Japan Constructed before 1867

Survey of Civil Engineering Heritage in Japan Constructed before 1867

- The Toyota Foundation, Wesco Scientific Promotion Foundation, Grant-in-Aid for Scientific Research (JSPS)
- Leader: Prof. BABA Shunsuke

As the first trail, civil engineering heritage in Japan before Edo Era(1668) has been totally investigated in our laboratory. We listed up more than 8000 heritage and made a field survey on 2000 of them. Based on these data, we have been tried to make a proposal in regard to evaluate the intrinsic value and preservation condition of each heritage. Since these heritage have strong unique regionality, the results will be used in the “Landscape Act (2004)” in Japan, as a feasible course of action to create a historically sustainable region.

Long Term Analysis of Clay Barrier for Radioactive Waste Disposal

- Joint Research: Tokyo Institute of Technology, Nuclear Safety Research Association
- Leader: Prof. ICHIKAWA Yasuaki
- Period: 2002 – 2012

High level radioactive wastes (HLW) are inevitably produced by nuclear power generation. It is planned to dispose HLW in deep geological layers contained in a steel overpack and surrounded by bentonite clay barrier which is the key material to conserve long-term safety. We have analyzed the clay behavior based on molecular simulations and multiscale analyses.

Transport of soil particles due to seepage flow – Creation of mechanics of sediment transport within soils –

- Grant-in-Aid for Scientific Research (JSPS)
- Leader: Sr. Asst. Prof. FUJISAWA Kazunori
- Period: 2011 – 2013

The loss of soil particles induced by seepage flow, so-called piping, is a primary cause of embankment breaks, such as dams and levees. Sea embankments constructed in coastal areas are often suffering from the runoff of the embankment materials by see waves, and even in urban areas, unexpected sinkholes beneath roads or streets are reported and the reasons are usually unclear. It is quite likely for soil structures and the ground to be damaged by the loss and the transport of the soil particles. However, the mechanism of the loss and the transport of the soil particles within soils is at present unclear. This study tries to reveal the mechanism and to create a new field of the mechanics of sediment transport within soils.

Globalization and Oil Palm Plantations in Southeast Asia: Changing Economy, Nature and Community

- Grant-In-Aid for Scientific Research (JSPS)
- Leader: Hidetki Hayasaka (Doshisha Univ.)
- Co-researcher: Assoc. Prof. UBUKATA Fumikazu
- Period: 2010 – 2012

The world palm oil production has been rapidly expanding. Especially in Indonesia and Malaysia where there production account for around 85 percent of the world total production, the expansion of oil palm plantation has accompanied various effects, including villagers’ life and natural environment. Based on both field and literature surveys in Southeast Asia, especially in Indonesia, Malaysia, Thailand and the Philippines, this interdisciplinary study tries to explore the process and effects of oil palm expansion. The research team jointly examines related themes, such as global background and discourse, promoting expansion, plantation development and actual management, social and ecological changes after the plantation establishment.
Department of Biological and Human Environment

Biodiversity and sustainable nomadism in the dry ecosystems in northeast Asia

- Environment Research and Technology Development Fund by Ministry of the Environment
  - Leader: Prof. YOSHIOKA Ken
  - Period: 2011 – 2013

The dry ecosystems in northeast Asia are the steppes with shrubs and/or herbaceous plants, and are characterized by hot and dry summer and cold winter. In these ecosystems, Mongolian steppe has a long history of pastoral nomadism. However, after the introduction of the market economy in 1991, the number of livestocks has kept on increasing rapidly, and the nomadic activity has been concentrating more in the region near to urban area or main roads. Therefore, the local overgrazing has occurred and may lead to the degradation and desertification of the steppe. In this study, we focus on “easy resource” in steppes, which is the plant resource contributes to the survival of livestock during the period under a harsh weather. The objective is to clarify the biodiversity and sustainable nomadism in Mongolian steppe, from the viewpoints of both natural and social sciences.

A dynamic study about processing and private branding of livestock products

- Grant-in-Aid for Scientific Research (C)
  - Leader: Prof. YOKOMIZO Isao
  - Period: 2010 – 2012

As for meat, much beef cattle farm or pig farm continues to sell in the shape of living body in order to need slaughter. In addition, as for milk and dairy products, much dairy farm continues to sell in the shape of raw milk to the Designated Milk Producers’ Organizations. In other words, they are price takers of market prices, and always receive risks of price fluctuations, for a stage of raw materials’ supply. Therefore, we will investigate and analysis the samples that succeed in private branding of livestock products, and processing and private branding of livestock products, in time series. We will clarify some essences of their management abilities and innovations.

