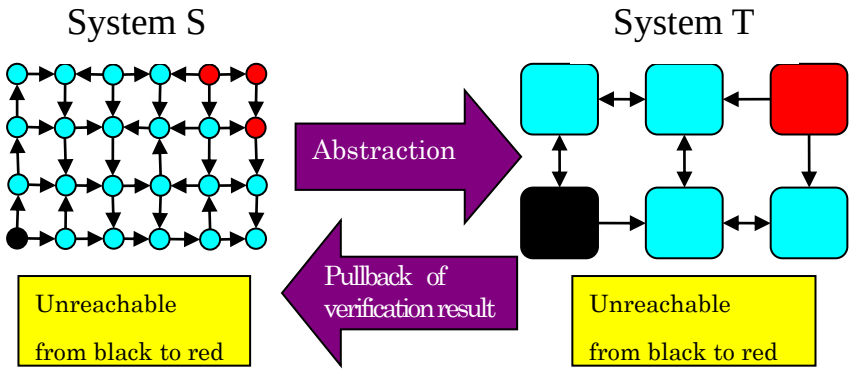

Fig. 1 Abstraction

Stone-type duality

There is a deep relationship between algebras and spaces. For example, a Boolean algebra is an algebraic structure that satisfies the same axioms as the propositional logic. There is a one-to-one correspondence between Boolean algebras and spaces equipped with Stone topologies. Similar one-to-one correspondences are found for various spaces and algebras, called Stone-type dualities. We are searching for sufficient conditions where the extension of logics induces the extension of Stone-type dualities.

Publications:

1) K. Nishizawa, S. Katsumata, Y. Komorida, “Stone Dualities from Opfibrations”, Relational and Algebraic Methods in Computer Science, LNCS 12062, pp.221-236, Springer, (2020). 2) K. Nishizawa, K. Yasuda, H. Furusawa, “Preorders, Partial Semigroups, and Quantales”, Relational and Algebraic Methods in Computer Science, LNCS 12062, pp.237-252, Springer, (2020). 3) K. Nishizawa, N. Tsumagari, "Composition of different-type relations via the Kleisli category for the continuation monad", Relational and Algebraic Methods in Computer Science, LNCS 11194, pp.97-112, Springer, (2018). 4) H. Furusawa, K. Nishizawa, "Multirelational representation theorems for complete idempotent left semirings", Journal of Logical and Algebraic Methods in Programming, Volume84, pp.426-439, Elsevier, (2015). 5) K. Nishizawa, H. Furusawa, "A Sufficient Condition for Liftable Adjunctions between Eilenberg-Moore Categories", Relational and Algebraic Methods in Computer Science, LNCS 8428, pp.261-276, Springer, (2014). 6) K. Nishizawa, H. Furusawa, "Relational Representation Theorem for Powerset Quantales", Relational and Algebraic Methods in Computer Science, LNCS 7560, pp.207-218, Springer, (2012). 7) K. Nishizawa, H. Furusawa, "Ideal Completion of Join Semilattices over T-Algebra", Bulletin of Tottori University of Environmental Studies, vol. 9 and 10, pp.91-103, (2012).

Affiliated Academic Organizations:

Japan Society for Software Science and Technology, International Society for Mathematical Sciences, The Mathematical Society of Japan

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Current members: Associate Professors: 1; Postgraduates: 1; Undergraduates: 11

Field of Information Systems Creation/Graduate School
Department of Information Systems Creation/Undergraduate

Cryptographic Systems Laboratory

Atsushi Fujioka (Professor) Office: 20-315 Ext.: 4558
Laboratory: 20-316 Ext.: 4559
Taroh Sasaki (Research Associate)
Laboratory: 20-310-E Ext.: 4572

Education/A. Fujioka (e-mail: fujioka@kanagawa-u.ac.jp)
03/1990, D.Eng., Tokyo Institute of Technology
03/1987, M.Eng., Tokyo Institute of Technology
Education/T. Sasaki (e-mail: taroh@kanagawa-u.ac.jp)
03/1994, Ph.D., Yokohama National University
03/1991, M.Eng., Yokohama National University


A. Fujioka


T. Sasaki

Research Field: Cryptology, Applied Cryptography.

Research Overview: Investigating cryptographic systems, security management, computer security, and information theory.

Research Subjects: 1. Theoretical research on algorithms in cryptography and information theory. 2. Systems research on security policy and computer management.

Introduction:

Cryptography may bring to mind mystery or spy novels, but cryptographic technologies are essential in many everyday activities. When we use smartphones, pay in digital cash, or buy something on the net, cryptographic technologies make these activities secure. However, there is no perfect and convenient cryptographic technology. Therefore, it is important to devise secure systems while preserving convenience, and we must define acceptable levels of security to design systems.

Similar to cryptographic technologies, error-controlling and data compression technologies in information theory are also important for digital communication. By correcting or detecting errors on a communication channel, each entity will receive the correct data, and compressing the data reduces the cost and time required to download the data. Combining all these technologies allows us to use devices, including mobile phones, music players, and digital TVs, on the net safely and conveniently.

In addition, even when these technologies are theoretically effective, implementing them improperly will also diminish the safety and reliability of devices. Therefore, evaluating and improving implementation and system administration are also challenging research topics.

We are studying theoretical and practical aspects of cryptography and information theory. Cryptographic theory is the basis of secure information systems, and research on system security, such as establishing consistent administration policy and safe system administration, is of considerable practical importance.

Publications:

1) A. Fujioka et al., “Strongly Secure Identity-Based Key Exchange with Single Pairing Operation,” *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, Vol.E104-A(1), pp. 58–68 (2021).

2) A. Fujioka, “Generalized key substitution attacks on message recovery signatures,” *Tatra Mountains Mathematical Publications*, vol. 70(3), pp.119–138 (2017).

3) A. Fujioka et al., “Strongly secure authenticated key exchange from factoring, codes, and lattices,” *Designs, Codes and Cryptography*, vol. 76(3), pp. 469–504 (2015).

Affiliated Academic Organizations:

A. Fujioka: Institute of Electronics, Information and Communication Engineers (IEICE), Information Processing Society of Japan (IPSJ), International Association of Cryptologic Research (IACR).

T. Sasaki: Institute of Electronics, Information and Communication Engineers (IEICE), Information Processing Society of Japan (IPSJ), Acoustical Society of Japan (ASJ), Institute of Image Information and Television Engineers (ITE)

Current members: Professors: 1; Research Associates: 1; Postgraduates: 5, Undergraduates: 11
Number of alumni: Postgraduates: 3; Undergraduates: 79

Field of Information Systems Creation/Graduate School
Department of Information Systems Creation/Undergraduate

Information Security Laboratory

Hikaru Morita (Professor) Office: 20-314 Ext.: 4560
Laboratory: 20-313 Ext.: 4561
Tiancheng Wang (Assistant Professor)
Laboratory: 20-310-D Ext.: 4571

Education/H.Morita (e-mail: morita@kanagawa-u.ac.jp)
06/1993, Ph.D., Engineering, Hokkaido University
03/1982, M.Eng., Hokkaido University
03/1980, B.Eng., Hokkaido University
Education/T.Wang (e-mail: wang@kanagawa-u.ac.jp)
03/2022, Ph.D., Information Science, Aichi Prefectural University
03/2019, MSc, Information Science, Aichi Prefectural University
03/2017, BSc, Information Science, Aichi Prefectural University

H. Morira

T. Wang

Research Field: Information Security and Cryptography.

Research Overview: Experimental research on cryptographic analysis, research on cryptographic protocols for constructing information systems, and feasibility studies for secure products.

Research Subjects: 1. Cryptographic analysis. 2. Cryptographic protocols for electronic money and electronic auctions. 3. Implementation methods to speed up information systems

Introduction:

Information systems contain many computers that are connected together on networks. Reading and writing information, which was previously done by only people, is now performed by electronic information systems, too. This is because costs are reduced by reducing the number of tasks performed by humans. Information systems are changing our lifestyles and society. Programmers who computerize existing businesses are not highly paid. Creative talent for building information systems that affect society and everyday life is required. Information systems that obtain people's attention or build interlocking communication services are pioneering. Engineers and researchers to develop the systems will be highly paid.

We research secure information systems for particular purposes such as cryptographic technologies. The main communication infrastructure is now the Internet. The use of wireless tools, such as cellphones and smart phones, has become commonplace. Thus, secure systems should be designed assuming that information can leak. However, in information systems that handle content, such as movies and music, copy protection is a concern. For electronic money, copy protection is a more serious problem, and information security has become an important field of research. We have been studying cryptographic protocols for Web services, and designing a wide range of security systems.

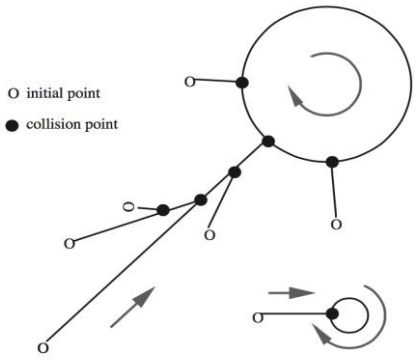

Fig. 1 Sequences generated by a Pseudo random function

Publications:

H. Morita: 1) H. Morita, H. Odagi, and K. Ohta, “Collision search of a hash function by using random mapping,” *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, vol. E81-A(1), pp. 35–40 (1998). 2) K. Kobayashi, H. Morita, K. Suzuki, and M. Hakuta, “Efficient sealed-bid auction by using one-way functions,” *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences*, vol. E84-A(1), pp. 289–294 (2001) .

T. Wnag: 1) T. Wang, S. Koyama, K. Nakahira, and T.S. Usuda, “Error Performances and Robust Design Criteria for Quantum Receiver in the Presence of Phase Noise,” *IEICE Trans. Commun. (Japanese edition)*, vol. J105-B(3), pp. 39–51, (2022), (in Japanese). 2) T. Wang, S. Takahira, and T.S. Usuda, “Error Probabilities of Quantum Illumination with Attenuation Using Maximum and Non-maximum Quasi-Bell States,” *IEEJ Trans. on Electro., Info., and Sys.*, vol.142(2), pp.151-161, (2022), (in Japanese).

Affiliated Academic Organizations:

H. Morita: Institute of Electronics, Information and Communication Engineers (IEICE), Institute of Electrical and Electronics Engineers (IEEE), Association for Computing Machinery (ACM).
T. Wang: Institute of Electronics, Information and Communication Engineers (IEICE).

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 3; Undergraduates: 11

Course of Industrial Engineering and Management/Graduate School
Department of Information Systems Creation/Undergraduate

Mathematical analysis system Laboratory

Minoru W. Yoshida (Professor) Office: 20-319 Ext.: 4546
Laboratory: 20-320 Ext.: 4547

Education／M. W. Yoshida (e-mail: ft101945kb@kanagawa-u.ac.jp)
Engineering Ph.D., Osaka University

Research Field: Probability theory, Functional analysis, Mathematical physics, Mathematical sciences, Information mathematics.

Research Overview: Stochastic analysis on infinite dimensional spaces, Random fields and their application to mathematical physics and mathematical sciences, Quantum information.

Research Subjects: Stochastic partial differential equations, Constructive quantum field theory, Stochastic control, Distribution theory.

Introduction: In this laboratory we perform researches on the problems of applied mathematics appearing in engineering, social sciences and natural sciences. The research methods adopted here are mathematics, substantially, but several information scientific techniques are also used efficiently. Students in this laboratory shall study, for example, Markov decision theory and their applications, models of biological systems formulated by statistical mechanics, game theory and its applications and stochastic control. Not only these subjects, however, each one will be able to complete his or her research on each one's individual interest of mathematical sciences.

To realize abstract or general mathematical (scientific) results by means of computer is also an important research subject in this laboratory. Precisely, the derivations of numerical concrete, or in some cases visual, results corresponding to some abstract mathematical statements by using computer are investigated. These experiences on researches performing in such manner (namely, through mathematics together with computer) give strong powers for students who will take active parts in the society.

Besides the above mentioned research subjects, in this laboratory we have been continuing the research on constructive (relativistic) quantum field theory which is a most important problem of mathematical physics and infinite dimensional analysis and is not solved completely for this 50 years. It is possible to say that to investigate and clarify this problem is to certify a consistency of the mathematical structure (equivalently, the way of cognition of all life).

Publications: M. W. Yoshida: 1) "A homeomorphism relating path spaces of stochastic processes with values in $\mathbf{R}^d$ respectively $(\mathbf{S}^1)^d$," Infinite Dimensional Analysis, Quantum Probability and Related Topics，Vol. 17，No. 1, pp. 219-257 (2014). 2) "Some abstract considerations on the homogenization problem of infinite dimensional diffusions," RIMS Kôkyûroku，Bessatsu，B21,pp. 183-192 (2010). 3) "Hida distribution construction of non-Gaussian reflection positive generalized random fields," Infinite Dimensional Analysis, Quantum Probability and Related Topics, Vol.12, No. 1, pp. 21-49 (2009). 4) "Systems of classical particles in the grand canonical ensemble, scaling limits and quantum field theory," Review in Math. Phys. Vol.17, No. 2, pp. 176-226 (2005). 5) "On the essential self-adjointness of Wick powers of relativistic fields and of fields unitary equivalent to random fields," Acta Applicande Mathematicae, Vol. 80, No. 3, pp. 309-334 (2004). 6) "H-$\mathbf{C}^1$ maps and elliptic SPDEs with polynomial and exponential perturbations of Nelson's Euclidean free field," J. Functional Analysis, Vol. 196, No. 2, pp.265-322 (2002). 7) "Construction of infinite dimensional interacting diffusion processes through Dirichlet forms," Probab. Theory Relat. Fields. Vol.106, No.2, pp. 265-297 (1996).

Current members: Professors: 1 ; Postgraduates: 1 ; Undergraduates: 19

Field of Industrial Engineering and Management/Graduate School

[Graduate (M.C. and D.C.)]

Department of Industrial Engineering and Management

/Undergraduate

Field of Industrial Engineering and Management/Graduate School
Department of Industrial Engineering and Management /Undergraduate

Information and Mathematical Systems Laboratory

Nobuaki Ishii (Professor) Office: 23-532-1 Ext.: 3779

Shuhei Ota (Assistant Professor)
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N. Ishii (n-ishii@kanagawa-u.ac.jp)
Ph.D., Tokyo Institute of Technology (Sept. 1995)
S. Ota (ota@kanagawa-u.ac.jp)
Ph.D., Hosei University (Mar. 2019)


N. Ishii


S. Ota

Research Field: Systems Lifecycle Management, Project Management, Production Technology, Reliability Engineering
Research Subjects: 1. Program and project management; 2. Management of systems development processes; 3. Corporate performance evaluations; 4. Supply chain visualization systems; 5. Production systems analysis and *kaizen* (continuous improvement) 6. Reliability analysis of systems

Introduction: Our society has evolved over many years through repeated systems lifecycles consisting of identifying and solving social problems, realizing opportunities, and implementing new systems (Fig. 1). The Information and Mathematical Systems Laboratory engages in scientific and engineering research with the aim of identifying and solving social problems from the perspective of systems lifecycles in order to contribute to the realization of a sustainable society.

We conduct research on topics such as systems analysis and modeling that are related to the creation of new systems in order to identify and characterize potential models for new systems, including performance evaluation systems and management systems that use the developed systems effectively. We also study project management in order to develop new systems effectively under such constraints as human resources, budgets, and time.

To maintain and support production systems, we research process analysis and *kaizen*, including line control systems and operational algorithms for automated storage and retrieval systems, with an aim toward improving the productivity and reducing the cost of such systems. We also research statistical methods for accurately assessing the reliability of large-scale systems. We also use IoT technology to investigate supply chain visualization systems that control production, sales, and inventory.

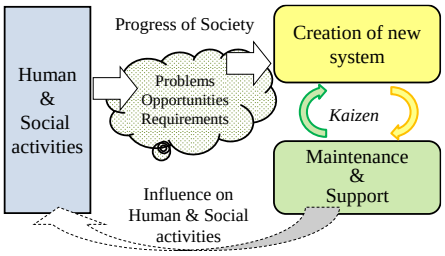

Fig.1 Overview of system lifecycle

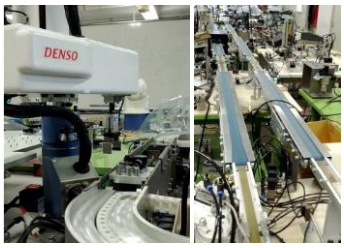

Fig. 2 Production lines

Publications:
N. Ishii
1) Determining bid markup and resources allocated to cost estimation in competitive bidding. *Automation in Construction*. 2018; 85: 358–368.
2) A simulation-based dynamic scheduling method in project cost estimation process. *Advances in Intelligent Systems and Computing*. 2017; 676: 261–279.
S. Ota
1) Effective estimation algorithm for parameters of multivariate Farlie–Gumbel–Morgenstern copula, *Japanese Journal of Statistics and Data Science*. 2021; 4(2): 1049-1078.
2) A statistical dependent failure detection method for n-component parallel systems. *Reliability Engineering and System Safety*. 2017; 167: 376–382.

Affiliated Academic Organizations:
N. Ishii: Japan Industrial Management Association, Society of Project Management, Information Systems Society of Japan
S. Ota: Institute of Electrical and Electronics Engineers, The Operations Research Society of Japan

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Current members: 1 professor, 1 assistant professor, 6 postgraduates, 11 undergraduates

Field of Industrial Engineering and Management/Graduate School
Department of Industrial Engineering and Management /Undergraduate

Production and Operations Management Laboratory

Jiahua Weng (Professor) Office: 23-416 Ext.: 3724
Shingo Akasaka (Assistant Professor) Office: 23-415 Ext.: 3723
Education/J. Weng (e-mail: wjh@kanagawa-u.ac.jp)
12/2010, Ph.D., Waseda University
03/2000, M.S., Waseda University
Education/S. Akasaka (e-mail: akasaka@kanagawa-u.ac.jp)
03/2018, Ph.D., Waseda University
03/1986, M.S., Waseda University

J. Weng

S. Akasaka

Research Field: Social Systems Engineering, Operations Management, Production Management, Production system

Research subjects:

1. Methodology for Engineer-to-order production;
2. Support systems for mass customization;
3. Business model design and optimization considering reuse and recycle;
4. Design and management of connected factory.

Introduction:

Japanese manufacturers are now challenged by domestic demand saturation and declining birthrate. In order to achieve sustainable development, it is essential for manufacturers to create new products/services continuously. Moreover, it is also important to create mechanisms that enable responsible consumption and production. Thus, we focus on the developments of both new business model and management methodologies for these directions. On the other hand, in order to increase manufacturers' productivities to be less depending on experienced workers, we also focus on directions such as applying AI-driven automation into production to clarify operation mechanisms of skilled workers.

Our laboratory aims to develop new production and management methodologies to deal with the formerly mentioned challenges. Our research target includes maintaining high efficiencies of service and productivity for those manufacturers who take sustainable development as their goals. Moreover, we propose to connect factories as a virtual factory so that even small- and medium-sized manufacturers can play a role and obtain more opportunities to enlarging their value.

Publications:

1) X. Fan and J. Weng, "Tabu-search-based Order Seat Planning for Engineer-to-order Manufacturing", Asian Journal of Management Science and Applications, Vol.5, No.2, pp.160-180 (2020)
2) Q. Huang, J. Weng, S. Ohmori and K. Yoshimoto, "A Routing Problem in Global Production Planning", Industrial Engineering & Management Systems, Vol.19, No. 2, pp.335-346 (2020)
3) J. Weng, S. Mizoguchi, S. Akasaka and H. Onari, "Smart manufacturing operating systems considering parts utilization for engineer-to-order production with make-to-stock parts", International Journal of Production Economics, Vol.220, pp.1-7 (2020).
4) Q. Huang, J. Weng and H. Onari, "Integrated Approach for Production Planning with Trading Prices of Global Supply Chain", Japan Society for Production Management (JSPM) Journal, Vol.6, No. 1, pp.43-50 (2018).
5) Y. Yamazaki, K. Shigematsu, J. Weng, F. Kojima and S. Takata, "Method for the design of material handling systems for lean automation", Transactions of the JSME (in Japanese), Vol.84, No.862, pp.1-12 (2018).

Affiliated Academic Organizations:

J. Weng: Japan Industrial Management Association (JIMA), The Japan Society of Mechanical Engineers (JSME), Japan Society for Production Management (JSPM)The Asian Association of Management Science and Applications (AAMSA), etc.
S. Akasaka: Japan Industrial Management Association (JIMA), The Japan Society of Mechanical Engineers (JSME), The Japan Society for Precision Engineering (JSPE), etc.

Current members: 1 professor, 1 assistant professor, 7 postgraduates, 10 undergraduates

Field of Industrial Engineering and Management/Graduate School
Department of Industrial Engineering and Management /Undergraduate

Management System Engineering Laboratory

Hideki Katagiri (Professor) Office: 23-409 Ext.: 3716
Laboratory 23-408 Ext: 3715

Education/H. Katagiri (e-mail: katagiri@kanagawa-u.ac.jp)
03/2000, Ph. D., Osaka University
03/1997, M. E., Osaka University

Research Field: Operations Research, Systems Optimization, Data Analysis

Research Subjects: 1. Soft computing approaches to optimization problems under uncertainty. 2. Production and logistics systems optimization. 3. Machine learning-based anomaly detection.

Introduction:

Owing to the progress of globalization caused by the rapid development of ICT, many difficult problems that need to be solved in large-scale complex systems have emerged. These problems are difficult because of the uncertainty of the environment and the diversity of individuals and organizations.

