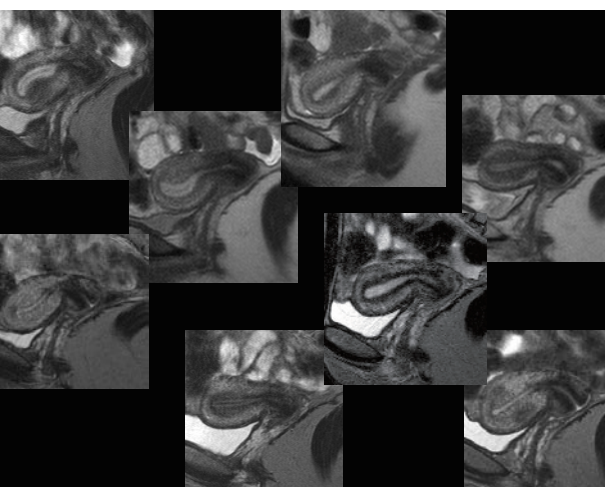


# Cutting-Edge Research in Kyoto University

Kyoto University is known for the quality and diversity of its research. Each issue of Research Activities can only highlight a small selection of those endeavors, but we hope to convey an impression of the university's rich academic milieu.

## **MED** The Uterus Has Many Faces

*The appearance of the uterus changes markedly depending on hormonal conditions and inherent contractility.*



On MRI (magnetic resonance imaging), the uterus demonstrates distinct zonal differentiation, consisting of the high-signal endometrium, a distinct low intensity junctional zone, and the outer myometrium with an intermediate signal. However, its appearance markedly changes depending on hormonal conditions and inherent contractility. The eight images below were obtained from one subject during one menstrual cycle and during a period of contraceptive pill usage. The uterus indeed has many faces. The inherent contractility of the uterus is supposed to be closely related to fertility problems, symptoms related to menstruation, endometriosis, and other issues.

**Kaori Togashi, MD, PhD**

*Professor, Graduate School of Medicine*

[www.med.kyoto-u.ac.jp/en/organization-staff/](http://www.med.kyoto-u.ac.jp/en/organization-staff/)

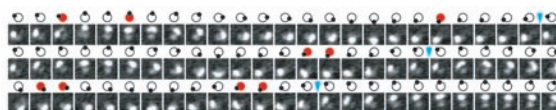
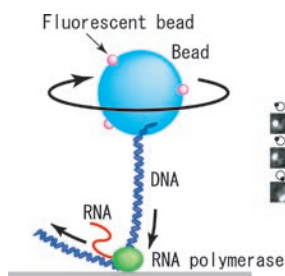
[research/doctoral\\_course/r-043/](http://research/doctoral_course/r-043/)



## **MOL-BIO** Making the invisible visible

*Single-molecule approaches to understand the function of individual protein molecules.*

In the human body, various biological molecules are continuously in motion. Among these, protein molecules are especially important. How does a single protein molecule execute so many functions? Due to their size, it is very difficult to observe the functions of single protein molecules under normal conditions. However, using various techniques such as single-molecule imaging (used for observing a single molecule of protein or a single DNA strand bound to a fluorescent dye or plastic microbeads), we can observe some functions directly. By unraveling the mechanisms of how protein molecules work step by step, we can deepen our understanding of fundamental biological activities.



RNA polymerase rotates DNA by tracking its right-handed helix during transcription



**Yoshie Harada, PhD**

*Professor, Institute for Integrated Cell-Material Sciences (WPI-iCeMS)*

[www.harada.icems.kyoto-u.ac.jp/en/index.html](http://www.harada.icems.kyoto-u.ac.jp/en/index.html)

## EDU Competences for Life

*Evaluating them through performance assessments.*



Performance assessment in physical therapy

In the past two decades, competences such as problem solving, critical thinking, and communication have come to be regarded as important educational goals, in addition to subject knowledge, from elementary to higher education in many countries. This indicates a concern not only with “what you know” but also with “what you can do.” However, in order to observe competences it is necessary to make them visible in the form of performances and interpret them. My colleagues and I have been developing learning assessment methods for competences in different disciplines from dentistry and physical therapy to philosophy.