Post-harvest pest control using ultraviolet light-emitting diode (UV LED) trap for safety of food.

- Grant: Agriculture, Forestry and Fisheries Research Council, Elevation of biological mechanisms of photoresponse and development of advanced technologies utilizing light, INSECT-2005
  - Leader: Prof. MIYATAKE Takahisa
  - Period: 2009 – 2013

This research concerns the establishment of a model post-harvest pest control system using ultraviolet light-emitting diode (UV LED) trap for safety of food. We deal with photo-response of the cigarette beetle, Lasioderma serricorne, an important pest insect, that feeds on various dry foods.

Department of Human Ecology

Modeling for a novel influenza transmission and control strategies against its pandemic

- Grant-in-Aid for Scientific Research(JSPS)
  - Leader: Prof. ISHIKAWA Hirofumi
  - Period: 2009 – 2012

In 2009, novel influenzA(H1N1) virus caused an outbreak in Mexico, and swept throughout the world, including Japan. The spread of highly pathogenic avian influenza will lead to an influenza pandemic. This study aimed at constructing a stochastic model for a novel influenza transmission and estimating the suppressive effectiveness of various interventions on an influenza pandemic through simulations for strategic considerations.

Alliance between Mathematics and Radiology

- Japan Science and Technology Agency, Basic Research Programs, Alliance for Breakthrough between Mathematics and Sciences, CREST
  - Leader: Prof. SUITO Hiroshi
  - Period: 2010 – 2015

This research project will contribute to high-performance clinical diagnoses through construction of decision-making tools including mathematical modeling, simulation technology, statistical analysis, scientific visualization, image processing, etc. Mathematical science will evolve greatly through this research project, not only from its application to medical science, but also from its own evolution derived from that application.

Research on improving validity in investigations of food-borne disease outbreak

- Research project on securement of food safety and reliability
  - Leader: Prof. TSUDA Toshhide
  - Period: 2008 –

In a disease outbreak, such as food-borne and infectious disease, we have to identify source and transmission of the outbreak and to prevent further transmission as soon as possible. We may also prevent disease outbreaks in other settings when reporting the present outbreak precisely. A set of techniques in epidemiologic field investigation is known as “Outbreak Epidemiology” or “Field Epidemiology”, which are basic components for national centers for disease control. In the Okayama University Graduate School of Environmental Science, we train up epidemiologists who can also conduct investigation in the field setting using the latter program.
Division of Sustainability of Resources

Department of Sound Material-Cycle Science

Development of Lake Biwa Basin Integrated Management Model (LBIM)
- Collaborative research: Lake Biwa Environmental Research Institute
- Researcher: Assoc. Prof. NAGARE Hideaki
- Period: 2006 – 2012
We have been developing the integrated model which simulates pollutant load from catchment to Lake Biwa, water dynamics, water quality, and ecological changes in the lake. The model is used to predict the effect of pollution control policy or climate change on Lake Biwa environment.

Dynamic Behavior of unsaturated zone
- Radioactive Waste Management Funding and Research Center
  - Research on important basic technology for the disposal of radioactive waste
  - Leader: Assoc. Prof. KOMATSU Mitsuru
  - Period: 2010 – 2012
Verification of geo-atmospheric interaction and extraction of assignment for modeling with dynamic behavior of unsaturated zone
(1) Estimates of barometric pumping of moisture through unsaturated zone
(2) Behavior of residual air under the re-flooding phase

Rapid test of drying shrinkage strain of concrete
- Japan Society for Promotion of Science Grants-in-Aid for Scientific Research "Grant-in-Aid for Young Scientists (B)"
- Leader: Asst. Prof. FLUJI Takashi
- Period: 2012 – 2014
As for the test method of the drying shrinkage of concrete, JIS A 1129 is generally performed. This method needs a half year for an examination at least. In this project, rapid test method of drying shrinkage strain of concrete is suggested.

Department of Material and Energy Science

Surface cleaning behavior on TiO2 photocatalyst film immersed under water with UV illumination
- JSPS Grant-in-Aid for Scientific Research
- Leader: Asst. Prof. NISHIMOTO Shunsuke
- Period: 2012 – 2013
This project conducts analysis of the organic contamination removal behavior by photo-induced superhydrophilicity of TiO2 photocatalyst and design of high performance self-cleaning surface.