To provide new technologies and valuable concepts for decision making methods, we conduct studies on systems optimization under uncertainty, data analysis, or business analytics based on soft computing, artificial intelligence, and machine learning. In cooperation with companies and other research institutes, we have performed several collaborative research projects to solve problems in manufacturing and in service industries such as tourism, medicine, and health.

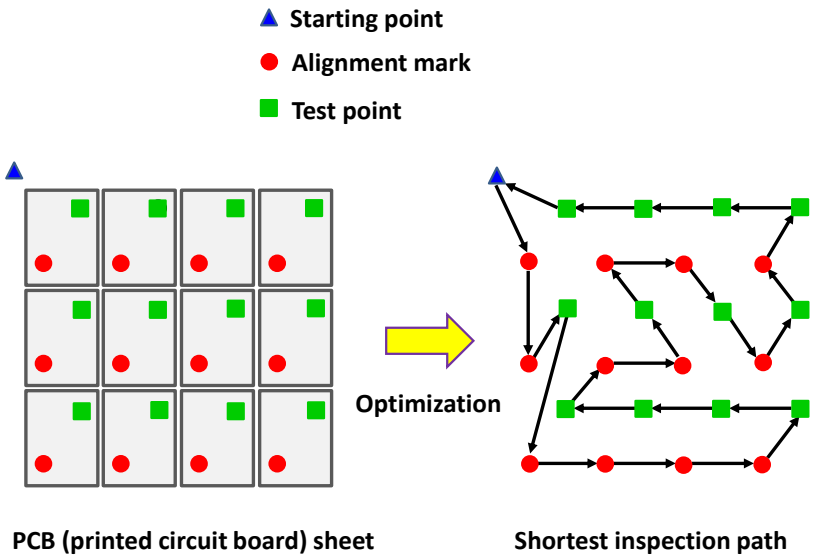

Figure 1. Path optimization for PCB inspection

Publications:

1) H. Katagiri, Q. Guo, H. Wu, H. Hamori, K. Kato, “A route optimization problem in electrical PCB inspections: pickup and delivery TSP-based formulation”, *In: G.-C. Yang, S.-I. Ao, X. Huang, O. Castillo (eds.) Transactions on Engineering Technologies*, pp. 193-205, Springer (2016).
2) H. Katagiri, T. Uno, K. Kato, H. Tsuda and H. Tsubaki, “Random fuzzy bilevel linear programming through possibility-based value at risk model”, *International Journal of Machine Learning & Cybernetics*, vol. 5, pp. 211–224 (2014).

Affiliated Academic Organizations:

H. Katagiri: Institute for Operations Research and the Management Sciences, Japan Association for Management Systems, INFORMS, IEEE

Current members: Professors: 1; Postgraduates: 6; Undergraduates: 9

Field of Industrial Engineering and Management/Graduate School
Department of Industrial Engineering and Management /Undergraduate

Nonlinear Systems Laboratory

Hiroto Kubotani (Professor) Office: 6-410 Ext.: 3375

Ryo Fujie (Assistant Professor) Office: 5-221 Ext.: 3114

Education/H. Kubotani (e-mail: kuboth01@kanagawa-u.ac.jp)
03/1992, Ph.D., Kyoto University
03/1988, M.S., Kyoto University
Education/R. Fujie(e-mail: fujie@kanagawa-u.ac.jp)
03/2010, Ph.D., Kyushu University
03/2007, M.S., Kyushu University


H. Kubotani


R. Fujie

Research Field: Nonlinear Systems theory, Complex Systems theory, Statistical Science, Sociophysics

Research Overview: Analysis of complex phenomena from nature to human society

Research Subjects: 1. Dynamical formation of quantum entanglement and its applications
2. Stability analysis of coexistence of multiple states in consensus dynamics
3. Social structure and collective phenomena emerging from interactions of individuals

Introduction: A best-selling product will often sell well because consumers know that it is selling well. This shows that consumers are affected by each other. If behaviors of the consumers go along with, a social tendency arises as a result of the summation of many individual personal activities. This phenomenon is similar to a macroscopic magnet, which is composed of many aligned magnetic spins. This type of phenomenon can be observed in human society and in nature.

For the study of a complex system that consists of many interacting elements, it is modeled in a nonlinear system. In our laboratory, we study a complex system that consists of many interacting elements. To reveal properties of the system, we use nonlinear systems theory and statistical science. We usually build a nonlinear system model of the complex system and estimate its validity through computer simulations.

Publications:

1) H. Kubotani, S. Adachi, M. Toda, "Measuring dynamical randomness of quantum chaos by statistics of Schmidt eigenvalues," Physical Review E, **87** (2013), 062921.
2) H. Kubotani, S. Adachi and M. Toda, "Exact Formula of the Distribution of Schmidt Eigenvalues for Dynamical Formation of Entanglement in Quantum Chaos," Physical Review Letters, **100** (2006), 240501.
3) R. Fujie, K. Aihara and N. Masuda,"A model of competition among more than two languages," Journal of Statistical Physics, **151** (2013), 289-303.

Affiliated Academic Organizations:

H. Kubotani: The Information Processing Society of Japan, the Physical Society of Japan, the Astronomical Society of Japan, the Japanese Society for Planetary Sciences
R. Fujie: the Physical Society of Japan

Current members: Professors: 1; Assistant Professors: 1

Field of Industrial Engineering and Management/Graduate School
Department of Industrial Engineering and Management /Undergraduate

Manufacturing Systems Engineering Laboratory

Kimitoshi Sato (Associate Professor) Office: 23-413-1 Ext.: 3721

Masahiro Nishikawa (Research Associate)
Laboratory: 23-414 Ext.: 3722

Education/ K. Sato (e-mail: k-sato@kanagawa-u.ac.jp)
03/2010, Ph.D., Nanzan University
03/2007, M.S., Nanzan University
Education/M. Nishikawa (e-mail: nishikawa@kanagawa-u.ac.jp)
09/1998, Ph.D., Shizuoka University

K. Sato

M. Nishikawa

Research Field: Operations Research, Management Science, Service Science.

Research Overview: Our laboratory focuses on operations and production management under uncertainty.

Research Subjects: 1. Pricing and revenue management. 3. Supply chain management. 4. Optimal inventory control. 5. Air and rail cooperation. 6. Financial engineering. 7. Real options.

Introduction: The Manufacturing Systems Engineering Laboratory is engaged in research related to building production and service management systems under uncertainty. With the development of the Internet of Things, information about consumer purchase behavior, inventories, and facility equipment, and many other things has become available in real time. For society to develop sustainably using these types of information, it is necessary to create a dynamic decision-making method to properly produce and provide goods and services for customers. This laboratory aims to enable the sustainable development of society and realize safe, secure purchasing environments by exploring analytical properties of optimal policy and developing a tool that is simple for decision makers to use.

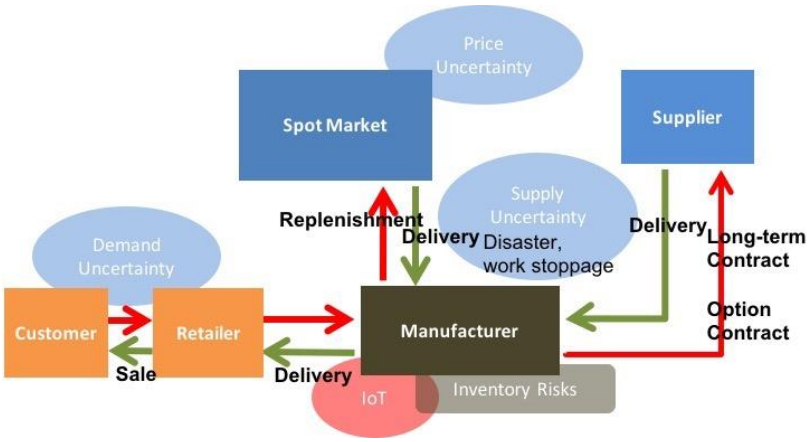

Figure 1. Supply chain risks.

Publications:

1) Sato, K. (2021). Dynamic pricing with automated purchase-reservation algorithms. *Journal of Revenue and Pricing Management*, 20, 33-41.
2) Sato, K., Nakashima, K. (2020). Optimal pricing problem for a pay-per-use system based on the Internet of Things with intertemporal demand. *International Journal of Production Economics*, 221, 107477.
3) Sato, K. (2019). Price trends and dynamic pricing in perishable product market consisting of superior and inferior firms. *European Journal of Operational Research*, 274(1),214-226.
4) Sato, K and Sawaki, K. (2013). A continuous-time dynamic pricing model knowing the competitor's pricing strategy, *European Journal of Operational Research*, 229, 223-229.

Affiliated Academic Organizations:

K. Sato: The Operations Research Society of Japan, Japan Industrial Management Association, Nippon Finance Association, Japan Association of Real Options and Strategy

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Current Members: Associate Professors: 1; Research Associate: 1; Graduates: 4; Undergraduates: 13

Field of Industrial Engineering and Management/Graduate School
Department of Industrial Engineering and Management /Undergraduate

Human Factors and Ergonomics Laboratory

Masato Takanokura (Professor) Office: 5-220-1 Ext.: 3112

Mitsuharu Ogiya (Assistant Professor) Laboratory: 5-220 Ext.: 3113

Education/ M. Takanokura (e-mail: takanokura@kanagawa-u.ac.jp)
03/2001, Ph.D., The University of Electro-Communications
03/1998, M.S., The University of Electro-Communications
Education/ M. Ogiya (e-mail: ogiya@kanagawa-u.ac.jp)
03/2008, Ph.D., University of Tsukuba
03/2003, M.S., University of Tsukuba

M. Takanokura

M. Ogiya

Research Field: Human Factors and Ergonomics, Human-Centered Design, Service Design

Research Subjects: 1. UX design: service and system design to improve user experience. 2. UI design and usability: system design to support daily activities for elderly and disabled persons. 3. Work and product design for safety and productivity. 4. Consumer engagement and loyalty.

Introduction:

Human Factors and Ergonomics Laboratory has studied “design based on user perspectives” to promote well-being and to improve the quality of daily and working life. We have devised novel design approaches to solve social issues through “design thinking.” Design thinking analyzes interactions between humans (users, consumers, workers, and other actors) and social/artificial systems (service, software, and hardware) in a diverse society and is aligned with the principles of sustainable development. We are currently focusing on UX/UI design, human-centered design, interface design with usability, consumer engagement and loyalty, and other subjects to build a better relationship between us and social/artificial systems.

Figure 1. Application to support speech and language disorders.

Figure 2. UX Design of a Japanese café (exterior design).

Publications:

1) M. Takanokura, R. Kurashima, T. Ohhira, Y. Kawahara, M. Ogiya, “Implementation and User Acceptance of Social Service Robot for an Elderly Care Program in a Daycare Facility. *Journal of Ambient Intelligence and Humanized Computing*, Online First (2021)
2) M. Takanokura, et al., “Posture-Based Ergonomic Risk Assessment for Physical Workload Improvement: Case Study for an Assembly Line,” *Journal of Japan Industrial Management Association*, Vol.67, No.4E, pp. 338-347 (2017)
3) S. Shioiri, M. Yoshizawa, M. Ogiya, K. Matsumiya, Y. Yaguchi, “Low-level motion analysis of color and luminance for perception of 2D and 3D motion,” *Journal of Vision*, vol. 12(6), pp 1-14 (2012)
4) K. Sakai, M. Ogiya, and Y. Hirai, “Decoding of depth and motion in ambiguous binocular perception,” *Journal of the Optical Society of America. A*, vol. 28 (7), pp. 1445-52 (2011)

Affiliated Academic Organizations:

M. Takanokura: Japan Industrial Management Association (JIMA), Japan Ergonomics Society (JES) and others.
M. Ogiya: Vision Society of Japan, The institute of Image Information and Television Engineers (ITE), Japan Society for Fuzzy Theory and Intelligent Informatics (SOFT), Japan Association for Management Systems (JAMS).

Current members: Professors: 1; Assistant Professors: 1; Graduates: 2, Undergraduates: 13

Field of Industrial Engineering and Management/Graduate School
Department of Industrial Engineering and Management /Undergraduate

Social Behavior Science Laboratory

Shuji Hisamune (Professor) Office: 23-627 Ext.: 3816

Education／S. Hisamune (e-mail: hisamune@kanagawa-u.ac.jp)
09/2000, Ph.D., Hokkaido University

Research Field: Ergonomics, Industrial Safety and Health, Psychology, Industrial Hygiene Engineering

Research Overview: Ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, with the aim of realizing a safe, secure and comfortable society and maintain and promote people's health. Research and education of this laboratory are carried out in the following fields.

Research Subjects:

1. Accident analyses and safety and reliability analyses of human-machine-system based on human factor approach.
2. Developed the Work Improvement on Board (WIB) program by applying participatory action-oriented training (PAOT) methods.
3. Field assessment for solving actual problem.

Introduction: In order to mitigate the risks of seamen, we developed the Work Improvement on Board (WIB) program by applying participatory action-oriented training (PAOT) methods that have proven effective for reducing work-related risks in small enterprises, construction sites, and agriculture. Materials and methods : We analyzed which features of the WIB program would be most effective for facilitating the planning and implementation of practical improvements on vessels. We examined action -oriented tools used, including a WIB action checklist and good examples, and practical improvements proposed by the participants in 1-day or half-day WIB workshops.

Subject	Not Needed	Needed	Priority	
HOUSEKEEPING and STORAGE				
	Do you propose action?			
1. Use multi-level shelves or racks	No	Yes	Priority	
for storing tools, materials, parts.	□	□	□	
(Remarks)				
	Do you propose action?			
2. Keep passageways clear in good	No	Yes	Priority	
condition for the movement of people	□	□	□	
and materials. (Remarks)				
	Do you propose action?			
3. Eliminate sudden height differences	No	Yes	Priority	
and holes on transport routes.	□	□	□	
(Remarks)				

Table 1. Typical check items in the WIB action checklist.

Easy! Low-cost! Effective!

Priority in order	Date	1 June 2015		Name of vessel	○○○ vessel
	Member	AAA BBB CCCC DDD			
	Improvement Points	Plan of improvement		Result	
		Plan	others	Improvement	Photos
1	Put the slipless mat	End of August	Paint $○○, slip less material, $○○	Use a paint with sand	
2	Prevent hitting the head	End of July	Urethane $○○, tape of yellow and black at discount shop	Put urethane on the head level with a tape yellow and black	
3	Difficult to find tools not put in order	End of June	Boards made with wood $○○, hook $○○ at discount shop	Place the tools according big size	

Table 2. An example of the WIB flow sheet for writing down the improvement plans and the results.

Publications:

1) Shuji Hisamune、Kazutaka Kogi, "Findings of the Work Improvement on Board (WIB) programme by the Fishery Agency in Japan" International Maritime Health Vol.66 No.3, pp152-159 (2015)
2) Shuji Hisamune, Kiyoshi Amagai, Nobuo Kimura, Koya Kisaida, "A Study of Factors Relating to Work Accidents among Seamen "Industrial Health Volume44,Number 1,pp144-149 (2006)
3) Miho Ehara, Sonoe Muramatu, Yuji Sano, Seiichi Kakeda, Shuji Hisamune "The Tendency of Diseases among Seamen during the Last Fifteen Years in Japan" Industrial Health,Volume44,Number 1,Juanuary, pp155-160 (2006)

Affiliated Academic Organization:

Japan Ergonomics Society, Japan Industrial Management Association, Japan, Japan Society of fisheries engineering, Institute of Navigation Human Ergology Society, Japanese Psychological Association

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Current member: Professor: 1; Undergraduate: 12

Field of Industrial Engineering and Management/Graduate School
Department of Industrial Engineering and Management /Undergraduate

Managerial Accounting Laboratory

Hirohisa Hirai (Professor) Office: 23-428 Ext.: 3735
Laboratory: 23-429

Ayuko Komura (Assistant Professor) Office: 23-429-1 Ext.: 3736

Education/H. Hirai (e-mail: hirai@kanagawa-u.ac.jp)
03/2004, Ph. D., Osaka University
Education/A. Komura (e-mail: komura-a@kanagawa-u.ac.jp)
03/2022, Ph. D., Meiji University

H. Hirai

A. Komura

Research Field:

Accounting, Cost Management, Corporate Valuation, Financial Analysis, Marketing

Research Subjects:

1. Value relevance of corporate value and financial information
2. Corporate value and use of human resources at corporations
3. Creation of corporate value via corporate reorganization etc.

Introduction:

Among resources that are important to corporate management, accounting is a field that places particular focus on money. In particular, knowledge of management accounting is important for managers and executives. In corporate management activities, people inside and outside of a corporation move a variety of goods (products, etc.) while handling a variety of information. At the same time, these management activities move money.

Knowledge related to the procurement and use of money at corporations is effective in a variety of areas of society. For example, both corporate investment and personal investment require the collection and efficient use of money. This laboratory uses accounting knowledge to perform analysis and research on corporate management.

Publication:

H. Hirai 1）H. Hirai and A. Shiiba, “Equity Valuation Using a Hybrid Approach: How to Combine Valuation Estimates?”, The Journal of Cost Accounting Research, Vol.34/N0.2, pp.103-115 (2010). 2) H. Hirai and A. Shiiba, “Cost Behavior of Selling, General, and Administrative Costs”, *The Journal of Management Accounting,* Vol.14/N0.2, pp.15-27 (2006). 3) H. Kataoka and H. Hirai, “The Nature of the Cumulative Method with FIFO in a Process Cost Accounting System”, *The Journal of Management Accounting,* Vol.23/N0.1, pp.3-19 (2015).

A. Komura 1) A. Komura, “The Effect of Number of Customers on Stability of Sales: A Case Study of a Japanese Hotel Chain,” *Japanese Journal of Strategic Management*, Vol.4/NO.3, pp.193-201. (2016)

2) A. Komura and K. Suzuki, “The Effect of Customer Relationship on a Correlation between Past Sales and Future Sales: Based on the Data of Membership Customers of Company A,” *Japanese Journal of Strategic Management*, Vol.3/NO.2, pp.161-172. (2014)

Affiliated Academic Organizations:

H. Hirai Japan Accounting Association, The Japanese Association of Management Accounting, The Japan Cost Accounting Association, Business Analysis Association, Japan Industrial Management Association, Japanese Society of Computational Statistics, The Japanese Association for Research in Disclosure, American Accounting Association, etc.

Current members: Professors: 1; Assistant Professor: 1; Graduates: 10, Undergraduates: 10

Field of Industrial Engineering and Management/Graduate School
Department of Industrial Engineering and Management /Undergraduate

Basic Technology Laboratory

Mitsuhiro Matsumoto (Associate Professor) Office: 23-708 Ext.: 3836
Laboratory: 5-219 Ext.: 3111

Education/M. Matsumoto (e-mail: m-matsumoto@kanagawa-u.ac.jp)
03/2011, Ph. D., University of Tsukuba

Research Field: Intelligent Mechanics, Measurement Engineering

Research Subjects:

1. Task support equipment for correcting deformed bicycle wheels.
2. 2D laser range sensor system for scanning the front and lateral sides of an object.

Introduction:

1. A bicycle wheel consists of a hub, spokes, nipples, and a rim. The rim deforms from a true circle to an irregular circle when a worker assembles the wheel. The rim must be a true circle for the wheel to be used safety. The worker needs to correct the deformed rim by relation between nipple position relative to the desired nipple rotation angle and rim displacements. I developed task support equipment to correct the deformed rim with these relation, so that the worker does not need to know them. The task support equipment shows the worker the intended nipple position for use in setting the nipple rotation angle. I measured the relation between the nipple rotation angle and the rim displacement and suggested a method to calculate the corrected rim displacements based on the relation. I created the hardware and software for the task support equipment and checked the performance of the task support equipment by correcting deformed rims.
2. I developed a 2D laser range sensor system, consisting of a 2D laser range sensor and a mirror based ellipse. The 2D laser range sensor can simultaneously scan the front side of the object and the lateral sides of the object densely with the laser light reflected by the mirror. I examined design conditions for the mirror based on the relation between the sensor and the object in the sensor system. I designed and made the mirror according to the design conditions and constructed the system from the sensor and the mirror. I took the reflecting points on an object experimentally with the sensor system and checked the positions of the scanned reflecting points to evaluate the system.

Publications:

1) M. Matsumoto, “Task support equipment for correcting deformed bicycle wheel”, *Transactions of the JSME* (in Japanese), vol. 82, pp. 15-00127 (2016), DOI: 10.1299/transjsme.15-00127.
2) M. Matsumoto, “2D laser range sensor system for scanning front side and lateral side of object”, *Transactions of the JSME* (in Japanese), vol.82, pp.15-00501 (2016), DOI: 10.1299/transjsme.15-00501.

Affiliated Academic Organizations: The Japan Society of Mechanical Engineers

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Current members: Associate Professors: 1; Undergraduates: 13

Coordinated Engineering Program

Plant Genetics and Breeding Laboratory

Nobuaki Asakura (Professor) Office: 6-304 Ext.: 3346

Education/N. Asakura (e-mail: asakura@kanagawa-u.ac.jp)
03/1997, Ph.D., Kobe University
03/1990, M.S., Kobe University

Research Field: Plant Genetics and Breeding.

Research Overview: Studying plant breeding, plant genetic systems, and plant evolution through analyzing DNA polymorphisms.

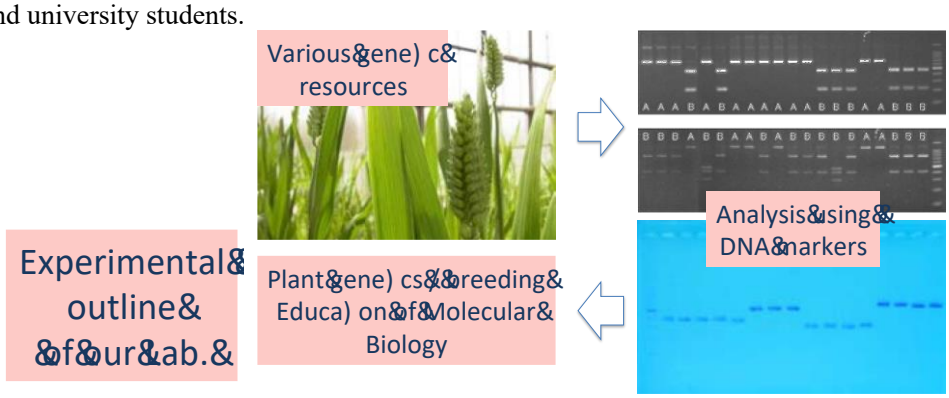
Research Subjects: 1. Molecular analysis of nuclear cytoplasmic interactions in wheat and its relatives. 2. Development of DNA markers associated with sexuality in sea buckthorn (*Hippophae*). 3. Educational studies and development of experimental biology programs for high school students.

Introduction:

1. Many nucleus cytoplasm hybrids have been produced in wheat and its relatives. We are investigating the molecular mechanisms that cause interesting phenotypes, such as male sterility and variegated leaves, in some hybrids.

2. Sea buckthorn is a wind pollinated dioecious shrub. Early sex determination of dioecious plants is required for its breeding and commercial fruit production. We are searching for DNA markers associated with sexuality in sea buckthorn.

3. Understanding genetic diversity is difficult, mainly because genetic diversity at the DNA level is still unfamiliar to most people. We are developing educational experiments to illustrate and teach genetic diversity at the DNA level to high-school, college, and university students.



Publications:

1) N. Asakura et al., "Comparative nucleotide sequence analysis of the D genome-specific sequence-tagged-site locus *A1* in *Triticum aestivum* and its implication for the origin of subspecies *sphaerococcum*," *Breeding Science* vol. 61, pp. 212–216 (2011).
2) N. Asakura, "Genotyping of the *Q* locus in wheat by a simple PCR-RFLP method," *Genes & Genetic Systems*, vol. 84, pp. 233–237 (2009).
3) N. Asakura, "Sequence diversity and copy number variation of *Mutator*-like transposases in wheat," *Genetics and Molecular Biology*, vol. 31, pp. 539–546 (2008).

Affiliated Academic Organizations:

Japanese Society of Breeding, The Genetics Society of Japan, The Society of Biological Sciences Education of Japan, The Japanese Society for Horticultural Science.

Current members: Professors: 1; Undergraduates: 7
Facilities: Thermal cycler, growth chamber, apparatus for manufacturing ultra-pure water, UV transilluminator.

Coordinated Engineering Program/Undergraduate
(Department of Chemistry)

Mechanistic Study Laboratory

Izumi Iwakura (Professor)

Office: 23-715 Ext.: 3843
Education/I. Iwakura (e-mail: izumi@kanagawa-u.ac.jp)
09/2005, Ph.D., Keio University

Research Field: Analysis of Reaction Mechanisms, Laser Chemistry.

Research Subjects: 1. Visualization of transition states with 5-fs visible laser pulses.
2. Development of novel reactions induced by coherent molecular vibrational excitation.

Introduction: Reactions induced by coherent molecular vibrational excitation in the electronic ground state just after photoexcitation are triggered by 5-fs visible laser pulses. The transition states in thermal reactions are observed by using reactions induced by coherent molecular vibration.

Publications:

1) I. Iwakura, A. Yabushita, Development of Novel Reactions Induced by Coherent Molecular Vibrational Excitation and Direct Observation of Molecular Structural Change during "Thermal" Reactions, *Bulletin of the Chemical Society of Japan*, **89**, 296-307 (2016). 2) S. Hashimoto, A. Yabushita, T. Kobayashi, I. Iwakura, Real-time measurements of ultrafast electronic dynamics in the disproportionation of $[TCNQ]_2^{2-}$ using a visible sub-10 fs pulse laser, *Chemical Physics Letters,* **650**, 47-51 (2016). 3) I. Iwakura, A. Yabushita, J. Liu, K. Okamura, S. Kezuka, and T. Kobayashi, "A new reaction mechanism of Claisen rearrangement induced by few-optical-cycle pulses: demonstration of non-thermal chemistry by femtosecond vibrational spectroscopy," *Pure and applied Chemistry*, vol. 85, pp. 1991–2004 (2013). 4) I. Iwakura, "The experimental visualization of molecular structural changes during both photochemical and thermal reactions by real-time vibrational spectroscopy," *Physical Chemistry Chemical Physics*," vol. 13, pp. 5546–5555 (2011). 5) I. Iwakura, A. Yabushita, and T. Kobayashi, "Transition states and nonlinear excitations in chloroform observed with a sub-5 fs pulse laser," *Journal of the American Chemical Society*, vol. 131, pp. 688–696 (2009).

Affiliated Academic Organizations: The Chemical Society of Japan, The Japanese Photochemistry Association, The Society of Japanese Women Scientists, The Society of Synthetic Organic Chemistry, Japan, The Society of Physical Organic Chemistry, Japan.

Current members: Professors: 1; Postgraduates: 1; Undergraduates: 4

Coordinated Engineering Program/Undergraduate
(Department of Physics)

Mathematical Biology Laboratory

Yoshiyuki Usami (Associate Professor) Office: 5-522 Ext. 3219
Lab. 6-412 Ext.3348

Education/Y. Usami (e-mail: usami@kanagawa-u.ac.jp)
03/1990, Ph.D., Tokyo Institute of Technology
03/1987, M.S., Keio University

Research Field: Autonomous Driving, Artificial Intelligence, Biomechanics,, Statistical Physics.

Research Overview: Adapting US autonomous driving system into Japanese roads. Studying dinosaur locomotion and the fluid dynamics of extinct animals.

Research Subjects: 1. Python programming for autonomous driving system. 2. How fast *Tyrannosaurus rex* could run. 3. Swimming patterns of the extinct animal *Anomalocaris*.

Introduction: Autonomous driving brings not only safety but also economic benefit for industries. Japanese car companies provide developed sensors for cars, but integrations of those elementary equipments have achieved by American companies. Our laboratory imported an autonomous driving system of Comma.ai for Japanese automobile environment. We found out that US system can be directly applied to Japanese roads. We have achieved round trip from Tokyo to Osaka on April, 2018. Slight difference between US-left handle system and Japanese one have been found. We try to fix this problem and the others by changing source chords of the software.

Publications:

1) Y.Usami and R.Kingasa, A Possibility of Fast Running of TYRANNOSAURUS, to appear in DEStech Transaction on Applied Mechanics and Mechanical Automation(2017).
2) Y. Usami, “Biomechanics for bipedal dinosaurs,” CreateSpace, 2014.
3) “Evolutionary computation strategy is superior than simulated annealing for obtaining running motion of dinosaur,” *Proceedings of the 6th International Conference on Evolutionary Computational Theory and Application*, Rome (2014).
4) Y. Usami, “Cambrian explosion,” *Gijutsu-hyoron-sha*, (2008) (in Japanese).
5) Y. Usami, “Theoretical study on the body form and swimming pattern of *Anomalocaris* based on hydrodynamic simulations”, *Journal of Theoretical Biology*, vol. 238, pp. 11–17 (2006).

Homepage: http://www.phys.kanagawa-u.ac.jp/~usami/

Affiliated Academic Organizations:
The Physical Society of Japan, Mathematical Biology Association, Association of Evolution, Japanese Society of Paleontology.

Current members: Associate Professors: 1; Undergraduates: 4

Coordinated Engineering Program/Undergraduate
(Department of Physics)

High-energy particle observation labolatory
Shigeharu Udo (Associate Professor)

Office: 6-416 Ext.: 3392
Education/S. Udo (e-mail: shige@kanagawa-u.ac.jp)
03/2004, D.S., Saitama University
03/2001, M.S., Saitama University

Research Field: High-energy Cosmic-Ray Physics

Research Subjects: Research into the the origin and propagation of ultra-high- and high-energy cosmic rays.

Introduction:

About 100 years ago, high energy particles which coming from space were discovered and named Cosmic Ray. “Ultra-High-Energy cosmic rays” are especially high energy particles among cosmic rays, those are expected to identify the origin of cosmic ray because the UHE cosmic rays are less susceptible from galactic and extra galactic magnetic field. However, cosmic ray particle which arrive to the earth collide with atmosphere, we can't observe it directly at ground. So we measure primary energy and arrival direction of cosmic ray using phenomena called extended air shower which caused by nuclear interaction between cosmic ray and atmosphere.

We are observing the Ultra-High-Energy cosmic rays in desert of Utah, USA with two types of detectors of Surface particle Detector array (SD array) and Fluorescence Detector telescope (FD telescope). While exploring the origin of cosmic ray with these two kinds of detectors, we are studying development of new particle detector, automation of experimental devices by mechatoronics and calibration of telescope optics etc.

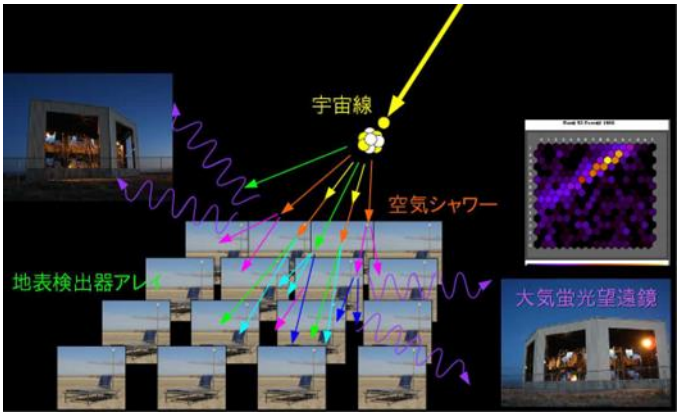


Fig 1: Schematic view of the extended air shower and detectors of SD array and FD telescope.

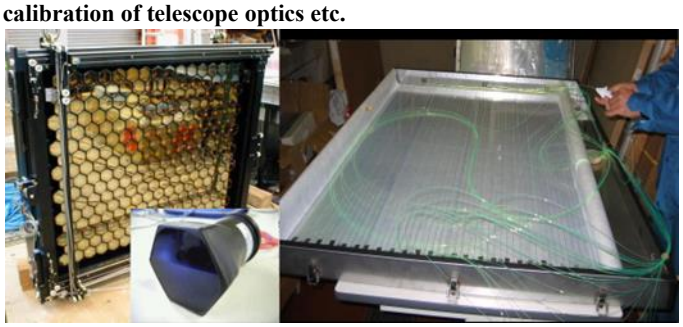


Fig 2: Camera of FD telescope (left) and inside of particle detector.

Publications: 1) A NORTHERN SKY SURVEY FOR POINT-LIKE SOURCES OF EeV NEUTRAL PARTICLES WITH THE TELESCOPE ARRAY EXPERIMENT, The Astrophysical Journal, 804, 133-143 (2015)
2) Gain Monitoring of Telescope Array Photomultiplier Cameras for the First 4 Years of Operation, Nuclear Instruments and Methods in Physics Research Section A, 768, 96-103 (2014)
3)Anisotropy and Corotation of Galactic Cosmic Rays, Science, 314, 439-443 (2006)

Affiliated Academic Organizations: The Physical Society of Japan

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Coordinated Engineering Program/Undergraduate
(Department of Chemistry)

Functional Molecular Chemistry Laboratory

Atsushi Kameyama (Professor) Office: 23-709 Ext.: 3837
Laboratory: 23-710 Ext.: 3838

Education/A. Kameyama (e-mail: kameya01@kanagawa-u.ac.jp)
03/1990, Ph.D., Department of Electronic Chemistry,
Graduate School of Science and Engineering, Tokyo Institute of Technology

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Research Field: Organic Chemistry, Polymer Chemistry, Materials Chemistry.

Research Overview: Amphiphilic block copolymers can self-assemble to form nanoparticles (micelles) consisting of a hydrophobic core and hydrophilic shell in aqueous media. We developed a series of nanoparticles with a catalytic core and an inert thermoplastic shell. These nanoparticles are used as latent catalysts to control reactions because the catalyst is only exposed when the shell is collapsed by heating.

We also developed a series of polymers including a thermal rearrangement system. We synthesized polymers with thermal rearrangement moieties in the polymer side chain, and the resulting polymer films showed an increase in the refractive index of 0.01. These polymers are suitable for optical devices.

Research Subjects: 1. Synthesis and self-assembly of novel amphiphilic block copolymers for nanostructured objects. 2. Synthesis of polymers with designed architectures and their applications. 3. Synthesis and characterization of stimuli-responsive materials.

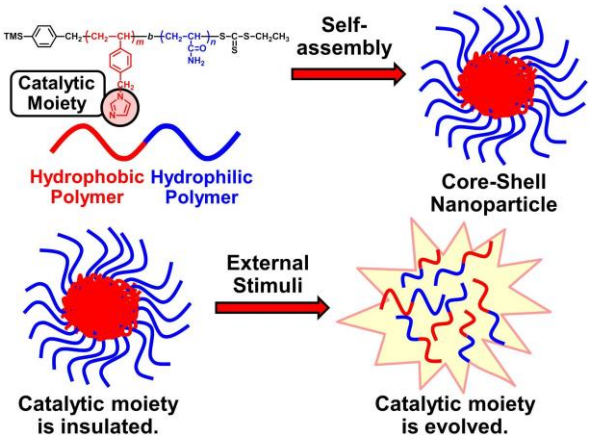

Figure 1. Nanoparticle formation by using amphiphilic block copolymers.

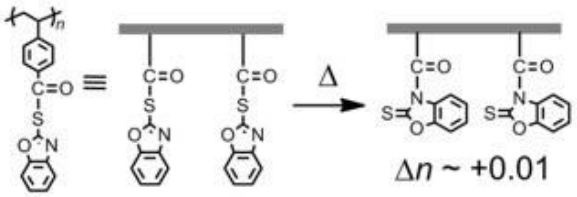

Figure 2. The refractive index change of the polymer with pendant aromatic heterocycles is induced by thermal rearrangement reaction.

Introduction:

All living things are composed of soft, flexible materials that can respond to many kinds of external stimuli such as temperature and light. Polymers, often called plastics, are typical soft, flexible materials. We are focusing on block copolymers, which consists of two or more chemically different polymer chains connected at one chain end. We are investigating how controlling the self-assembly of these polymers can produce many kinds of unique nanometer-sized periodic structures and we are developing their functionalities.

Publications:

1) K. Tsuchiya, Y. Ishida, A. Kameyama, “Synthesis of diblook copolymers consistent of POSS-containing random methacrylate copolymers and polystyrene and their cross-linked microphase-separated structure via fluoride ion-mediated cage scrambling”, Polymer Ohemistry. 2017.8.2516-2527. 2) Y. Ishida, Y.Takeda, A. Kameyama, “Synthes is of Blook Copolymer with Photo-decomposable Polyurethane and its Photo-initiated Domino Decomposition” , Reactive nd Functional Polymers, 2016.107.20-27. 3)K. Tsuchiya, H. Arai, Y. Ishida, A. Kameyama, “Dynamic Network Formation of POSS-Pendanted Polymer via Cage Scrambling Mediated by Fluoride Ion” , Macromolecules, 2015.48.1636-1643.

Homepage: http://apchem2.kanagawa-u.ac.jp/~kameyamalab/index.html

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Current members: Professors: 1; Assistant Professors: 1; Postgraduates (M.C.): 4; Undergraduates: 9

Nano Science Laboratory

Haruka Kyakuno (Associate Professor) Office: 5-323B Ext.: 3159

Education/H. Kyakuno (e-mail: h-kyakuno@kanagawa-u.ac.jp)
03/2014, D. Sci., Tokyo Metropolitan University

Research Field: Experimental materials physics, nano science.

Research Overview: Nanomaterials often exhibit unusual properties that do not appear in the bulk. They are of considerable interest in fundamental science, as well as in the development of new nanoscale devices. We study substances in confining geometries of nanostructured materials using a variety of experiments and simulations, such as synchrotron X-ray diffraction (XRD) experiments, thermal analyses, electrical measurements, optical measurements, scanning probe microscope observations, and molecular dynamics simulations.

Research Subjects: 1. Novel properties and applications of nanomaterials. 2. Structures and dynamics of confined fluids.

Introduction: (1) We study confined fluids, such as water, rare gases, and hydrocarbons, inside nanopores. For example, hydrogen-bonded structures of confined water can be controlled by the size, shape, topology, and hydrophobicity of nanopores. We investigate the novel properties and functions of the confined water. This study contributes to the development of high-performance filtration/separation devices and to a better understanding of the function of biological channels.

(2) Single-wall carbon nanotubes (SWCNTs) have high potential as flexible, lightweight thermoelectric materials. Previous studies showed that the thermoelectric properties of SWCNT bundles depend strongly on the carrier density and the mixing ratio of semiconducting and metallic SWCNTs. We examine the thermoelectric properties of bulk SWCNT materials by using experiments and simulations. Our goal is to find the conditions under which bulk SWCNT materials have sufficient thermoelectric properties to be suitable for practical use.

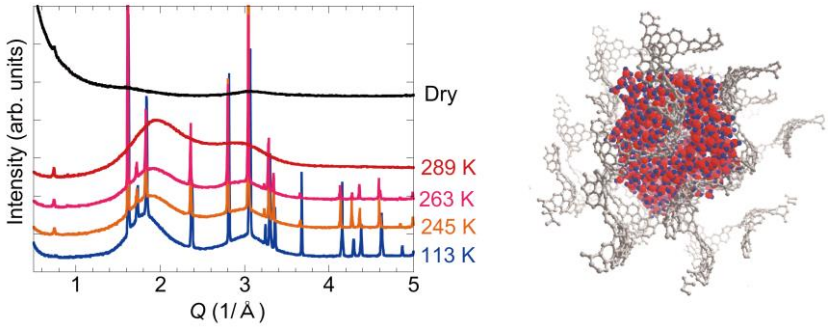

Figure. XRD patterns (left) and schematic (right) of water confined in nanopores of a carbon nanomaterial.

Publications: 1) D. Hayashi, Y. Nakai, H. Kyakuno, Y. Miyata, K. Yanagi, Y. Maniwa, "Temperature dependence of the Seebeck coefficient for mixed semiconducting and metallic single-wall carbon nanotube bundles," *Applied Physics Express*, vol. 13, pp. 015001-1-5 (2020). 2) H. Kyakuno, H. Ogura, K. Matsuda, Y. Maniwa, "Ice nanoribbons confined in uniaxially distorted carbon nanotubes," *The Journal of Physical Chemistry C*, vol. 122, pp. 18493-18500 (2018). 3) H. Kyakuno, K. Matsuda, Y. Nakai, R. Ichimura, T. Saito, Y. Miyata, K. Hata, Y. Maniwa, "Rotational dynamics and dynamical transition of water inside hydrophobic pores of carbon nanotubes," *Scientific Reports*, vol. 7, pp. 14834-1-11 (2017).

Affiliated Academic Organizations: The Physical Society of Japan, The Fullerenes, Nanotubes and Graphene Research Society.

Current members: Associate Professors: 1; Undergraduates: 4

Coordinated Engineering Program/Undergraduate
(Department of Physics)

Computational Statistical Physics Laboratory

Munetaka Sasaki (Associate Professor) Office: 5-323C Ext.: 3160

Education/M. Sasaki(e-mail: msasaki@kanagawa-u.ac.jp)
03/2001, Ph.D., Hokkaido University

Research Field: Statistical Mechanics, Computational Physics.

Research Subjects: 1. Statistical mechanics in disordered systems. 2. Development of efficient Monte Carlo methods. 3. Temperature effects in nanomagnets.

Introduction: We investigate disordered systems, such as spin glasses and glasses, with statistical mechanics and computer simulations. Spin glass is a random magnet in which ferromagnetic and antiferromagnetic interactions coexist randomly. Glass is a metastable state in which molecular arrangement is frozen randomly. Disordered systems often exhibit curious phenomena which are not observed in regular systems. Temperature chaos, which is a phenomenon that the equilibrium state chaotically changes with temperature, is one of them (see Fig. 1). One of the purposes of our study is to clarify the mechanism of these curious phenomena in disordered systems.

We have also developed efficient Monte-Carlo methods for disordered systems and long-range interacting systems. A stochastic cutoff method is one of them. This method enables us to reduce computational time for long-range interacting systems without any approximations (see Fig. 2). As an application research of the stochastic cutoff method, we have also studied thermal effects in nanomagnets.

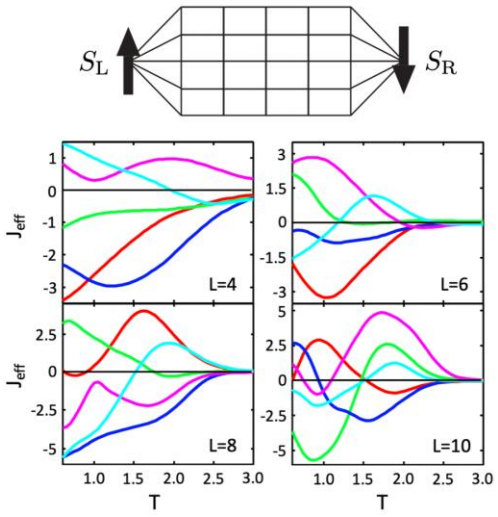

Figure 1 The temperature dependence of effective coupling between S_L and S_R in a spin glass. The temperature dependence increases with increasing the size L.