Development of organic materials for solar cells using synergetic effect between nanocarbons and main group elements
- Leader: Sr. Asst. Prof. TAJIMA Tomoyuki
- Period: 2010 – 2012 (maximum)
We are developing organic semiconductors for organic solar cells using synergetic effect between nanocarbon materials and main group elements. The materials are expected to enable construction of a new type of photovoltaic cell.

Crystallization control and performance improvement of topological blend polymer system having cyclic polymer as a component
- Japan Society for the Promotion of Science, Grant-in-Aid for Scientific Research (C)
- Leader: Assoc. Prof. YAMAZAKI Shinichi
- Period: 2012 – 2014
This project conducts development of high performance polymers with tunability of physical properties such as mechanical properties using topological blend polymer system having cyclic polymer as a component. The topological blend polymer system is capable of control of crystalline and entanglement state.
Division of Science for Bioresources

Department of Biofunctional Chemistry

Analysis of physiological function of cytosolic free N-glycans involved in plant growth

- JSPS Grant-in-Aid for Scientific Research (C)
- Leader: Prof. KIMURA Yoshinobu
- Period: 2012 – 2014

In growing or developing plant tissues, free asparagine-linked oligosaccharides (N-glycans) occur ubiquitously at micromolar level, but the physiological functions of these ubiquitous free glycans have yet to be revealed. This research project, therefore, is aimed at (1) elucidation of the physiological function of free N-glycans involved in plant development or fruit ripening and (2) application of the oligosaccharide-function to plant breeding through gene-expression control of glycoenzymes (ENGase, PNGase, α-Man’ase).

Molecular Characterization and Industrial Application of L-Amino Acid Oxidases with High Substrate Specificity

- Grant-in-Aid for Scientific Research
- Leader: Prof. INAGAKI Kenji
- Collaborator: Katsumi Imada (Graduate School of Science, Osaka University)
- Period: 2012 – 2014

In this project, we focus on the microbial L-amino acid oxidases with high substrate specificity and study the molecular characterization and the industrial application of the enzymes. We want to know the substrate recognition mechanism of the L-amino acid oxidases.

Research on improvement in efficiency of biomining from low grade sulfide ores

- Grant-in-Aid for Scientific Research (C)
- Leader: Prof. KAMIMURA Kazuo
- Period: 2011 – 2013

The iron-oxidizing and sulfur-oxidizing activities are indispensable for the biomining from low grade sulfide ores. Since Acidithiobacillus ferrooxidans can oxidize both ferrous iron and reduced inorganic sulfur compounds (RSCs), the bacterium is successfully used for the biomining. In this research, we will clarify the pathway predicted for sulfur oxidation and the regulatory mechanism involved in expressions of genes for iron and sulfur oxidations to improve the biomining efficiency.

Department of Plant Stress Science

Generation and transmission control of plant artificial chromosomes

- Program for Promotion of Basic and Applied Researches for Innovations in Bio-oriented Industry
- Leader: Prof. MURATA Minoru
- Period: 2009 – 2013

In this project, we aim to generate plant artificial chromosomes (PACs), which are expected as a novel vector in Arabidopsis, tobacco and rice, and also to develop systems for controlling PAC transmission.

Development of stay-green plants through genetic modification of chloroplast functions

- Core Research for Evolutional Science & Technology (Japan Science and Technology Agency)
- Co-leader: Prof. SAKAMOTO Wataru

Stay green is the genetic trait or phenomenon in which plants can retain greenness during leaf senescence. In this project, we aim in understanding molecular mechanisms or mutations giving rise to the `functional' stay green, which ultimately prolongs photosynthetic capacity in leaves and leads to biomass increase. To establish stay green technology, we will attempt to utilize stay-green genes, to modify photosynthetic machineries, and to improve quality control of chloroplast functions. We will also attempt to understand the fundamental mechanisms pertaining to the biogenesis, the maintenance and the degradation of the chloroplasts.