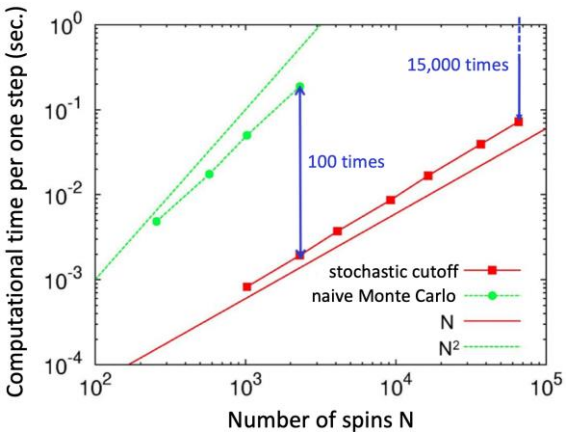

Figure 2 The size dependence of computational time of the stochastic cutoff method in a two-dimensional magnetic dipolar system.

Publications: 1) M. Sasaki and K. Hukushima, "Numerical Detection of Ergodicity Breaking in a Glass Model", J. Phys. Soc. Jpn. **85**, 074602-1-5 (2016). 2) E. Endo, Y. Toga, and M. Sasaki, "Parallelized Stochastic Cutoff Method for Long-Range Interacting Systems", J. Phys. Soc. Jpn. **84**, 074002-1-7 (2015). 3) K. Matsushita and M. Sasaki, "Design of Domain Wall Spin Torquemeter", J. Phys. Soc. Jpn. **84**, 043801-1-5 (2015).

Affiliated Academic Organizations: The Physical Society of Japan, Magnetic Society of Japan.

Current members: Associate Professors: 1; Undergraduates: 5

Space Environment Laboratory

Yuki Shimizu (Associate Professor) Office: 5-423 Ext.: 3220

Education/Y. Shimizu (e-mail: yshimizu@kanagawa-u.ac.jp)
03/2005, Ph.D., The University of Tokyo

Research Field: Astrophysics and Particle Physics Experiment, Radiation Measurement.

Research Subjects: 1. Studying annihilation and decay of dark matter. 2. Development of radiation detectors for space applications.

Introduction: I observe high-energy cosmic rays with detectors on the international space station, and search for indirect evidence of dark matter with long duration balloons.

Publications: 1) “Relativistic electron precipitation at International Space Station: Space weather monitoring by Calorimetric Electron Telescope”, Geophysical Research Letters, 43, pp. 4119-4125 (2016). 2) “CALET Upper Limits on X-ray and Gamma-ray Counterparts of GW 151226”, The Astrophysical Journal Letters, 829, Number 1, L20 (2016). 3) “A balloon experiment using CALET prototype (bCALET-2)”, Advances in Space Research, 55, Issue 2, pp. 753-760 (2015).

Affiliated Academic Organizations: The Physical Society of Japan.

Astroparticle Observation Laboratory

Tadahisa Tamura (Professor) Office: 6-302 Ext.: 3341

Education/T. Tamura (e-mail: ttamura@kanagawa-u.ac.jp)
03/1993, Ph.D., The University of Tokyo
03/1990, M.S., The University of Tokyo

Research Field: Radiation Detection, Astroparticle Physics.
Research Overview: Studying high-energy phenomena by observing cosmic rays and gamma rays.
Research Subjects: 1. Development of the CALorimetric Electron Telescope (CALET) to observe cosmic rays on the International Space Station. 2. Research and development of particle detectors with high-energy particle accelerators. 3. Study of the interaction of high-energy particles with the LHC accelerator in CERN.
Introduction: High-energy phenomena, such as supernova explosions and black holes, occur in the universe. In such environments, electrons and protons are accelerated to high energies close to the speed of light. These particles are called cosmic rays and can be observed from Earth. I am developing detectors to measure radiation and particles from balloons or the International Space Station.

In balloon experiments, payloads of about 300 kg are launched to altitudes of around 40 km, where the atmospheric pressure is reduced to a few hectopascals. Cosmic rays can be observed in such a low-pressure environment before they are attenuated by the atmosphere. To observe cosmic-ray electrons, our collaborative group carried out several balloon observations in Japan and also performed a long duration balloon observation for 2 weeks in Antarctica.

The results from these balloon experiments led to a project to observe cosmic rays from the International Space Station. I am involved in the Japan Aerospace Exploration Agency project to develop CALET. From the beginning of development, detector structure designs, development of front-end electronics and data taking system, simulations to optimize detector capabilities, and tests to evaluate the performance of instruments must be considered. New methods to derive scientific results from the data are also very important for data analyses. Our analysis techniques for radiation and particle measurements can be applied to measurements of environmental radiation and medical instruments, such as positron emission tomography.

Figure 1 A cosmic ray detector for a balloon experiment.

Figure 2 Helium gas-filled balloons float at an altitude of about 40 km.

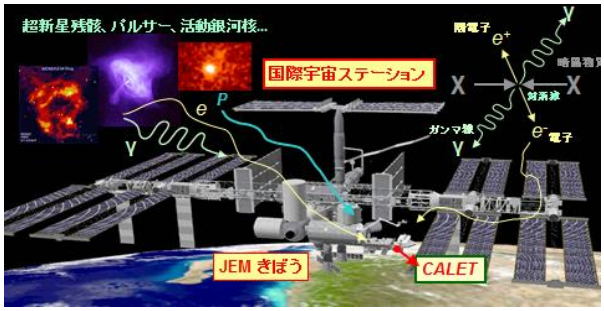

Figure 3 CALET will be launched in 2015 to observe cosmic rays at the International Space Station

Publications:
1) On-orbit operations and offline data processing of CALET onboard the ISS, *Astroparticle Physics*, Volume **100**, (2018) 29-37.
2) Energy Spectrum of Cosmic-Ray Electron and Positron from 10 GeV to 3 TeV Observed with the Calorimetric Electron Telescope on the International Space Station, *Physical Review Letters*, **119** (2017) 181101 (6pp).
3) Energy calibration of CALET onboard the International Space Station, *Astroparticle Physics,* Volume **91** (2017) 1-10.
Affiliated Academic Organizations:
The Physical Society of Japan, The Astronomical Society of Japan.

Current members: Professors: 1; Postgraduates: 1 ; Undergraduates: 8
Facilities: Wire bonder.

Plant Physiology Laboratory

Rie Nakagawa (Assistant Professor) Office: 6-303 Ext.: 3342

Education/R. Nakagawa (e-mail: riekikuc@kanagawa-u.ac.jp)
03/2006, Ph.D., University of Tsukuba

Research Field: Plant Physiology, Plant Breeding.

Research Overview: Analysis of physiological actions of the phytohormone auxin in plants.

Research Subjects: 1. Analysis of the auxin biosynthesis pathway in Arabidopsis. 2. Examining the relationship between flowering and auxin in tomatoes.

Publications: 1) R. Kikuchi et al., "The differential expression of ***HvCO9*****,** a member of the *CONSTANS*-like gene family, contributes to the control of flowering under short-day conditions in barley," *Journal of Experimental Botany*, vol. 63, pp. 773–784 (2012).
2) R. Kikuchi et al., "Molecular and functional characterization of PEBP genes in barley (*Hordeum vulgare* L.) reveal the diversification of their roles in flowering," *Plant Physiology*, vol. 149, pp. 1341–1353 (2009).
3) R. Kikuchi et al. "*PnMADS1*, encoding as StMADS11-clade protein, acts as a repressor of flowering in *Pharbitis nil*.," *Physiologia Plantarum*, vol. 133, pp. 786–793 **(**2008).
Affiliated Academic Organizations: The Japanese Society of Plant Physiologists, Japanese Society of Breeding.

Current members: Associate Professors:1

Theoretical Quantum Physics Laboratory

Akinori Nishino (Associate Professor) Office: 5-421 Ext.: 3218
Laboratory: 6-103 Ext.: 3308

Education/A. Nishino (e-mail: nishino@kanagawa-u.ac.jp)
03/2002, D. Sci., Graduate School of Science, The University of Tokyo

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Research Fields: Quantum Physics and Condensed-Matter Theory.

Research Overview: Theoretical studies of quantum systems and nanoscale devices.

Research Subjects: 1. Scattering theory in open quantum systems. 2. Quantum transport in nanoscale devices. 3. Solvable models in quantum mechanics and statistical mechanics.

Introduction: Nanoscience has attracted much interest in various fields of physics, chemistry, and engineering. In particular, quantum transport in nanoscale devices is a rapidly developing field of condensed matter physics. For devices smaller than the coherent length, quantum effects appear in the electron transport, which cannot be described by classical Ohm's law. To analyze quantum transport theoretically, we must treat nonequilibrium steady states in open quantum systems. The Landauer formula can be used to calculate electrical conductance with the transmission eigenvalues of the scattering matrix, which implies that the nonequilibrium steady states are scattering eigenstates. However, the formula has been restricted to non-interacting cases.

We study the quantum transport of interacting electrons in open quantum systems. Let us consider the nanoscale device shown in Figure 1. The blue area in Figure 1 is negatively charged, and hence electrons are localized in the small area indicated by the dashed green circle, which is called a quantum dot (QD). We must consider the Coulomb repulsion for the electrons localized in the QD. Recently, we have proposed an extension of the Landauer formula for these QD systems that includes interactions. Through constructing exact many-electron scattering eigenstates, we have obtained an analytical form of the average electric current for the interacting resonant-level model under bias voltages. Figure 2 shows the I-V curve of the average electric current. The electric current is suppressed for large bias voltages, which is the negative differential conductance originating from the Coulomb interaction.

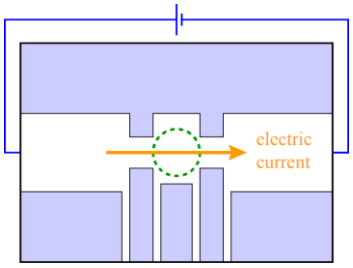

Figure 1. Open QD fabricated on the heterojunction of two semiconductors.

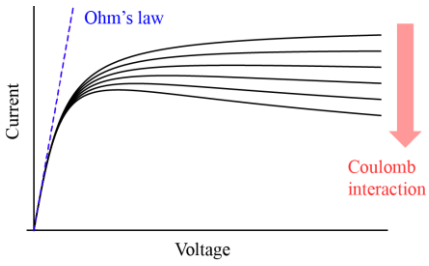

Figure 2. I-V curve of the average electric current in the interacting resonant-level model.

Publications: 1) A. Nishino, N. Hatano and G. Ordonez, "Exact scattering eigenstates in double quantum-dot systems with an interdot Coulomb interaction," *Journal of Physics: Conference Series*, vol. 670, pp. 012038-1-15 (2016). 2) A. Nishino, N. Hatano, and G. Ordonez, "Universal electric current of interacting resonant-level models with asymmetric interactions: An extension of the Landauer formula," *Physical Review B*, vol. 91, pp. 045140-1–11 (2015). 3) A. Nishino, T. Imamura, and N. Hatano, "Exact many-electron scattering states in a parallel-coupled double quantum-dot system," *Journal of Physics: Conference Series*, vol. 343, pp. 012087-1–7 (2012). 4) A. Nishino, T. Imamura, and N. Hatano, "I–V characteristics of an open quantum dot with a Coulomb interaction: Extension of the Landauer formula with exact scattering eigenstates," *Physical Review B*, vol. 83, pp. 035306-1–17 (2011).

Affiliated Academic Organizations: The Physical Society of Japan.

Current members: Associate Professors: 1; Undergraduates: 6

Coordinated Engineering Program/Undergraduate
(Department of Physics)

Astroparticle Laboratory

Kinya Hibino (Professor) Office: 6-411 Ext.: 3376

Education/K.Hibino（e-mail: hibino@n.kanagawa-u.ac.jp）
10/1993, D. Sci., Physics, Graduate School of Natural Science, Konan University

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Research Field: High-energy Astroparticle Physics.

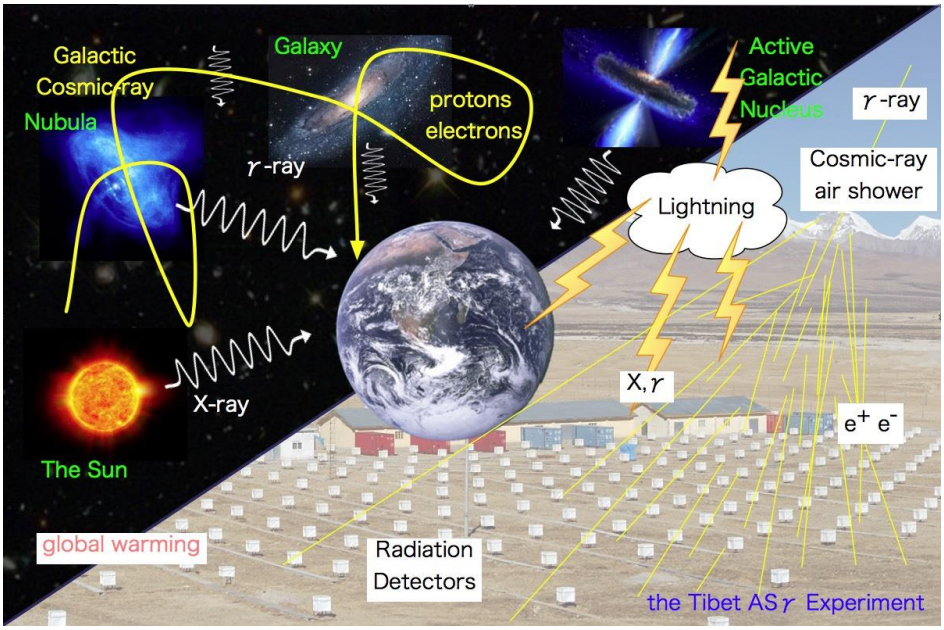
Research Overview: Studying very high-energy gamma rays and cosmic rays from the Universe and Earth.

Research Subjects: 1. Searching for ultra-high-energy gamma-ray sources, anti-matter, dark matter from the Universe, and high-energy radiation from thunderclouds. 2. Research and development of radiation detectors.

Introduction:

Astroparticle physicists strive to find the answers to some of the most exciting questions about the Universe. What is the origin of cosmic rays? Where does the acceleration of ultra-high-energy cosmic rays originate? What is the role of violent astrophysical processes? Can we detect dark matter?

The laboratory's main study is gamma-ray astrophysics, extending from mega-electronvolts (MeV) to peta-electronvolts (PeV), and covers a wide range of phenomena in particle physics and astrophysics, providing one of the most active fields of modern astroparticle physics. Moreover, the laboratory tackles challenges in technology and computing.



Publications:

1) M. Amenomori et al., "Indications of intermediate-scale anisotropy of cosmic rays with energy greater than 57 EeV in the northern sky measured with the surface detector of the telescope array experiment," *Astrophysical Journal Letters*, vol. 790, pp. L21 (2014).

2) M. Amenomori et al., "Probe of the solar magnetic field using the "cosmic-ray shadow," *Physical Review Letters*, vol. 111, pp. 011101 (2014).

3) M. Amenomori et al., "Is the large-scale sidereal anisotropy of the galactic cosmic-ray intensity really instable at TeV energies?," *Astroparticle Physics*, vol. 36, pp. 237–241 (2012).

4) M. Amenomori et al., "Observation of thundercloud-related gamma rays and neutrons in Tibet," *Physical Review D*, vol. 85, pp. 092006 (2012)

Affiliated Academic Organization:

The Physical Society of Japan, Information Processing Society of Japan, Community for Innovation of Education and Learning through Computers and Communication Networks, The Astronomical Society of Japan, Japan Geoscience Union, Society of Atmospheric Electricity of Japan.

Current members: Professors: 1; Postgraduates 4; Undergraduates: 5

Coordinated Engineering Program/Undergraduate
(Department of Physics)

Electronic Materials Physics Laboratory

Kazuyuki Matsuda (Professor) Office: 6-409 Ext.: 3374
Laboratory: 6-101-1 Ext.: 3312

Education/K. Matsuda (e-mail: matsuda@kanagawa-u.ac.jp)
03/1999, D. Sci., Himeji Institute of Technology

Research Field: Experimental Condensed Matter Physics, Magnetic Resonance Experiments, Molecular Simulations.

Research Overview: Many network solids composed of light elements, such as boron, carbon, or silicon, possess cage structures. For example, single-walled carbon nanotubes (SWCNTs) have cylindrical cages with typical diameters of 1–3 nm. Materials confined to cages are expected to exhibit novel features that do not appear in bulk materials. We explore the exotic properties of network solids and materials confined to nanoscale cages.

Research Subjects: 1. Electronic and structural properties of network solids. 2. Dynamics of molecules confined to nanoscale spaces.

Introduction: (1) Carbon nanomaterials are promising for the development of new technologies owing to their unique electronic, thermal, and elastic properties. SWCNTs can behave as metals or semiconductors depending on their helicity and diameter. By using a nuclear magnetic resonance (NMR) technique, we study the electronic states of SWCNTs and other carbon nanomaterials. (Fig. 1. ^{13}C-NMR spectra obtained for metallic and semiconducting SWCNTs. The inset shows a highly purified SWCNT paper.)

(2) SWCNTs serve as model systems for confined molecules in cylindrical cages a few molecules wide. We are exploring the properties of molecular materials confined to the nanoscale cages of network solids. (Fig. 2. Magnetization curves for oxygen adsorbed inside SWCNTs. The inset shows a schematic of the alignment of oxygen molecules encapsulated in the SWCNTs.)

(3) One of the constituent materials of cement, insulating $12CaO{\cdot}7Al_2O_3$, with a subnanoscale structure becomes metallic by the heat treatment. We study the metallization mechanism of $12CaO{\cdot}7Al_2O_3$. (Fig. 3. Structure of an empty cage of $12CaO{\cdot}7Al_2O_3$ and the temperature dependence of the ^{27}Al nuclear spin-lattice relaxation rate, T_1^{-1}.)

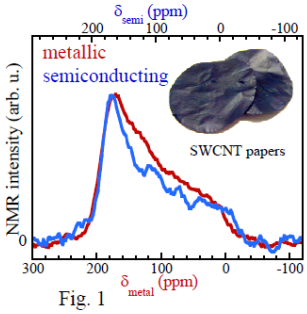


Fig. 1

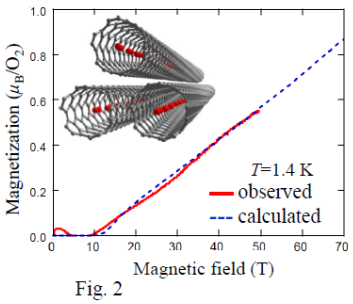


Fig. 2

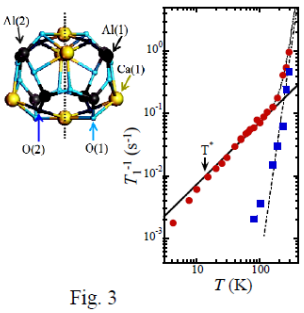


Fig. 3

Publications: 1) M Hagiwara, T Kida, K Matsuda, H Kyakuno, Y Mniwa, Z Honda, Y Sakaguchi, M Tashiro, M Sakai, T Fukuda, N Kamata, K Okunishi, "Magnetic Properties of One- and Two-Dimensional Functional Materials: Oxygen Molecules Encapsulated in Single-Walled Carbon Nanotubes and Copper Ions Embedded into Phthalocyanine Sheets", *Open Chemistry Journal*, 6, pp. 27 (2019) . 2) H. Kyakuno, H. Ogura, K. Matsuda, and Y. Maniwa, "Ice Nanoribbons Confined in Uniaxially Distorted Carbon Nanotubes", *The Journal of Physical Chemistry C*, vol. 122, pp. 18493 (2018). 3) N. Serita, Y. Nakai, K. Matsuda, K. Yanagi, Y. Miyata, T. Saito, and Y. Maniwa, "Intertube effects on one-dimensional correlated state of metallic single-wall carbon nanotubes probed by ^{13}C NMR", *Physical Review B*, vol. 95, pp. 035128 (2017). 4) K. Matsuda, K. Yanagi, S. Sagitani, H. Kataura, and Y. Maniwa, "^{13}C-NMR shift of highly concentrated metallic and semiconducting single-walled carbon nanotubes", *Journal of the Physical Society of Japan*, vol. 82, pp. 015001 (2013).

Affiliated Academic Organizations: The Physical Society of Japan.

Current members: Professors: 1; Undergraduates: 6

Coordinated Engineering Program/Undergraduate
(Department of Mathematics)

Mathematical and Computational Science Laboratory

Noriaki Yamazaki (Professor) Office: 20-321 Ext.: 4548
Laboratory: 20-322 Ext.: 4549

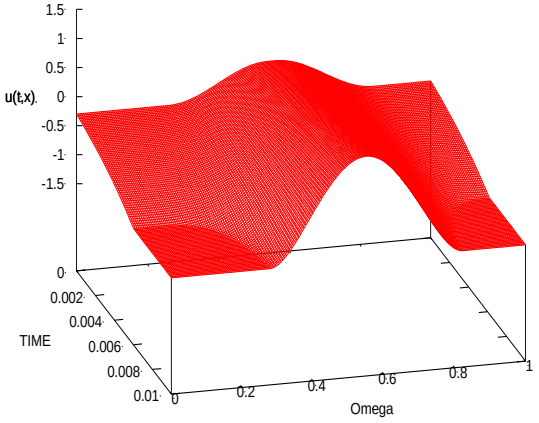
Education/N. Yamazaki (e-mail: noriaki@kanagawa-u.ac.jp)
03/1999, Ph.D., Chiba University
03/1996, M.S., Chiba University

Research Field: Mathematics, Nonlinear Analysis, Nonlinear Phenomena, Mathematical Science, Free Boundary Problem.

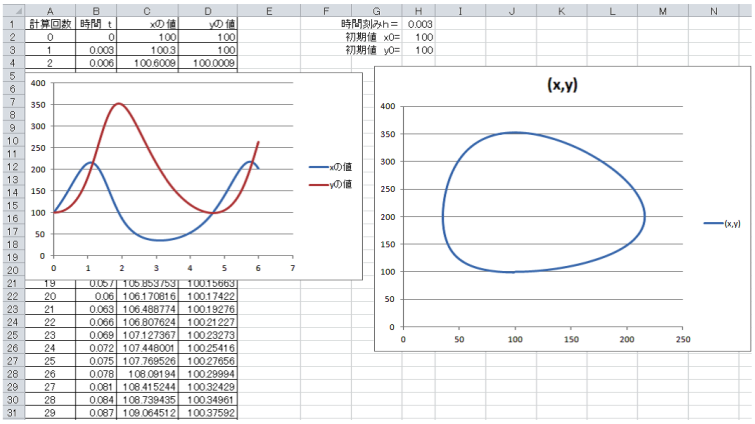
Research Overview: Investigating nonlinear convex analysis, phase change problems, and optimal control theory.

Research Subjects: 1. Nonlinear evolution equations. 2. Grain boundary motion phenomena. 3. Optimal control problem.

Introduction: We investigate mathematical solutions to unsolved problems surrounding natural and social phenomena. We analyze the phase change (solidification) problem in materials, the modeling of flows in partially saturated porous media, color denoising in image processing, and the crystal growth problem. We also study abstract nonlinear evolution equations governed by subdifferential convex functionals in real Hilbert spaces. In particular, we are establishing abstract optimal control theory of nonlinear evolution equations. Furthermore, we study numerical models of nonlinear phenomena to elucidate the dynamics of nonlinear phenomena and validate theoretical results. Finally, we are studying the control of interfaces and free boundaries in nonlinear phenomena by applying theories.



Solid-liquid phase change problem



Predator/prey interactions

Publications:

1) P. Colli, M. H. Farshbaf-Shaker, K. Shirakawa, and N. Yamazaki, Optimal control for shape memory alloys of the one-dimensional Frémond model, Numerical Functional Analysis and Optimization, 41 (2020), 1421--1471.
2) M. Kubo and N. Yamazaki, Global strong solutions to abstract quasi-variational evolution equations, J. Differential Equations, 265 (2018), 4158--4180.
3) N. Kenmochi, K. Shirakawa and N. Yamazaki, Singular optimal control problems for doubly nonlinear and quasi-variational evolution equations, Adv. Math. Sci. Appl., 26 (2017), 313--379.

Affiliated Academic Organizations: Mathematical Society of Japan

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Current members: Professors: 1; Undergraduates: 6

Department of Mathematics
(Liberal Arts, Faculty and Graduate School of Engineering)

Hidekazu Ito (Project Professor)

Office: 6-422 Ext.: 3382 (e-mail: hideito@kanagawa-u.ac.jp)
Education: 03/1982, D. Sci., Tokyo Institute of Technology

Research Field: Dynamical Systems
Research Subjects: Integrable Hamiltonian dynamical systems and their perturbation theory
Introduction: I have been working on dynamical systems, especially Hamiltonian systems. The topics of my interests include study on the structure of singularities of integrable Hamiltonian systems by using Birkhoff normal forms.

Publications: 1) H. Ito, Some remarks on integrability and normal forms for vector fields, RIMS Kôkyûroku Bessatsu B57, (2016), 249-264. 2) H. Ito, Birkhoff normalization and superintegrability of Hamiltonian systems, Ergodic Theory & Dyn. Systems 29(6), (2009), 1853-1880. 3) H. Ito, Integrability of Hamiltonian systems and Birkhoff normal forms in the simple resonance cases, Math.Ann. 292 (1992), 411-444. 4) H. Ito, Convergence of Birkhoff normal forms for integrable systems , Comment.Math. Helv. 64 (1989), 412-461. 5) H. Ito, Non-integrability of Hénon-Heiles system and a theorem of Ziglin, Kodai Math. J. 8 (1985), 120-138.
Affiliated Academic Organizations: The Mathematical Society of Japan

Shodai Kubota (Project Assistant Professor)

Office: 5-226 Ext.:3122（e-mail：skubota@kanagawa-u.ac.jp）
Education: 03/2022, D., Science, Graduate School of Science and Engineering, Chiba University

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Research Field: Nonlinear partial differential equations.
Research Subjects: Nonlinear partial differential equations and their application to optimal control problems.
Introduction: Optimal control problems for Kobayashi—Warren—Carter systems of grain boundary motion.

Publications:
1) Harbir Antil, Shodai Kubota, Ken Shirakawa, Noriaki Yamazaki, Constrained optimization problems governed by PDE models of grain boundary motions, Advances in Nonlinear Analysis 11 (2022), 1249-1286.
2) Harbir Antil, Shodai Kubota, Ken Shirakawa, Noriaki Yamazaki, Optimal control problems governed by 1-D Kobayashi–Warren–Carter type systems, Mathematical Control and Related Fields 11(2) (2021), 258-289.
3) Shodai Kubota, Subdifferential decomposition of 1D-regularized total variation with nonhomogeneous coefficients, Izvestiya Irkutskogo Gosudarstvennogo Universiteta. Seriya Matematika 36 (2021), 69-83.
4) Shodai Kubota, One-dimensional optimal control problems for time-discrete constrained quasilinear diffusion equations of Allen–Cahn types, Advances in Mathematical Sciences and Applications 30(2) (2021), 453-498.
5) Shodai Kubota, Ryota Nakayashiki, Ken Shirakawa, Optimal control problems for 1D parabolic state-systems of KWC types with dynamic boundary conditions, Advances in Mathematical Sciences and Applications 29(2) (2020), 583-637.
Affiliated Academic Organizations: The Mathematical Society of Japan.

Katsuhisa Koshino (Project Assistant Professor)

Office: 6-420 Ext.: 3380
Education/K. Koshino (e-mail: ft160229no@kanagawa-u.ac.jp)
Education: 03/2014, Ph.D., Science, University of Tsukuba

Research Field: Topology
Research Subjects: Infinite-Dimensional Topology
Introduction: I study the topological properties and structures of infinite-dimensional manifolds, function spaces, and hyperspaces by using methods and techniques from General and Geometric Topology.

Publications: 1) K. Koshino, Characterizations of manifolds modeled on absorbing sets in non-separable Hilbert spaces and the discrete cells property, Colloq. Math. 167 (2022), 127-147. 2) K. Koshino, The space consisting of uniformly continuous functions on a metric measure space with the L^p norm, Topology Appl. 282 (2020), 107303. 3) K. Koshino, Hyperspaces of finite subsets, homeomorphic to pre-Hilbert spaces, Topology Appl. 210 (2016), 133-143. 4) K. Koshino, Characterizing non-separable sigma-locally compact infinite-dimensional manifolds and its applications, J. Math. Soc. Japan 66 (2014), 1155-1189. 5) I. Banakh, T. Banakh and K. Koshino, Topological structure of non-separable sigma-locally compact convex sets, Bull. Pol. Acad. Sci. Math. 61 (2013), 149-153.
Affiliated Academic Organizations: The Mathematical Society of Japan

Toshiyuki Suzuki (Project Assistant Professor)

Office: 6-425 Ext.: 3385
Education/T. Suzuki (e-mail: ft160245cc@kanagawa-u.ac.jp)
03/2013, Ph.D. (Science), Graduate School of Mathematics, Tokyo University of Science

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Research Field: Nonlinear Partial Differential Equations
Research Subjects: Global analysis of nonlinear Schrödinger equations
Introduction: 1) Well-posedness and scattering problems for nonlinear Schrödinger equations with inverse-square potentials. 2) Energy methods for abstract nonlinear Schrödinger evolution equations.

Publications: 1) T. Suzuki, “Semilinear Schrödinger evolution equations with inverse-square and harmonic potentials via pseudo-conformal symmetry”, Commun. Pure Appl. Anal., **20** (2021), 4347-4377. 2) T. Suzuki, “Semilinear Schrödinger equations with a potential of some critical inverse-square type”, J. Differ. Equ., **268** (2020), 7629-7668. 3) T. Suzuki, “Scattering theory for semilinear Schrödinger equations with an inverse-square potential via energy methods”, Evol. Equ. Control Theory, 8 (2019), 447-471. 4) T. Suzuki, “Virial identities for nonlinear Schrödinger equations with a critical coefficient inverse-square potential”, Differ. Equ. Appl., **9** (2017), 327-352.
Affiliated Academic Organizations: The Mathematical Society of Japan

Tomoyuki Suzuki (Assistant Professor)

Office: 20-323 Ext.: 4550
Education/T. Suzuki (e-mail: t-suzuki@kanagawa-u.ac.jp)
04/2007, D. Sci., Mathematics, Tohoku University

Research Field: Nonlinear Partial Differential Equations
Research Subjects: Regularity of weak solutions to the Navier–Stokes equations
Introduction: I study the regularity and singularity of solutions to nonlinear PDEs, especially Navier–Stokes equations, by using functional analytic and harmonic analytic techniques.

Publications: 1) T. Suzuki and H. Wadade, "Optimal embeddings on critical Sobolev–Lorentz spaces into generalized Morrey spaces," *Advances in the Mathematical Sciences*, vol. 22, pp. 225–238 (2012). 2) T. Suzuki, "Regularity criteria of weak solutions in terms of the pressure in Lorentz spaces to the Navier–Stokes equations," *Journal of Mathematical Fluid Mechanics*, vol. 14, pp. 653–660 (2012). 3) T. Suzuki, "A remark on the regularity of weak solutions to the Navier–Stokes equations in terms of the pressure in Lorentz spaces," *Nonlinear Analysis*, vol. 75, pp. 3849–3853 (2012). 4) T. Suzuki, "On partial regularity of suitable weak solutions to the Navier–Stokes equations in unbounded domains," *Manuscripta Mathematica*, vol. 125, pp. 471–493 (2008).
Affiliated Academic Organizations: The Mathematical Society of Japan

Kenji Nakamura (Assistant Professor)

Office: 20-310-C Ext.: 4570
Education/K. Nakamura (e-mail: knakamura@kanagawa-u.ac.jp)
03/2019, Ph.D., Science, University of Tsukuba

Research Field: Partial differential equations.
Research Subjects: Mathematical analysis of the Navier-Stokes equations.
Introduction: I study the mathematical properties of the Navier-Stokes equations, especially hyperbolic Navier-Stokes equations, by using the real analysis method.

Publications: 1) T. Kobayashi, M. Misawa, K. Nakamura, Time-space L^2-boundedness for the 2D Navier-Stokes equations and hyperbolic Navier-Stokes equations, Tsukuba J. Math., 43 (2019), 223–239. 2) T. Kubo, T. Kobayashi, K. Nakamura, On a local energy decay estimate of solutions to the hyperbolic type Stokes equations, J. Differ. Equ., 264 (2018), 6061–6081.
Affiliated Academic Organizations: The Mathematical Society of Japan.

Yasushi Hirata (Project Associate Professor)

Office: 6-419 Ext.: 3379
Education/Y. Hirata (e-mail: hirata-y@kanagawa-u.ac.jp)
03/2004, Ph.D., Science, University of Tsukuba

Research Field: Set-theoretic Topology
Research Subjects: Topological properties of linearly ordered spaces, monotonically normal spaces, and their products.
Introduction: I study relations between topological properties of products of monotonically normal spaces with special factors and neighborhood properties, as well as similarities and differences between linearly orderable topological space and ordinals.

Publications: 1) Y. Hirata and Y. Yajima, “Separation of diagonal in monotonically normal spaces and their products,” *Topology and its Applications*, vol. 196, 1033–1059 (2015). 2) Y. Hirata, N. Kemoto, and Y. Yajima, “Products of monotonically normal spaces with various special factors,” *Topology and its Applications*, vol. 164, 45–86 (2014). 3) Y. Hirata, “The collection-wise Hausdorff property of products of two or three subspaces of ordinals," *Houston Journal of Mathematics*, vol. 35, pp. 891–901 (2009).
Affiliated Academic Organizations: The Mathematical Society of Japan

Kotaro Mine (Project Assistant Professor)

Office: 6-421 Ext.: 3381
Education/K. Mine (e-mail: mine@kanagawa-u.ac.jp)
03/2008, D. Phil., Mathematics, University of Tsukuba

Research Field: Geometric Topology
Research Subjects: 1. Coarse geometry, compactifications, and topological manifolds modeled on infinite-dimensional spaces.
Introduction:
I study geometric properties on metric spaces from the viewpoint of general topology.
Publications:

1) K. Mine and A. Yamashita, “Metric compactifications and coarse structures”, *The Canadian Journal of Mathematics*, vol. 67, pp. 1091–1108 (2015).
2) K. Mine, “Approximation theorems for compactifications”, *Colloquium Mathematicum*, vol. 122, pp. 93–101 (2011).
3) T. Banakh, K. Mine, K. Sakai and T. Yagasaki, “Homeomorphism and diffeomorphism groups of non-compact manifolds with the Whitney topology”, *Topology Proceedings*, vol. 37, pp. 61–93 (2011).
4) K. Mine, “Universal spaces of non-separable absolute Borel classes”, *Tsukuba Journal of Mathematics*, vol. 30, pp. 137–148 (2006).
Affiliated Academic Organizations: The Mathematical Society of Japan

Department of Physics
(Liberal Arts, Faculty and Graduate School of Engineering)

Daisuke Ikeda (Assistant Professor)

Office: 6-301 Ext.: 3340
Education/D. Ikeda (e-mail: dikeda@kanagawa-u.ac.jp)
03/2010, Ph. D., The University of Tokyo

Research Field: Cosmic Ray Physics, Geophysics using Cosmic Rays
Research Subjects: 1. Origin of ultra-high energy cosmic rays. 2. Probing fault by cosmic rays
Introduction: 1. Search for the origin of ultra-high energy cosmic rays by measurements of energy spectrum, chemical composition and arrival direction of those at huge scale observatory. 2. Improvement of the estimation for the earthquake / tsunami damages by constructing a realistic model of the fault with muography, which see through faults by cosmic ray muons.

Publications: 1) K. D. Vries et al., “Coherent radio emission from the electron beam sudden appearance”, Phys. Rev. D 98, 123020 (2018)
2) R. U. Abbasi et al., “Depth of Ultra High Energy Cosmic Ray Induced Air Shower Maxima Measured by the Telescope Array Black Rock and Long Ridge FADC Fluorescence Detectors and Surface Array in Hybrid mode”, ApJ 858, 76 (2018)
3) T. Abu-Zayyad et al., “Energy spectrum of ultra-high energy cosmic rays observed with the Telescope Array using a hybrid technique”, Astropart. Phys. 61, 93-101 (2015)
Affiliated Academic Organizations: The Physical Society of Japan, Seismological Society of Japan

Hiroshi Shibuya (Project Professor)

Office: 5-227 Ext.: 3125 (e-mail: ft160291fh@kanagawa-u.ac.jp)
Education
07/1982, Ph.D., Nagoya University
03/1979, M.S., Nagoya University

Research Field: High-energy physics.
Research Subjects: 1. Neutrino oscillations. 2. Neutrino-nucleus interactions. 3. Emulsion spectrometers.
Introduction:
(1) Neutrino oscillations and neutrino-nucleus interactions are investigated by using nuclear emulsion detectors.
(2) Particle detectors, such as emulsion spectrometers, are also studied.

Publications:
1) N. Agafonova et al. (OPERA Collaboration), “OPERA tau neutrino charged current interactions”, Scientific Data 8, 218 (2021).
2) H. Oshima et al. (NINJA Collaboration), “First measurement using a nuclear emulsion detector of the □□ charged-current cross section on iron around the 1 GeV energy region”, Progress of Theoretical and Experimental Physics 2021, 033C01 (2021).
3) N. Agafonova et al. (OPERA Collaboration), “Final results of the OPERA experiment on □□ appearance in the CNGS neutrino beam”, Physical Review Letters 120, 211801 (2018).
Affiliated Academic Organizations: The Physical Society of Japan, The Society of Photography and Imaging of Japan.

Shunya Takekawa (Assistant Professor)

Office: 6-301 Ext.: 3340
Education/S. Takekawa (e-mail: shunya.takekawa@jindai.jp)
03/2018, Ph.D., Keio University

Research Field: Astronomy

Research Subjects: 1. The Galactic center. 2. Search for intermediate-mass black holes.

Introduction: I study the kinematics and physical conditions of molecular gas in the Galactic center by using radio telescopes. Currently I am especially focusing on searching for inactive black holes lurking in the Galaxy.

Publications: 1) S. Takekawa, T. Oka, Y. Iwata, S. Tsujimoto, and M. Nomura, "The Fifth Candidate for an Intermediate-mass Black Hole in the Galactic Center", The Astrophysical Journal, 890, 167-172 (2020)
2) S. Takekawa, T. Oka, S. Tokuyama, K. Tanabe, Y. Iwata, S. Tsujimoto, M. Nomura, and Y. Shibuya, "An energetic high-velocity compact cloud CO–0.31+0.11", Publications of the Astronomical Society of Japan, 71, S21 (2019)
3) S. Takekawa, T. Oka, Y. Iwata, S. Tsujimoto, and M. Nomura, "Indication of Another Intermediate-mass Black Hole in the Galactic Center", The Astrophysical Journal Letters, 871, L1-6 (2019)

Affiliated Academic Organizations: The Astronomical Society of Japan

Daisuke Yamauchi (Assistant Professor)

Office: 6-301 Ext.: 3340
Education/D. Yamauchi（e-mail: yamauchi@jindai.jp）
03/2011, Ph. D, Kyoto University

Research Field: Cosmology

Research Subjects: 1. Modified gravity theories. 2. Early universe. 3. Cosmology with radio telescopes.

Introduction:

Theoretical studies and observational tests of fundamental questions in cosmology such as the physics in the very early Universe and the origin of the cosmic acceleration.

Publications:

1) T. Kobayashi, Y. Watanabe and D. Yamauchi, "Breaking of Vainshtein screening in scalar-tensor theories beyond Horndeski", *Physical Review D*, vol. 91, pp. 064013 (2015).
2) D. Yamauchi, K. Takahashi and M. Oguri, "Constraining primordial non-Gaussianity via multitracer technique with surveys by Euclid and Square Kilometre Array", *Physical Review D*, vol. 90, pp. 083520 (2014).
3) D. Yamauchi, A. Linde, A. Naruko, T. Tanaka and M. Sasaki, "Open inflation in the landscape", *Physical Review D*, vol. 84, pp. 043513 (2011)

Affiliated Academic Organization: The Physics Society of Japan, The Astronomical Society of Japan

Department of Chemistry
(Liberal Arts, Faculty and Graduate School of Engineering)

Department of Biology
(Liberal Arts, Faculty and Graduate School of Engineering)

Akira Takahashi (Assistant Professor)

Office: 23-710 Ext.: 3838
Education/A. Takahashi (e-mail: ft102022is@kanagawa-u.ac.jp)
09/2017, Ph.D., Department of Organic and Polymeric Materials,
Graduate School of Engineering, Tokyo Institute of Technology

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Research Field: Organic Chemistry, Polymer Functionalization

Research Subjects: Development of new polymer functions based on stimuli-responsive components.

Introduction: Polymer properties arise from the constituent molecules and their hierarchical assembly; therefore, the post-polymerization control of the molecular structures and concomitant orientation enables on-demand control of the macroscopic properties of polymers.

Publications:

1) A. Tsuruoka, A. Takahashi, D. Aoki, H. Otsuka, “Fusion of different cross-linked polymers based on dynamic disulfide exchange”, *Angew. Chem. Int. Ed.*, in press (2020). 2) A. Takahashi, R. Yuzaki, Y. Ishida, A. Kameyama, “Controlled ring-expansion polymerization of thiiranes based on cyclic aromatic thiourethane initiator” *J. Polym. Sci., Part A: Polym. Chem.*, **57**, 2442–2449 (2019). 3) A. Takahashi, T. Watanabe, A. Kameyama, “Refractive index modulation by photo-Fries rearrangement of main chain-type aromatic polyurethanes”, *J. Photopolym. Sci. Technol.*, **32**, 243–247 (2019). 4) N. Suzuki, A. Takahashi, T. Ohishi, R. Goseki, H. Otsuka, “Enhancement of the stimuli-responsiveness and photo-stability of dynamic diselenide bonds and diselenide-containing polymers by neighboring aromatic groups”, *Polymer*, **154**, 281–290 (2018). 5) A. Takahashi, R. Goseki, K. Ito, H. Otsuka, “Thermally healable and reprocessable bis(hindered amino)disulfide-cross-linked polymethacrylate networks”, *ACS Macro Lett.*, **6**, 1280–1284 (2017). 6) A. Takahashi, R. Goseki, H. Otsuka, “Thermally adjustable dynamic disulfide linkages mediated by highly air-stable 2,2,6,6-tetramethylpiperidine-1-sulfanyl (TEMPS) radicals”, *Angew. Chem. Int. Ed.*, **56**, 2016–2021 (2017). 7) Y. Nakai, A. Takahashi, R. Goseki, H. Otsuka, “Facile modification and fixation of diaryl disulphide-containing dynamic covalent polyesters by iodine-catalysed insertion-like addition reactions of styrene derivatives to disulphide units”, *Polym. Chem.*, **7**, 4661–4666 (2016). 8) A. Takahashi, T. Ohishi, R. Goseki, H. Otsuka, “Degradable epoxy resins prepared from diepoxide monomer with dynamic covalent disulfide linkage”, *Polymer*, **82**, 319–326 (2016). 9) T. Matsuda, Y. Suda, A. Takahashi, “Double 1,4-rhodium migration cascade in rhodium-catalysed arylative ring-opening/spirocyclisation of (3-arylcyclobutylidene) acetates”, *Chem. Commun.*, **48**, 2988–2990 (2012).