Strategy of plants to adapt to problem soils

- Grant-in-Aid for Scientific Research on Innovative Areas (MEXT)
- Leader: Prof. MA Jian Feng
- Period: 2010 – 2015

Acid soil is a typical problem soil, which comprises of about 40 % of arable soil in the world. There are many limiting factors for crop production on acid soils including toxicity of aluminum and manganese, deficiency of calcium, magnesium, silicon and boron. However, some plant species have developed strategies to adapt to acid soils during long evolution process. The objective of this project is to systematically elucidate the mechanisms underlying of acid soil tolerance at the molecular level.
**Division of Science for Bio-production**

**Department of Plant Science**

**Improvement of Soybean Yield Potential in Monsoon Asia**
- **Grant-in-Aid for Scientific Research (JSPS)**
- **Leader**: Prof. SAITO Ken'ichi
- **Period**: 2010 – 2013

Soybean production in Monsoon Asia is limited not only by the biotic and abiotic stresses but also by the genetic and physiological characteristics. We focus on the assimilation, distribution, and accumulation of photosynthate in the plants, and the ability of sink formation in soybean plants. The effects of genetic and agronomic improvement of those traits on the increase in yield potential are evaluated using the newly developed prediction model for growth and yield of soybean.

![Image of soybean plant](image)

**Functional analysis and application of transcription factor regulating fruit ripening using array, gene engineering and Tilling technology**
- **Grant-in-Aid for Scientific Research (JSPS)**
- **Leader**: Prof. KUBO Yasutaka
- **Period**: 2012 – 2016

Analysis in regulatory mechanism in fruit ripening is a one of hot spots in horticultural research, and it is an important for development of postharvest technology. Based on recent progress of international tomato genome project, using array, transgenic and TILLING, our research targets on molecular mechanism in fruit ripening and its application.

![Image of tomato](image)

**Cooperative Research and Educational Center for Important Plant Genetic Resources in East Asia**
- **Asian CORE Program (JSPS)**
- **Leader**: Prof. KATO Kenji
- **Period**: 2009 – 2013

Plants are the novel resources which can be reproduced, and people has utilized plants in various ways. The functions and plant species we have already used are so limited, and most of the plant resources remain to be exploited. Therefore, for the future of human and global environment, research and education on 'Plant Genetic Resources' have been accelerated by collaborating with Kunming Institute of Botany, China.

![Image of plants](image)

**Department of Plant Stress Science**

**Studies on the local and mutual regulatory mechanisms controlling ovarian, oviductal and uterine functions**
- **Development for innovative technologies of breeding, reproduction and disease prevention using livestock genomic information**
- **Leader**: Prof. OKUDA Kiyoshi
- **Period**: 2012 – 2016

The ovary, oviduct and uterus interact with each other by mutual regulatory mechanisms (crosstalk) via signal molecules, and then maintain a harmonious reproductive function. Therefore, the unraveling of this mutual regulatory mechanism may result in a crucial disorder for the reproductive function. The objective is to elucidate the cross-talk mechanisms among ovary, oviduct and uterus from the aspect of the cell physiology involving endocrinology. The new findings will be applied to new breeding technologies aiming to shorten the breeding cycle and to improve the conception rate.

**Development of assessment systems and preservation technologies of boar spermatozoa for a higher conception rate following artificial insemination**
- **New developmental project for practical technologies to promote policies for agriculture, forestry and fisheries (the ministry of agriculture, forestry and fisheries; partial responsibility)**
- **Researcher in charge of the partial responsibility**: Prof. FUNAHASHI Hiroaki
- **Period**: 2009 – 2012

To introduce new technologies for artificial insemination to obtain a stable and high conception rate into the swine industry, we will develop new assessment technologies for sperm quality and liquid or frozen semen preservation. We also will develop a new artificial insemination technology with a high efficiency in sperm utility, and consequently having reproductive technologies to be expected a high conception rate.

**Impacts of blood coagulation factor XI deficiency on production of Japanese Black cattle**
- **Grant-in-Aid for Scientific Research (JSPS)**
- **Leader**: Prof. KUNIEDA Tetsuo
- **Period**: 2011 – 2013

Blood coagulation factor XI deficiency is a hereditary bleeding disorder reported in Japanese Black cattle breed. Although the bleeding tendency of this disorder is mild, risk for developmental anomalies and reproductive defects have been suggested. If the disorder has negligible effects on production of beef cattle, there should be considerable negative impacts on the beef cattle industry, since allele frequency of the gene for this disorder is remarkably high in the population of Japanese Black cattle. Therefore, we are investigating the relation of the blood coagulation factor XI deficiency with the reproductive or developmental defects in the cattle population, as well as its effects on the physiological processes involved in reproduction and development to reveal the impact of this disorder on beef cattle production.

![Image of cattle](image)