Affiliated Academic Organizations:

The Society of Polymer Science, Japan, The Chemical Society of Japan.

Course of Architecture and Building Engineering

/Graduate School [Graduate (M.C. and D.C.)]

Department of Architecture and Building Engineering/Undergraduate

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Built Environment Engineering Laboratory

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Ayano Dempoya (Assistant Professor) Laboratory: 12-23 Ext.: 3477

Education/S. Iwamoto (e-mail: iwamotos@kanagawa-u.ac.jp)
03/1989, D.Eng., Meiji University
Education/A. Dempoya (e-mail: dempoya@kanagawa-u.ac.jp)
03/2016, D.Clothing Environment, Bunka Gakuen University


S. Iwamoto


A. Dempoya

Research Field: Built Environment Engineering, Indoor Thermal Comfort, Thermal Analysis, Building Services.
Research Overview: Analysis of indoor and outdoor air distribution. Computational fluid dynamics (CFD) and energy simulations.

Research Subjects: 1. Indoor thermal comfort with floor panel heating. 2. CFD simulations of cross ventilation. 3. Energy simulations of offices and residential buildings. 4. Energy conservation performance for building services.

Introduction:

1. Indoor and outdoor thermal and air environment

We are researching ways of achieving thermally comfortable environments with clean air. We are using three main methods: numerical calculations, field experiments, and human subject experiments. The experiments in our climate chamber and with thermal manikins or subjects can be conducted with a wide variety of air conditioning and heating systems. The air distribution in the climate chamber is measured with a number of sensors, such as thermocouples and ultrasonic anemometers, to understand the differences in air conditioning and heating systems and evaluate thermal comfort. We can also perform CFD simulations (STREAM or SCRYU/Tetra software) with human thermal models to obtain air distribution, thermal comfort indices, such as predicted mean vote and SET*, human skin temperature, and thermal sensation from the human thermal model to estimate the thermal environment.

2. Energy conservation and environmental impact reduction in building services

Commercial buildings, such as offices and hotels, consume a large amount of energy for air conditioning, lighting, and hot water supply. To reduce the environmental impact, we conduct various energy simulations by TRNSYS, BEST, or HASP software, and daylight simulations by Radiance software for light shelves, light ducts, natural ventilation, geothermal technology, photovoltaics, solar energy, green roofs and walls, and double roofs. We evaluate the effects of these methods, seasonal schedules, and working style on energy conservation and environmental impact reduction.

Publications:

1) Y. Misawa, S. Hikone, M. Nakamura, S. Iwamoto, and M. Iwata, “Diagonally arranged louvers in integrated facade systems - effects on the interior lighting environment,” *Journal of Facade Design and Engineering*, vol. 2(3–4), pp. 163–182 (2015).
2) T. Kawaguchi, M. Otsuka, T. Inoue, S. Iwamoto, T. Kurabuchi, M. Mae, Y. Kuwasawa, and S. Yabe, “A study on hot water-saving effects of hot/cold water-saving kitchen faucets having various types of spout designs and water-ejection modes,” *Proceedings of CIB-W062 Symposium*, 2015.
3) T. Sato, K. Kubo, S. Hikone, Y. Misawa, W. Cho, S. Iwamoto, and M. Iwata, “Study on indoor thermal environment in integrated facade system,” *Journal of Environmental Engineering (Transaction of AIJ)*, vol. 676, pp. 467–474 (2012).
4) S. Hikone, Y. Misawa, M. Nakamura, S. Iwamoto, and M. Iwata, “Lighting environment of diagonally arranged louver on integrated facade system,” *Journal of Environmental Engineering (Transaction of AIJ)*, vol. 644, pp.1187–1193 (2009).
5) T. Kondo, S. Iwamoto, N. Ichikawa, and M. Kamata, “Effect of thermostatic mixing faucet and shower head with stop valve, Study on performance test of water saving fixture,” *Journal of Environmental Engineering (Transaction of AIJ)*, vol. 607, pp. 87–92 (2006).

Affiliated Academic Organizations:

Architectural Institute of Japan, the Society of Heating, Air-Conditioning and Sanitary Engineers of Japan. Japanese Society of Human Environment System, Japan Society of Physiological Anthropology.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 1;Undergraduates: 11
Facilities: Thermal manikin, climate chamber, examination room for domestic hot water systems.

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Town Planning laboratory


M. Ueno

Masaya Ueno (Associate Professor) Office: 9-63 Ext.: 4065

Education/M. Ueno (e-mail: ueno@kanagawa-u.ac.jp)
03/2015, Ph.D., Yokohama city University
03/2006, M.S., Kanto Gakuin University

Research Field: Town planning, creative cities, urban planning.

Research Overview: "*Machizukuri*" community engagement based on creativity, utilization of public space, and area management.

Research Subjects: Urban policy and urban development utilizing creativity, creative industries, and sustainability of suburban residential areas.

Introduction:

Various approaches to increasingly complex urban and regional challenges need to be considered and solutions explored. We should consider not only buildings but also activities and management. In considering the architecture required for the region and the vision of the city of the future, we emphasize the processes of examination and space creation.

We are committed to practical community development. We have been involved in the promotion of community development in the Tōkaichiba Station area of Yokohama City in collaboration with the Urban Planning Laboratory since fiscal year 2022. This initiative has been implementing efforts to utilize local resources based on an agreement with the City of Yokohama. Furthermore, we are providing support for area management activities in the Tōkaichiba area.

In addition, Keikyu Corporation, the City of Kawasaki, and Kanagawa University have formed an industry-academia-government collaboration to promote urban development. As one of the activities in this area, we are studying the use of the vacant space in front of Hatchō-nawate Station. In considering how to use the land, we research for local needs through social experiments. We will consider how to manage and operate the vacant space, the design of the vacant space will be studied and constructed, and further demonstrations will be performed.


Workshop in Tōkaichiba


Interim design for Hatchō-nawate

Publications:

1) M. Ueno, K. Yamaga, "Action Research on Examining Process for Utilization of Private Open Space-The Case of Pilot Program in Hatcho-Nawate of Kawasaki City", AIJ Journal of Technology and Design, Vol. 26, No. 64, 1173-1178, 2020.
2) M. Ueno, K. Yamaga, "A Research on Community Involvement Complementing Residents' Association-A Case of Voluntary Community Activities in Yokohama Residential Suburb", Asia-Pacific Planning Society 2019 (Seoul), 2019.
3) M. Ueno, N. Suzuki, "A Study on Creative Industry Accumulation and Creative City in Yokohama", Journal of City Planning Institute, Vol. 49, No. 1, 11-18, 2014.

Affiliated Academic Organizations:

Architectural Institute of Japan, City Planning Institute of Japan, Japan Association for Cultural Policy Research.

Current members: Associate Professors: 1; Undergraduates: 6

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Architectural History Laboratory

Seizo Uchida (Professor) Office: 8-510 Ext: 3433

Myungchae Kang (Assistant Professor)Laboratory: 8-510 Ext: 3433
Education/S. Uchida (e-mail: suchida@kanagawa-u.ac.jp)
03/1983, D.Eng., Tokyo Institute of Technology
Education/ M. Kang (e-mail: m-kang@kanagawa-u.ac.jp)
03/2019, D.Eng., Kanagawa University

S. Uchida

M. Kang

Research Fields: History of Japanese Architecture, Modern Japanese Architecture, Japanese Housing, History of Traditional Chinese Housing, Japanese Shrines Built Outside Japan.

Research Subjects: 1. Historical buildings, houses, and architects. 2. Preservation and restoration planning of buildings. 3. Historical residential areas. 4. History of technological innovation. 5. Folk houses and communities in historical documents. 6. Historical sites of Japanese shrines built abroad.

Introduction:

Our researches and the activities of the laboratory aim to clarify the history of modern architecture, such as houses, apartments, schools, and offices. Our research's interests also include the activities of the architects with distinctive architectural practices and planning of residential and retreat areas. My work on Yokohama focuses on former foreign settlement districts, tracing the history of the city through its changing infrastructure, buildings and cityscapes. The study on the history of modern Japanese architecture extends to American and European, or East Asian architecture, in particular, its strong influence and connections to Japanese one. Furthermore, the interest of our research is also about the East Asian architecture, especially for the History of Modern Korean architecture.

Former Honda Villa (in Okazaki city), One of the Relocated and Preserved Architecture which I Participate in.

Publications:

S. Uchida:

1) (Joint), "The study about the architecture activity of Kenzo Takekosi – Focused on the campus plan of the University of the Sacred Heart, Tokyo, the masterpiece in postwar", Religion and Culture』 vol.38, the University of the Sacred Heart, Tokyo, pp.7-53(2021.3)
2) "The study about the gaze of Minka (Private House) and Mingei (National Art) Movement in modern japan", Rekishi to Minzoku (History and Folk Customs) vol. 37, Institute for the Study of Japanese Folk Culture, Kanagawa University, pp.463-505(2021.3)
3) "Washitugaku : the unique space in worldwide ", edited by Shuichi Matumura and Mineki Hattori, Published by Heibonsha, pp. 187-222 (2020.10).
4) "Bunri-ha Kenchikukai (the Secession school of architects) : the birth of the Modern Japanese Architecture", edited by Takahiro Taji, Published by Kyoto University Press, pp. 242-263 (2020.10).
5) "The vitality of housing : one hundred years of the house of Shimizu family", edited by Housing Research Foundation JUSOKEN, Published by Kashiwa shobou (2020.5).

M. Kang:

1) "The Construction Process of Great Kanto Earthquake Memorial Museum: – The Nihon-Shumi (Japan-Taste) required to the building in Yokoamicho Park –", Transactions of AIJ. Journal of architecture planning and environmental engineering vol. 84(757), Architectural Institute of Japan, pp.661-669 (2019.3).
2) "The Construction Process of the Memorial Hall (completed in 1930) for Great Kanto Earthquake" Transactions of AIJ. Journal of architecture planning and environmental engineering vol. 82(734), Architectural Institute of Japan, pp. 1029-1038 (2017.4).
3) "The Trend of Architectural Designs in Taisho Period through the Design Competition of the Memorial Hall for Great Kanto Earthquake" The study of nonwritten cultural materials vol.14, Research Center for Nonwritten Materials, Institute for the Study of Japanese Folk Culture, Kanagawa University, pp. 275–319(2017.3).

Affiliated Academic Organizations: Architectural Institute of Japan, Japan Society of Lifology, Japan Society of Home Economics, et al.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 5; Undergraduates: 8;
Alumni: Undergraduates: 177; Postgraduates (M.C.): 18; Postgraduates (D.C.): 2

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

New Functional Structural Systems Laboratory

Kazushi Shimazaki (Professor) Office: 12-35 Ext.: 3482

Yuki Shirai (Assistant Professor) Laboratory: 12-15 Ext.: 3460

Education/K. Shimazaki (e-mail:shimazaki@kanagawa-u.ac.jp)
03/1995, Ph.D., Tokyo Institute of Technology

Education/Y. Shirai（e-mail: ft101966ya@kanagawa-u.ac.jp）
03/2016, Ph.D., Tokyo Institute of Technology


K. Shimazaki


Y. Shirai

Research Field: Building Engineering, Structural Systems.

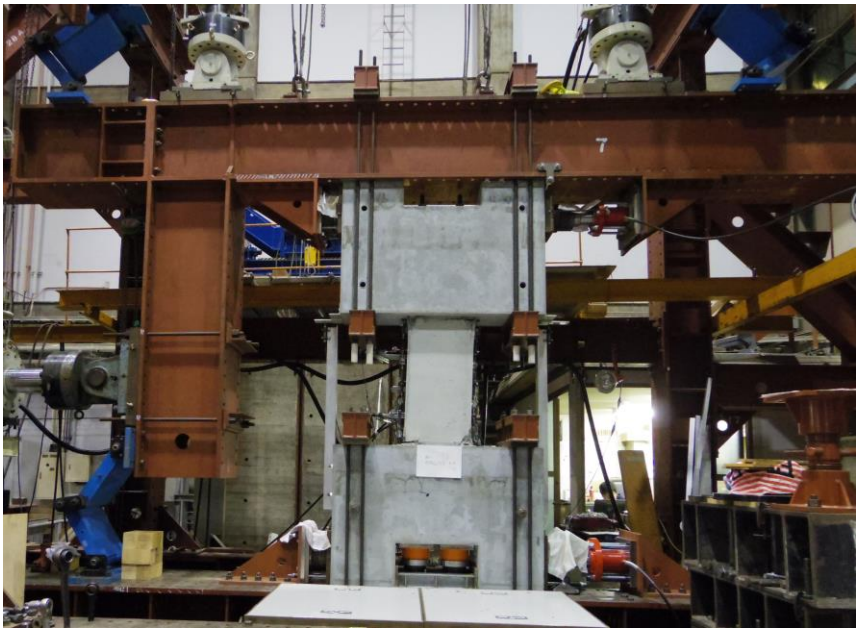
Research Overview: Investigating reinforced concrete structures, seismic design methods, and new functional structural systems.

Research Subjects: 1. Safety performance of reinforced concrete structures. 2. Damage control functional structural systems. 3. Earthquake damage risk of existing reinforced concrete structures.

Introduction:

The goal of earthquake-resistant design in any country is to protect life in severe earthquakes by creating buildings with the strength and durability required to resist collapse. However, after a severe earthquake, such as the Great Hanshin Earthquake, the demands of building owners change; they want to be able to use the buildings again at a low repair cost.

We are researching the resistance mechanism and displacement response of reinforced concrete buildings under severe earthquake motion, and damage levels in small to medium earthquakes. We are also investigating the effect of long-term deformation caused by shrinkage and temperature change on the earthquake-resistance performance of seismic isolation buildings. Moreover, we are researching new functional structural systems such as energy dissipative damage-controlled reinforced concrete structures and hybrid structures.



Experiments of Unbound Prestressed Concrete members

Publications:

1) K. Shimazaki, “Actual member tests of the existing RC building -Verifications on seismic strengthening of the existing RC building Part 2,” *Journal of Structural and Construction Engineering, Transactions of AIJ*, vol. 719, pp. 91–99 (2016) (in Japanese).

2) K. Shimazaki, “Verifications on seismic strengthening of the existing RC building,” *The 5th Asia Conference on Earthquake Engineering*, Paper ID 23-013, Taiwan (2014).

3) Kiyoka Kinoshita, Kazushi Shimazaki, et al. : Study on shear of post-tensioned connection between concrete and cast iron plate having shear-key, 8th ISEC, Paper ID St-141, Sydney, Australia, November (2015)

Affiliated Academic Organizations:

K. Shimazaki : AIJ, JCI, ACI, JAEE, JSSI.
Y. Shirai : AIJ, JCI

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 2; Undergraduates: 12
Facilities: 1 MN dynamic loading system, 750 kN loading system, 10 kN one-direction vibration table.

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Disaster Risk Management Laboratory


Y. Shumuta T. Ochiai

Yoshiharu Shumuta (Professor) Office: 8-55 Ext.: 3431

Tsutomu Ochiai (Research Associate) Laboratory: 12-12 Ext.: 3462
Y.Shumuta (shumuta@kanagawa-u.ac.jp)
D. Eng., Tokyo Metropolitan University
T. Ochiai (ochiai @kanagawa-u.ac.jp)
D. Eng., Kanagawa University

Research Field: Mitigating regional earthquake hazard risk.

Research Overview: Earthquake engineering, structural engineering, urban disaster prevention and mitigation engineering, and soil mechanics and geotechnical engineering (Y. Shumuta and T. Ochiai).

Research Subjects: 1. Evaluating seismic ground motion, ground tremors, and building-response characteristics; 2. evaluating disaster risk level; 3. applying sensing technology; 4. seismic microzoning; 4. mitigating natural disaster risk.

Introduction: The objective of our research is to propose effective natural disaster mitigation countermeasures based on field surveys of actual earthquakes and meteorological disasters, computer simulations, and sensing technologies related to ground motion, physical structure, functional damage, and the regional disaster environment.

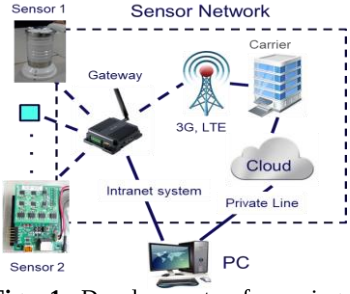


Fig. 1 Development of sensing technology.

Fig. 2 Raised manholes caused by soil liquefaction (Urayasu City).

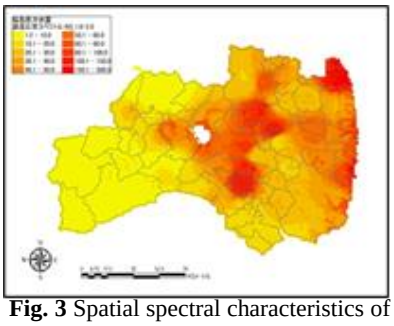


Fig. 3 Spatial spectral characteristics of seismic ground motion.

We conduct research related to the mechanisms of ground failure and building damage caused by earthquakes, and we investigate damage prediction systems and disaster mitigation countermeasures for urban areas against meteorological disasters, based on earthquake and structural engineering, geotechnical engineering, and urban disaster prevention engineering. Japan has experienced various natural disasters and the social environment, and the disaster environment are constantly changing as times change. For example, the 2011 Great East Japan Earthquake off the Pacific coast of Tohoku was an unprecedented large-scale earthquake. The likelihood of a Nankai Trough earthquake or an earthquake directly under the Tokyo Metropolitan Area occurring is also gradually increasing. In addition, rising seawater temperature around Japan due to climate change in recent years frequently causes weather-related disasters, such as large-scale typhoons in urban areas. For example, typhoons no. 15 and 19 in 2019 caused heavy damage in the Chiba area, which had previously experienced little typhoon damage. In addition, bomb cyclones, heavy rain, and floods, and other disasters that threaten people's lives are gradually increasing all over Japan. In response to these natural disasters, our research approach is to combine hard and soft countermeasures to manage natural disaster risk using the latest sensing technologies, including microtremor observation and computer simulations. We value discussions with regional communities about how to protect building structures, how to improve disaster-resilient potential in residential areas, and how to minimize loss of human life, in order to implement our research results in society.

Publications:

1) Y. Shumuta, J. Nagai, T. Ochiai, and T. Enomoto: Distribution characteristics of ground motion spectrum in Fukushima area, *Proceedings of the Twelfth Symposium on Disaster Mitigation and Resilience of Infrastructures and Lifeline Systems*, Japan Society of Civil Engineering, p. 140-145, 2022 (in Japanese). 2) N. Fuse, Y. Shumuta, A. Naganuma, J. Tani: Corrosion rate estimation based on sensor monitoring: Field test validation in transmission towers, *Corrosion*, Vol. 75, Issue7,839-847, 2019. 3) Y. Shumuta: Practical seismic upgrade strategy for substation equipment based on performance indices, *Earthquake Engineering & Structural Dynamics*, Special Issue: Earthquake Engineering for Electric Power Equipment and Lifeline Systems, 36(2): 209-226, 2007. 4) T. Ochiai et al.: Creation of a hazard map considering regional characteristics by microtremor, *Journal of Japan Association for Earthquake Engineering*, 20(8):20-31, 2020.

Affiliated Academic Organizations:
Architectural Institute of Japan, Japan Society of Civil Engineers, Institute of Electrical Engineers of Japan, Japan Society for Earthquake Engineering, The Japanese Geotechnical Society, Institute of Social Safety Science, The Society of Exploration Geophysicists of Japan, Japan Association for Wind Engineering.

Current members: 1 professor, 1 research associate, 12 undergraduates.

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

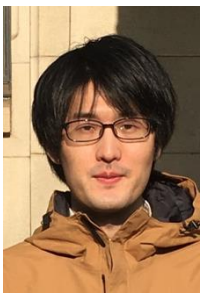
Habitation Design History Laboratory

Fumiyo Suzaki (Associate Professor) Office: 9-64 Ext: 4068

Takahiko Kanemaki (Assistant Professor)
Laboratory: 9-64 Ext: 4067

Education/F. Suzaki (e-mail:fsuzaki@kanagawa-u.ac.jp)
03/2014 D. Eng., Kanagawa University
Education/T. Kanemaki (e-mail:kanemaki@kanagawa-u.ac.jp)
03/2021 D. Eng. The University of Tokyo

F. Suzaki



T. Kanemaki

Research Fields: History of Architecture, History of Housing, History of Life
Research Overview: Architectural history on housing and habitation design.
ResearchSubjects:Architectural history of habitation design focused on 1. Body, 2. Technics, 3. Art and 4. Commonality.
Introduction: We research the history of architecture and habitation designs by which human life is constructed, especially in terms of history of housing, history of architecture and history of life. We also focus on the global environment and the reconstruction of relationship between human life and natural environment, not only in research but also in practical activities. Research subjects of our laboratory are as follows: history of the modern hygiene theory, historical transformation of plumbing fixtures (kitchen, bathroom and toilet), community and mutual aid, Japanese immigrant housing in Brazil, preservation and restoration of historical buildings such as the former Watanabe Jinkichi house, rethinking of the history and theory of modern architecture in terms of environment or ecology.

(1) Historical study on modern hygiene and plumbing fixtures: modern hygiene theory and its practical aspects, and history of the domestic space relating to plumbing fixtures (ex. kitchen, bathroom and toilet).
(2) Historical study on the settlement houses both in Japan and abroad: the history of settlements houses, which were used for practical activities based on mutual aid and communal living in Britain and the United States since the late 19th century.

Fig. 1 Frankfurt Kitchen (Frankfurt am Main, Ernst May House): rationalization of the kitchen space in modern housing

(3) <The Small Earth Project – Satoyama School of Design>: the field survey and proposal of innovative design on the network of things (human – building – natural environment).
(4) Historical study on the concept of "environment" in the modern architectural discourse and representation: historical process of the formation of the idea of controlling the "environment" surrounding humans, especially in the architectural debates in the early 20th century.

Fig. 2 Renovated old residence named "Yuugitsuka"(the Small Earth Project, Kamanuma, Kamogawa-shi, Chiba） and its compositing toilet: survey and design of environment- and ecology-conscious toilet

Publication:

1) Fumiyo Suzaki：The Boundaries and Relations of Habitation - Domestic Distance Ⅱ, Gendai Shiso, Vol. 50, No.2, pp. 123-134, 2022.2
2) Fumiyo Suzaki：A Study on the "Dissolution" of Life – Tracing of the Science on the Life and Habitat, Rekishi to Minzoku (History and Folk Customs), Vol.37, pp. 301-325, 2021.3
4) Takahiko Kanemaki：Corwin Willson's Proposal for "Mobile House" and Its Ideological Background, AIJ Journal of Architecture Planning, Vol. 85, No. 774, pp. 1801-1808, 2020.8
5) Takahiko Kanemaki：A Study on the Background and Positioning of Adolf Loos' Article "The Theatre", AIJ Journal of Architecture Planning, Vol. 85, No. 769, pp. 743-751, 2020.3

Affiliated Academic Organizations: Architectural Institute of Japan, Japan Society of Lifology, Society of Architectural Historians of Japan, The Japan Society for the History of Interiors, Furniture and Tools, The Japan Society of Home Economics et al.

Current members: Associate Professors: 1; Assistant Professors: 1; Undergraduates: 3

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Architectural Design Laboratory

Nobuhiro Suzuki (Professor) Office: 9-63 Ext.: 4066

N. Suzuki

Education/N.Suzuki (e-mail:ft102141mt@kanagawa-u.ac.jp)
03/1988, M.Eng./M.Arch., Kanagawa-University

Research Field: Nobuhiro Suzuki , Residence Design, House Planning ,Interior Design ,

Research Overview: Exploring the new possibilities and attractiveness of housing design.

Research Subjects: Housing design and town development to live in a relationship with the community.

Introduction: A house is a vessel that supports people's lives. The basis of the affluence of our lives is that our lives and vessels are close to each other in a good relationship. Life is made up of a wide variety of elements. Wake up in the morning, get dressed, go to work or study, go home in the evening, cook and eat, relax, do housework and takeaway homework, take a bath and go to bed. On weekends, friends and relatives come to play together for meals, seasonal decorations and annual events, garden care and cleaning, as well as hobbies and activities.

House in Higashiyama (in Yokohama)

In addition to allowing the family to live safely and securely, good housing design criteria include, 1) whether they can do various things in their daily lives without delay, 2) whether they can spend their feelings calmly, and 3) whether they are mentally satisfied. "House" includes everything as a "nest" for human beings to live like human beings. In this way, I like housing design, and I will summarize my research and plans on the theme of housing.

Publications:

1) Publications. “How to design the house live with 50% energy” Ichigaya Publishing. 2019.（co-author, Dr. Norihiko Kamata）
2) Publications. “Dissection picture book of housing storage style”ex-knowledge, 2013.
3) Architecture. “House-H”Yokohama ,Kanagawa, 2019.（Win the 2019 Environmental Award of Kanagawa architect Association ）
4) Architecture. “House-T”Yokohama ,Kanagawa, 2005.（Win the 2005 Architecture Award of Kanagawa Prefecture ）

Affiliated Academic Organizations:

Architectural Institute of Japan, Japan Institute of Architects, Kanagawa architect Association. New Wooden house Industrial Technology Conference General Incorporated Association “SHINJUKYO”

Current members: Professors: 1; Undergraduates: 4

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Building Environment and Services Laboratory

Mao Serikawa (Associate Professor) Office: 8-56 Ext.: 3432

Atsumasa Yoshiura (Assistant Professor)
Laboratory: 8-57 Ext.: 3442
Education/M. Serikawa (e-mail: serikawa@kanagawa-u.ac.jp)
09/2018, D.Eng., The University of Tokyo
Education/A. Yoshiura (e-mail: yoshiura@kanagawa-u.ac.jp)
07/2014, D.Eng., Yamaguchi University

M. Serikawa

A. Yoshiura

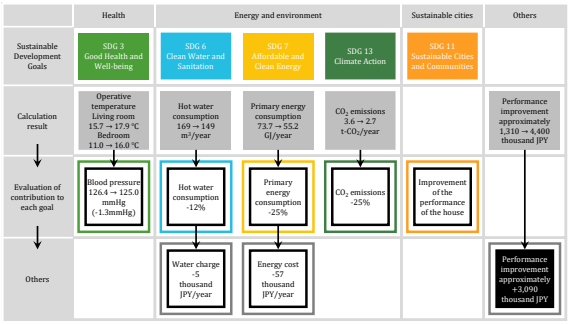
Research field: Building environmental engineering, building services, housing thermal environment, energy conservation.

Research Subjects: 1. Calculation of room temperature and energy consumption via simulations. 2. Evaluation of the residential thermal environment. 3. Evaluation of the thermal characteristics of walls and buildings. 4. Improvement of the thermal environment in traditional timber houses.

Introduction:

This laboratory was established in April 2022. Here, we describe some of the previous research that we have been engaged in.

To address global environmental problems, there is a growing need to conserve energy and reduce CO_2 emissions. A large proportion of energy consumption in Japan is attributable to houses and buildings. In addition, houses in Japan are often cold in the winter due to insufficient insulation, and this poor thermal environment may contribute to health problems in residents. Increasing the environmental performance of houses and other buildings would help to solve these problems.



Evaluation of housing performance improvements for achieving Sustainable Development Goals.

A traditional timber house converted into a welfare facility that was the focus of our research.

To this end, it is essential that residents recognize the advantages of homes with high environmental performance. One advantage is lower energy costs; however, a return on investment in improved housing performance is not enough. Therefore, we have proposed a method for evaluating improvements in the environmental performance of houses that contributes to achieving the UN's Sustainable Development Goals, which have been attracting increasing attention. One indicator used in the evaluation is blood pressure, which is calculated depending on room temperature, and is used as an indicator for Sustainable Development Goal 3 (Good Health and Well-being). Improving the thermal insulation performance of newly constructed houses helps to lower residents' blood pressure and contributes to improving health outcomes.

In addition to ensuring the performance of newly constructed houses, it is also important to improve the thermal environment of older houses. We studied a traditional timber house that was converted into a welfare facility and proposed solutions for maintaining a suitable thermal environment in the winter.

We will continue to research energy conservation and building performance with the aims of realizing sustainable housing and combating climate change.

Publications:

1) Mao Serikawa et al., "Quantitative evaluation of the contributions of improved housing performances toward delivering sustainable development goals by a building energy simulation tool", Sustainable Cities and Society, Volume 79, April 2022.
2) Atsumasa Yoshiura, Hiroyasu Okuyama, "Basic experiments and simulation for symbiotic evaporative cooling cladding", Journal of Heat Island Institute International, Volume 13, 2018.

Memberships:

Architectural Institute of Japan (AIJ), The Society of Heating, Air-Conditioning, and Sanitary Engineers of Japan (SHASEJ).

Current members: Professors: 1; Assistant Professors: 1; Undergraduates: 7

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Architecture and Urban Design Laboratory

Masashi Sogabe (Professor) Office: 8-63 Ext.: 3450

Hiroyuki Yoshioka (Assistant Professor)
Education/M. Sogabe (e-mail:ponkan@mikan.co.jp)
03/1988, M.Eng./M.Arch., Tokyo Institute of Technology
Education/H. Yoshioka（e-mail:ft101937mn@kanagawa-u.ac.jp）
03/2001, M.Eng./M.Arch., Nihon University


M. Sogabe


H. Yoshioka

Research Field: Architectural Design.

Research Overview: Investigating the applications of Architectural Design by studying real cities from new perspectives.

Research Subjects: 1. Design of architecture, public space, and landscape based on relationships between urban activities and cities.

Introduction:

Exploring new possibilities together

How do we relate to cities? We are studying the involvement in urban spaces through architectural design. We are using various methods, for instance, designing places for communication and creating innovative meeting spaces. We aim to use practical study methods and gain an original perspective free from conventional attitudes to make our work diverse. We expect students to participate these studies positively. In other words, our lab is not a place for learning established knowledge, it is a place for exploring new possibilities.


Designed temporary building in Ehime （model)


Designed temporary building in Ehime （completion)

Publications: 1) Publications. “MIKAN 2” ex-knowledge, 2007. 2) Publications. “POST OFFICE-renovation plan for work space.” TOTO Publishing. 2006. 3) Architecture. “Art factory in Takamatsu” Takamatsu Kagawa, 2013 (Sogabe Lab. + MIKAN + Shohei OKA). 4) Architecture. “House T” Yashio Saitama, 2014 (Sogabe Lab. + Matidesign). 5) Architecture. “Sun Road Regeneration Project” Kokura Fukuoka, In progress.

Affiliated Academic Organizations:

M. Sogabe: Architectural Institute of Japan, Japan Institute of Architects, Architectural Design Association of Nippon.
H. Yoshioka: Architectural Institute of Japan, Japan Institute of Architects.

Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 16; Undergraduates: 11

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Real Estate Design Laboratory

Jutaro Takahashi (Professor) Office：9-62　Ext：4063

Education／J. Takahashi（e-mail: jutaro-takahashi@kanagawa-u.ac.jp）
03/2000, M.Eng., Graduate School of Science and Technology, Kyoto Institute of Technology

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Research Fields: Architectural project design, real estate finance and marketing, local revitalization.

Research Overview: Research into phenomena found between architecture and real estate.

Research Subjects: 1. Real estate marketing research for architectural project design. 2. Renovation planning and its feasibility. 3. Architectural project design and its profitability. 4. Improvement ofthe existing system of vacant house databases called “Akiya banks” in Japan.

Introduction: Our laboratory is Japan’s first laboratory specializing in real estate science. We have a philosophy of fusing architecture and real estate, are actively involved in architectural planning, a field that considers the conditions under which architecture and renovations are possible.

There is a shift in the industrial structure caused by the increase in vacant houses owing to the declining birth rate and ageing population. Talented people who can think about architectural project design and local revitalization are in increasing demand.

Weexpect students to take an interest in a wide range of fields and to tap a new market such as team building and suggesting the way of use.

It is most important to learn design thinking in a broad sense to solve social issues. I expect that we will develop and design not only “*mono*” (products), for entity-oriented consumption but also “*koto*” (services), for situation-oriented consumption for the benefit of society.

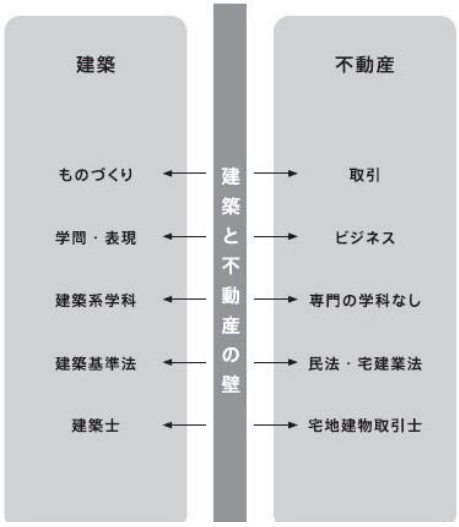

Fig. 1: Fusion of architecture and real estate.

Fig. 2: Project design example: Imaken Building (2018).

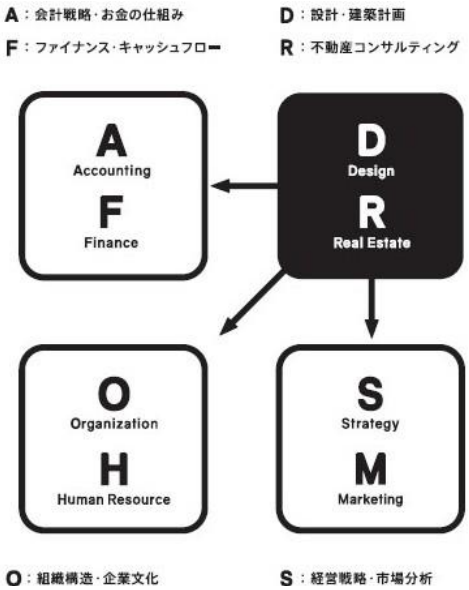

Fig. 3: Relationship between architectural real estate and management. [[In the figure, “Resource” should read “Resources”.]]

Current members: Professors: 1

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Housing Design Laboratory

Mio Tachibana (Associate Professor) Office: 9-65 Ext.: 4070

Gen Takahashi (Assistant) Office: 9-65 Ext.: 4069
Education/M.Tachibana (e-mail:tachibana@kanagawa-u.ac.jp)
03/2006, M.Eng., Tokyo Institute of Technology
Education/G.Takahashi（e-mail:gentakahashi@kanagawa-u.ac.jp）
03/2011, M.Eng., University of Tokyo


M.Tachibana


G.Takahashi

Research Field: Architectural design and architectural planning.
Research Overview: Architectural design and planning of housing, residences, learning environments, and libraries.
Research Subjects: Housing and residential design associated with local communities. The architectural design of local community centers in temporary housing after major earthquakes. Spatial composition and utilization of school squares
Introduction:
Designing living environments with local communities
Owing to the COVID-19 pandemic impact, we have been undergoing a significant paradigm shift in the locations and ways of working and living; for example, remote working and workcations. We study these relationships between social background and living environments. We learn from the past and present and aim to propose future housing designs that enhance personal and community well-being. We conduct bibliographic and on-site surveys of contemporary housing, traditional villages, and lifestyles that reintegrate production and consumption. Student agency and co-agency are emphasized in our laboratory. Currently, we research eco-villages, workplaces following the COVID-19 pandemic, examine the spatial composition and utilization of primary and secondary schools in Japan and Europe, and design residences and housing.


Hinge House in Tokyo


House-for-all in Heita

Publications: 1) Tachibana, M. et al.; Hinge House, Jutakutokushu -Special Housing-, Shinkenchiku-sha Co., Ltd., (390):2018-10, pp.146-151, 2018. 2) Yamamoto, R., Takahashi, G., et al.; House-for-all in Heita, Shinkenchiku, 87(15):2012-09, pp. 132-137, 2012. 3) Tachibana, M. et al.; “HINGE HOUSE”: Space Embracing Plural People, Activities, and Objects by Devising a Timber Frame Joint, Japan Architectural Review, Vol. 4, No. 1, pp. 22-27, 2021. 4) Tachibana, M. et al.; Spatial Composition and Use of Common Cores in Danish Gymnasier, Journal of Architecture and Planning (Transactions of AIJ), Architectural Institute of Japan, Vol. 85, No. 775, pp. 1841-1851, 2020. 5) Tachibana, M. et al.; English Lesson Activities and Systems of Settings in Danish Schools, Journal of Architecture and Planning (Transactions of AIJ), Architectural Institute of Japan, Vol. 87, No. 793, pp. 510-520, 2022.
Affiliated Academic Organizations:
Tachibana, M.: Architectural Institute of Japan.
Takahashi, G.: Architectural Institute of Japan.

Current members: Associate Professors: 1; Assistants: 1; Undergraduates: 3

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Seismic and Wind Resistance Structural Laboratory

Yan-Gang Zhao (Professor) Office: 12-36 Ext.: 3483

Haizhong Zhang (Assistant Professor) Laboratory: 12-32 Ext.: 3490

Education/Y. Zhao (e-mail: zhao@kanagawa-u.ac.jp)
03/1996, Ph.D., Nagoya Institute of Technology
Education/H. Zhang (e-mail: zhang@kanagawa-u.ac.jp)
03/2018, Ph.D., Kanagawa University


Y. Zhao


H. Zhang

Research Field: Structural Engineering, Structural Safety, Structural Reliability, Site response Analysis.

Research Overview: We are mainly researching structural safety considering various uncertainties and risk potentials in loads and structural systems. Reliability engineering, statistical theory, and site response analysis have been conducted to evaluate structural safety rationally and quantitatively.

Research Subjects: 1. Collapse analysis of structures. 2. Seismic performance of concrete-filled steel tube (CFT) column. 3. Statistical study of strong motion properties for seismic design. 4. Seismic safety evaluation for structures. 5. Development of seismic design models considering site effects. 6. Site effects on response spectrum.

Introduction:

1. Collapse analysis of building structures
   Examining column over-design factors that affect the collapse probability of building structures when a large earthquake occurs (Figure 1).
2. Seismic performance of CFT short columns
   Investigating benchmarks for CFT short columns considering the material and mechanical properties (Figure 2).
3. Seismic safety evaluation for structural buildings
   Evaluating structural seismic reliability considering the uncertainties of parameters on structural analytical models.
4. A simple method for estimating site effects
   Development of a simple method to incorporate site effects into seismic design loads (Figure 3).

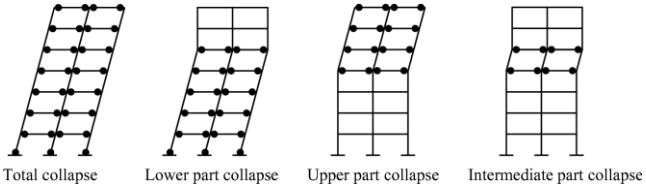

Figure 1 Mechanisms of structural story collapse.


Figure 2 CFT test.

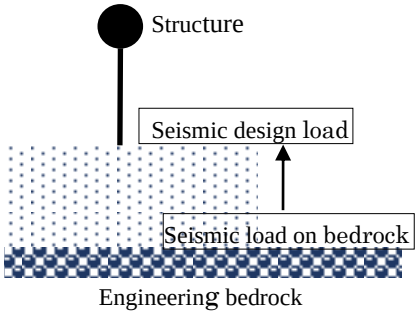

Figure 3 Evaluation of site effects

Publications:

1) Y. G. Zhao, X.Y. Zhang and Z. H. Lu “Complete monotonic expression of the fourth-moment normal transformation for structural reliability,” *Computers & Structures*, Vol. 196, pp.186－199 (2018)
2) Y. G. Zhao, S.Q. Lin, Z. H. Lu and L. S. He “Loading paths of confined concrete in circular concrete loaded CFT stub columns subjected to axial compression,” *Engineering Structures*, Vol.156 (1), pp.21－31 (2018)
3) Y. G. Zhao, Z. H. Lu, Y. S. Lin, and H. Idota, “Structural reliability assessment based on fourth moment standardization of performance function,” *Journal of Structural and Construction Engineering*, vol. 73(630), pp. 1251–1256 (2008).
4) H. Z. Zhang and Y. G. Zhao “A Simple Approach for Estimating the First Resonance Peak of Layered Soil Profiles,” *Journal of Earthquake and Tsunami*, vol.12 (1), pp. 1850005-1–1850005-22 (2018).

Affiliated Academic Organizations:

Y. Zhao: Architectural Institute of Japan, American Society of Civil Engineers, Japanese Society of Steel Construction.
H. Zhang: Architectural Institute of Japan, Japanese Geotechnical Society, Japan Society of Civil Engineers, Japan Association for Earthquake Engineering

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Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 9; Undergraduates: 13

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Architectural Planning Laboratory

Kunio Nakai (Professor) Office: 8-67A Ext.: 3452
Laboratory: 8-67 Ext.: 3452

Education/K. Nakai (e-mail: ft101774cl@kanagawa-u.ac.jp)
03/1999, Dr. Eng., Tokyo Institute of Technology

Research Field: Architectural Planning, Architectural Design, Architectural Theory.

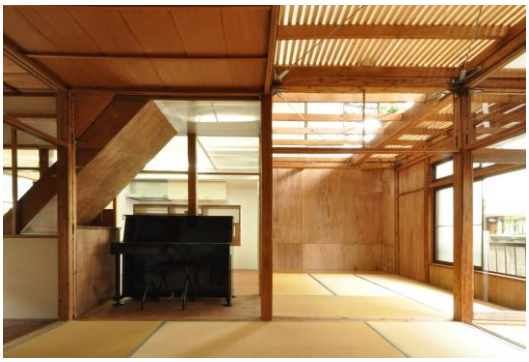
Research Overview: Analysis of the spatial composition of architecture and the urban environment, development of new design theories for architecture.

Research Subjects: 1) Design of firebreak belt buildings in postwar reconstruction. 2) Spatial composition of waterfront areas in cities. 3) Architectural design theory and criticism.

Introduction: We are born in houses and hospitals, commute to schools and offices, and live with our families in our homes. Throughout our lives, we coexist with buildings until we eventually go to our graves. There is no human activity without the space created by buildings and cities. Therefore, what sort of richness should a space that supports these various activities have? When considering the diversity of people's lives and the search for durable urban environments, from what standpoint should we plan space?

This lab investigates these problems through systematic methods based on practical activities and case studies. The findings are then presented as either research papers or plan proposals. In addition, through our research, we encounter the joy of discovering new perspectives for planning buildings and urban spaces.

Asakusa Culture and Tourist Center (competition project) (2009)



House in Tomihisacho (Sunoko House) (2013)

Publications:

1) “Studies of architectural composition,” Jikkyo Shuppan Co., Ltd, pp. 84–93, 103–112 (2012).
2) “Composition of the exterior void space of the fireproof belt buildings in Yokohama,” *J. Archit. Plann., Architectural Institute of Japan*, vol. 708, pp. 323–330 (2015).
3) “Exterior spatial composition of contemporary Japanese commercial buildings: A study on architectural composition with articulation of exterior volumes (5),” *J. Archit. Plann., Architectural Institute of Japan*, No. 622, pp. 65–70 (2007).
4) “Exterior spatial composition and conditions of location of contemporary Japanese museums: A study on architectural composition with articulation of exterior volumes (4),” *J. Archit. Plann., Architectural Institute of Japan*, vol. 607, pp. 33–40 (2006).
5) “Sapporo Shiryokan renovation (competition awarded project),” *Exhibition of selected works, Sapporo Shiryokan*, Jul. 19–Sep. 28 (2014).
6) “House in Tomihisacho (Sunoko House),” *Selected works of the 30th Housing Reform Contest, Center for Housing Renovation and Dispute Settlement Support*, pp. 18 (2013).
7) “House in Sakurayama (project),” *Shinkenchiku Jutaku Tokushu*, vol. 297, pp. 169 (2010).
8) “Zushi City Dai-ichi Sports Park (2nd prize project),” *Zushi City* (2010).
9) “Asakusa Culture and Tourist Center (competition awarded project),” *Exhibition of selected works*, Jan. 15–28 (2009).

Affiliated Academic Organizations:
Architectural Institute of Japan

Current members: Professors: 1; Assistants: 1; Postgraduates: 7; Undergraduates: 7

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Architectural Conservation and Utilization Laboratory

Kazunori Nomura / Professor Laboratory:9-62 Ext:4064

Sho Shiowaki / Assistant Professor Laboratory:9-61 Ext:4062

Career／Kazunori Nomura（e-mail:k-nomura@kanagawa-u.ac.jp）
04/1988～ Mitsubishi Jisho Sekkei (Executive Fellow)
03/2019 Ph.D., Tokyo Institute of Technology
Career／Sho Shiowaki（e-mail:shiowaki@kanagawa-u.ac.jp）
03/2015 M.Eng./M.Arch., Kanagawa University


Kazunori Nomura


Sho Shiowaki

Research Fields: Architectural preservation and utilization, renovation, conversion, inheritance design, urban redevelopment, historic landscapes.

Research Overview: To continue to use building stock such as historic buildings, we are researching examination processes and technical methods to improve the quality of solutions to problems including the inheritance of historical value and safety. We are also researching how to publicize historical value via building archives.

Introduction:

(1) Examination process for preservation, utilization, and development: Research on the examination process to produce optimal plans that balance the inheritance of historical value and utilization or development.

(2) Seismic and fire prevention measures for brick buildings: Practical research on earthquake resistance and fire prevention measures for brick buildings constructed in the Meiji era.

(**3) Building archives of historic cities and villages:** Research on the construction and utilization of archives to publicize the historical value of cities and villages.

(4) Experiential community development: Research on experimental methods for discovering the characteristics and issues in each region and for sustainable community development.


Fig.1: Regeneration of The Industry Club of Japan Building.

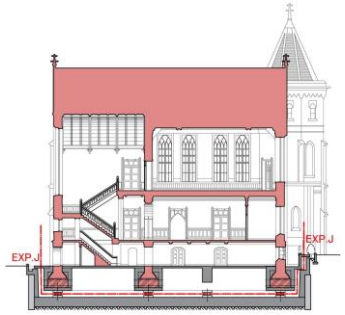


Fig.2: Seismic and fire protection measures for brick buildings.

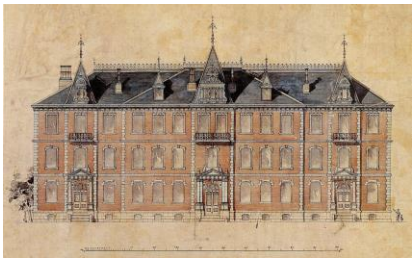


Fig.3: City-wide architectural archives.


Fig.4: Experimental use of vacant houses.

Publications:

1) Kazunori Nomura and Taisuke Yamazaki “On the process of utilization and succession design methods for the Industry Club of Japan Building,” IJ Technol Des, Vol. 23, No. 55, pp. 1043-1048, Oct., 2017.
2) Kazunori Nomura and Taisuke Yamazaki “On the process of utilization and succession design methods for Kabukiza Theatre,” AIJ Technol Des, Vol. 25, No. 59, pp. 477-482, Feb., 2019.
3) Kazunori Nomura and Taisuke Yamazaki “On the process of utilization and succession design methods for Tokyo Central Post Office,” AIJ Technol Des, Vol. 25, No. 59, pp. 491-496, Feb., 2019

Affiliated Academic Organizations: Architectural Institute of Japan, Japan ICOMOS National Committee.

Current members: Professors: 1, Assistant Professors: 1

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Sustainable Building Structure Laboratory

Masanori Fujita (Professor) Office: 8-54 Ext: 3430
Makoto Nakamura (Research Associate)
Laboratory: 12-22, 8-53 Ext.: 3471
M. Fujita (fujitam1@kanagawa-u.ac.jp)
Dr. Eng., Tokyo Institute of Technology (Mar. 2000)
M. Nakamura (makoto-nakamura@kanagawa-u.ac.jp)
Dr. Eng., Kanagawa University (Mar. 2022)


M. Fujita


M. Nakamura

Research Fields: Architectural Structural Design, Steel Building Structures, Sustainable Building Structures
Research Overview: Research and development of sustainable building structures
Research Subjects: 1) Buckling-restrained braces; 2) System for reusing steel building structures; 3) Composite steel–timber structures; 4) Mechanical fastening of steel fatigue cracks; 5) Corrosion-resistant steel materials

Introduction:

1) *Buckling-restrained braces using steel mortar planks*

Buckling-restrained braces using steel mortar planks are a structural system comprising a core that works axially and an outer part that restrains the core to prevent buckling (Fig. 1). The performance of the system is substantially superior in earthquake-resistant members and seismic-response-control members. Structures using the buckling-restrained brace system, also known as damage-controlled structures, make it possible for a building to last longer.


Fig. 1 Buckling-restrained braces

2) *System for reusing steel building structures*

Reusing steel members benefits the environment because the production of new steel generates carbon dioxide. Consequently, reusing steel makes it possible to reduce emissions and the overall environmental burden. We therefore conduct feasibility studies and other research with the aim of reusing steel members. We use technologically advanced methods to create proposals and perform evaluations in terms of design, fabrication, construction, and dismantling.

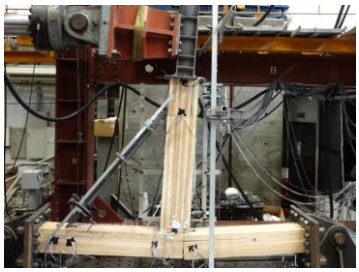


Fig. 2 Composite steel-timber structures

3) *Composite steel–timber structures*

Composite steel–timber structures incorporate as much timber as possible into steel strucutures, thereby contributing to the revitalization of forests. This approach also aims to achieve a design focused on functionality and safety. By combining steel and timber, the strong characteristics of each material can be incorporated in the end (Fig. 2)

4) *Durability of steel members*

Galvanization improves the durability of steel, but corrosion can still occur in galvanized steel members that are subjected to long-term exposure to the environment. We therefore monitor corrosion of the plating in galvanized bolts in order to evaluate their durability (Fig. 3).

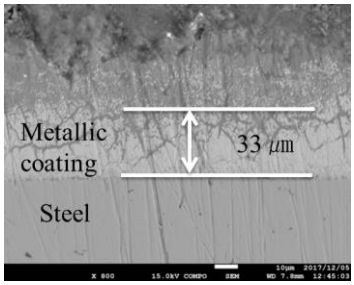


Fig. 3 Corrosion of galvanized bolts

Publications:

1)Clearance adjustment construction for core plate and restraing part of the buckling-restrained brase using steel mortar planks, *Journal of Structural and Construction Engineering, (Transactions of AIJ)*. 2022; 87(791): 20–30.
2)Effects of the clearance between the core plate and restraining part on the structural performance of the buckling-restrained brace using steel mortar planks, Steel Construction, Design and Research Vol.15,2022
3) Fatigure tests of the buckling-restrained brase using low-yield-point steel core plate, Journal of Structural Engineering, Vol..67.B, March *(Transactions of AIJ)*. 2021: 331–337.
4)Design method of building steel structures for reuse –Seismic performance of braces in the longitudinal direction considering damage–. *Journal of Structural and Construction Engineering (Transactions of AIJ)*. 2018; 83(748): 903–911.
5)Verification of clearance and gap for fabricating the buckling-restrained brace using steel mortar planks. *The 9th International Conference on the Behavior of Steel Structures in Seismic Areas*, 2018.

Affiliated Academic Organizations:

M. Fujita: Architectural Institute of Japan, Japanese Society of Steel Construction, The Japan Society of Seismic Isolation, International Association for Bridge and Structural Engineering, STESSA

Current members: 1 professor, 1 research associate, 3 postgraduates, 12 undergraduates

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Environmental Acoustics Laboratory

Yosuke Yasuda (Professor) Office: 6-407 Ext.: 3373
Makoto Morinaga (Assistant Professor) Laboratory: 6-406 Ext.: 3389

Education/Y. Yasuda (e-mail: yyasuda@kanagawa-u.ac.jp)
03/2004, Ph.D. Environ., The University of Tokyo
03/2001, M. Environ., The University of Tokyo
Education/M. Morinaga (e-mail: m-morinaga@kanagawa-u.ac.jp)
03/2005, Ph.D. Eng., Osaka University
03/2002, M. Eng., Osaka University

Y. Yasuda

M. Morinaga

Research Field: Architectural Environmental Engineering, Architectural Acoustics, Noise Control Engineering.

Research Overview: Contribution to create better architectural and acoustic environments.

Research Subjects: Development of numerical simulation methods for acoustic design, prediction of sound fields inside/outside buildings, insulation of floor impact sound in buildings, acoustic characteristics modeling of building members, control of urban noise, psychoacoustic experiment, socio-acoustic survey.

Introduction: In the field of architecture, it is important to consider the quality of space and quality of life (QOL) continuously. Our laboratory is engaged in environmental acoustics research, which is a field in architectural environmental engineering that is closely related to QOL. Our projects include the development of numerical simulation methods for acoustic design and noise control; prediction of a variety of sound fields; understanding and modeling acoustic characteristics of building members; and assessment of noise propagation. We have focused on developing highly efficient wave-based numerical simulation methods, because the spaces dealt with in the field of architectural acoustics are so large that computational costs for highly accurate wave-based numerical analyses are high. Recently, we have also focused on more practical research such as development of sound insulation systems for floor impact sound in buildings and development of silencers for tunnel blasting infrasound.

Figure 1. Anechoic chamber.

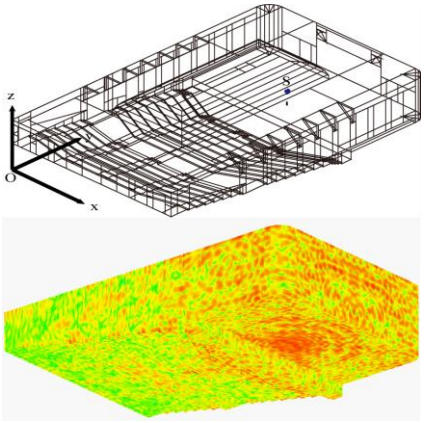


Figure 2. SPL distribution obtained by the fast multipole boundary element method.

Figure 3. High sound insulation double floor structure.

Publications:

1) Y. Yasuda, *et al.*, A basic study on incidence directivity analysis using multipole and local expansions, *Acoust. Sci. & Tech.*, **43**, 77-80, 2022.
2) Y. Yasuda, *et al.*, Effects of the convergence tolerance of iterative methods used in the boundary element method on the calculation results of sound fields in rooms, *Appl. Acoust.*, **157**, 106997, 2020.
3) Y. Iwane, *et al.*, Study on reduction of tunnel blasting infrasound using silencer with tube resonators, *Acoust. Sci. & Tech.*, **39**, 428-431, 2018.
4) M. Morinaga, *et al.*, The effect of an alternative definition of “percent highly annoyed” on the exposure–response relationship: comparison of noise annoyance responses measured by ICBEN 5-point verbal and 11-point numerical scales, *Int. J. Environ. Res. Public Health*, **18** (12), 6258, 2021.
5) M. Morinaga, *et al.*, A laboratory investigation into the effect of quiet-time interval between aircraft noise events on overall noisiness, *J. Acoust. Soc. Am.*, **144** (1), 11-22, 2018.

Affiliated Academic Organizations:

Architectural Institute of Japan, Acoustical Society of Japan, Institute of Noise Control Engineering of Japan.

Current members: Professors: 1; Assistant Professors: 1; Undergraduates: 7
Number of alumni: Postgraduates: 9; Undergraduates: 81

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Urban Planning Laboratory

Kyoko Yamaga (Professor) Office: 8-66A Ext.: 3451

Saori Kashihara (Assistant Professor) Laboratory: 9-61 Ext.: 4061
Education/K. Yamaga (e-mail: yamaga@kanagawa-u.ac.jp)
03/1992, Ph.D., The University of Tokyo
03/1984, M.S., The University of Tokyo
Education/S. Kashihara (e-mail: kashihara@kanagawa-u.ac.jp)
03/2018, Ph.D., The University of Tokyo
03/2009, M.Environ., The University of Tokyo


K. Yamaga


S. Kashihara

Research Fields: Kyoko Yamaga, Architecture and Urban Planning. **Saori Kashihara,** Historic Urban Landscape.

Research Overview: Study on the urban space and practice of "Machizukuri" through project activities.

Research Subjects: Construction of an urban vision in the "shrinking era", examination of the influence of ICT on architecture and urban space, research and design of urban facilities supported by communities, design of urban housing, investigation and projects of "Machizukuri" using local resources, research into the sustainability of suburban residential areas, research and design on the use of public spaces.

Introduction: We explore the generation of places in urban space through research and design projects for sustainable "Machizukuri" based on field works.

Together with Yokohama City Government, we have worked on the Machizukuri project in the neighborhood around Tōkaichiba Station since 2016. The project activities include treasure hunting workshop, map making, and creating memory and life style cards based on interviews with the residents. In the treasure hunting workshop (Fig. 1), students and local residents rediscovered the area's attractiveness through walking around the town and making personal treasure maps. The students synthesized these findings as the "Tōkaichiba Treasure Map". Based on these outputs, we examine the planning of residential area through discussing the places with local people's attachment and explore the sustainable town for the future.


Figure 1 Treasure hunting workshop

Under a partnership with Keikyu Corporation and Kawasaki City, we have been engaged in a project to revitalize the neighborhoods and to make visions. We investigate the current situation through fieldworks in several sites along the Keikyu railway. More specifically, we implemented a series of pilot projects at a vacant lot in front of the Hatchō-nawate Station (Fig. 2) to capture the local people's needs and explore the possible strategies for effective utilization of the open space.


Figure 2 Pilot project in an open space near Hatchō-nawate Station

Undergraduate subject of study

Places with people's attachment and places for people in suburban residential area; Utilization of private vacant lot; Interaction within community and community facilities prompted by COVID-19; Case studies on urban regeneration projects overseas.

Publications: 1) M. Ueno, K. Yamaga, "Action Research on Examining Process for Utilization of Private Open Space –The case of pilot program in Hatcho-Nawate of Kawasaki City−" *AIJ Journal of Technology and Design*, vol. 26, Issue 64, pp. 1173-1178. 2) Y. Tsuda, T. Sugie, K. Yamaga, I. Cheong, "The formation and the Spatial Changes in Nakamise Street, Rokkakubashi Shopping Area" *History and People*, no. 32, pp.311-329 (2016). 3) I. Cheong, K. Yamaga, "Streetscape Management Based on Learning and Sharing Method : Streetscape Handbook in Rokkakubashi Neighborhood Shopping District in Yokohama", The International Symposium on Urban Planning 2015 (Sejong).

Affiliated Academic Organizations:

K. Yamaga: Architectural Institute of Japan, City Planning Institute of Japan

S. Kashihara: Architectural Institute of Japan, City Planning Institute of Japan, Association of Urban Housing Sciences

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Current members: Professors: 1; Assistant Professors: 1; Postgraduates: 12; Undergraduates: 9

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Architectural Design Laboratory

Miru Rokkaku (Professor) Office: 8-68A Ext.: 3453

Education/M. Rokkaku (e-mail: rokkaku@kanagawa-u.ac.jp)
03/2011, Ph.D., The University of Tokyo

Research Fields: Architecture Design
Research Overview: Design and design methodology for architecture, environments, and spaces
Research Subjects: Space framing (visual environments, windows, and spaces), family traditions (history and lifestyle), architectural materials, and renovation and utilization of architecture
Introduction: I think that one of the roles of architectural design is to interact with the surrounding environment and organize the visual world as a charming space through design. In space framing research, we study how to manage the design of the external environment that surrounds architecture through architectural windows.
This laboratory aims to discover the relationship between the individual elements and the space, researching the application of design methods that incorporate a sense of distance, scale, and human sensibility. In addition, we study architectural features and explore elements and finishing materials. We aim to create design expressions for actual homes, community facilities, and so on, where people can interact.

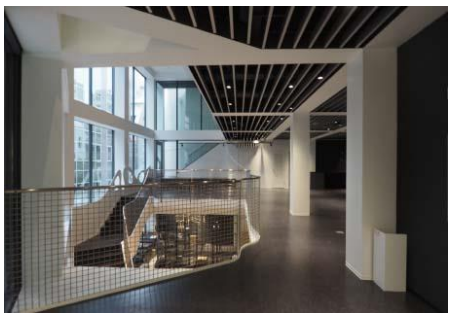
ORU Oriori exterior

BentBox Asama Kanso exterior

SeaForce bldg, exterior

ORU Oriori interior

BentBox Asama Kanso interior



SeaForce bldg, interior

Publications: 1) Paper: “Space Framing Research in Regional Ecospheres,” *Special Education and Research Reports*, Shibaura Institute of Technology, pp. 155–158, 2019.9; 2) Paper: “History of Windows around the World 1 & 2” *Windowology Exhibition Archive*, YKKap, Window Research Institute, pp. 2014–2016, 2018.3; 3) Books: *The Hidden Power in Windows* “Stillness and Motion”, “Learning from Detail Diagrams around Windows in Classic Homes” Ohmsha, Ltd., 2016.4; 4) Works: “Kōonji Temple” in *SD 2019*, Kashima Institute Publishing, 2019.12
Affiliated Academic Organizations: The Japan Institute of Architects, The Society for Clinical Art

---

Current members: Professors: 1; Postgraduates: 9; Undergraduates: 9

Course of Architecture and Building Engineering/Graduate School
Department of Architecture and Building Engineering/Undergraduate

Architectural Engineering Laboratory

Building No. 12

Hiroki Satou (Technical Assistant)
(e-mail: satouh01@kanagawa-u.ac.jp)

Experimental Facilities

Structural Engineering Course

- Dynamic Jack System (Shimadzu).
  Horizontal loading: ±1000 kN (dynamic: ±750 kN). Vertical loading:±1000 kN (2 units).
  Shaking table: 10 kN (payload), ±200 mm (max. displacement), 25 cm/s (max. velocity).
- Three-axis pseudo dynamic testing system (Riken Seiki Corp.).
  Max. load: ±700 kN (1 unit), ±200 kN (2 units).
- Long-span compression testing machine (Tokyo Koki Corp.).
  Max. load: 5000 kN
- Hydraulic universal testing machine (Shimadzu).
  Compression, tension, bending (span: 2.5 m). Max. load: 1000 kN.
- Material testing machine (Shimadzu).
  Compression, tension. Max. load: 1000 kN.
- Seismic shaking table loading system (San-Esu Corp.).
  Max. payload: 3 kN. Max. displacement: x,y–horizontal, 150 mm
- Exciter
  Exciting force: 3 kN × 3 = 9 kN, Max. displacement ±250 mm,
  Max. velocity: ±1500 mm/s

Environment Course

- Experimental facilities for architectural acoustics: anechoic room, semi-anechoic room, low-noise blowing apparatus, and acoustic measurement system.
- Virtual reality system: projector (8500/3D, Marquee), 120-inch screen, and reflection mirror.
- Environmental chamber: refrigerating machine (RCUJ75A1, 6.7 kW, Hitachi), coil units (DSCM-1, Kubota Corp.), and humidifier (0–2.5 kg/h).
- Experimental room for hot water supply system (2.7 (d) × 4.4 (w) × 2.4 (h) m^3).
- Experimental system for balancing airflow in air duct network in situ.
- Impulse response measurement system (Type 4292-L and 7841, Brüel & Kjær) and real-time convolution operation system (Huron, Lake Technology; TDIF-1, RME Co.).
- Two-microphone impedance measurement tubes (Type 4206, Brüel & Kjær).
- Thermal manikin (height: 168 cm, weight: 20 kg, heat discharge: 0–200 W/m^2, min. unit: 0.1 W/m^2, surface temperature: 18–42 °C, PT-Teknik).
- Sound quality head and torso simulator for binaural sound recording (Type 4100, Brüel & Kjær) .
- Fast Fourier transform analyzer (3566A-32ch, HP; DS3000-16ch, Ono Sokki Corp.).
- Laser velocity transducer (Type 3544, Brüel & Kjær).