**Kayo Matsushita, PhD**

*Professor, Center for the Promotion of Excellence in Higher Education*  
[kaken.nii.ac.jp/d/r/30222300.en.html](http://kaken.nii.ac.jp/d/r/30222300.en.html)

## ANTHROP Living amid Differences

*Minorities, gender, and connected coexistence.*

Working on a long-term anthropological fieldwork project about hill-dwelling minorities in northern Thailand changed my perspective on life and scholarship. I have since been interested in the crisscrossing of differences such as ethnicity and gender, especially within the intimate aspects of life. My current project is “Care in Southeast Asia.” In the region now faced with an aging population, where policies and institutional support are not yet sufficient, what kinds of grassroots activities and new social formations can be found, and what local concepts of care are there? The elucidation of these questions provides hints for solving our own problems. Fieldwork is a process of learning how to live by understanding how others live.

**Yoko Hayami, PhD**

*Professor, Center for Southeast Asian Studies*  
[www.cseas.kyoto-u.ac.jp/en/2013/06/yoko\\_hayami/](http://www.cseas.kyoto-u.ac.jp/en/2013/06/yoko_hayami/)



Karen family with the author (far right) in northern Thailand

## LETTERS Were Edo-Period Japanese Internationally Minded?

*The transition of Japan's recognition of the world during the late early-modern period.*



The first Japanese map of Russia (late 18<sup>th</sup> century)

I research how Japanese people's recognition of the world changed from the end of the 18<sup>th</sup> century to the beginning of the 19<sup>th</sup> century. My recent research has shown that during this transitional period, the Japanese began to see the world as divided into “Europe” and “everything else.” I am now getting closer to discovering the prototype that has been shaping the Japanese worldview since early-modern times.



**Naoko Iwasaki, PhD**

*Professor, Kyoto University Museum*  
[www.museum.kyoto-u.ac.jp/](http://www.museum.kyoto-u.ac.jp/)

## CELL-BIO How to Find the Way to Divide

*The mechanisms for oriented cell division.*

One strategy of organisms to maintain their homeostasis is replacing old cells with new ones without altering basic configurations of their bodies. Many types of stem cells contribute to the tissue metabolism by providing the tissues with fresh cells at the right time and the right place. The orientation of stem cell division is another management system to regulate tissue homeostasis. Oriented cell division

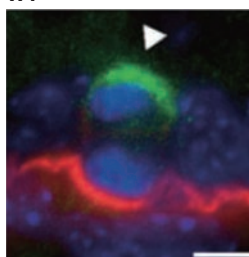
allows cells to divide symmetrically or asymmetrically by directing the spindle axis parallel or perpendicularly, respectively, to the pre-determined axis. Our research aims to elucidate how the cells decide their division orientation in a given tissue.



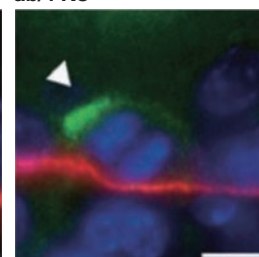
**Fumiko Toyoshima, PhD** *Professor, Institute for Virus Research*

[www.virus.kyoto-u.ac.jp/Lab/Toyoshima-HP/EnHome.html](http://www.virus.kyoto-u.ac.jp/Lab/Toyoshima-HP/EnHome.html)

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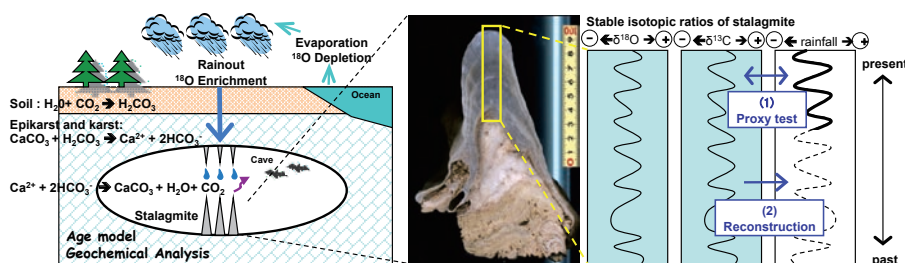


ab/1 KO



## GEO Key to the Future

*Palaeoclimatological studies using stalagmites and tree-rings in Asia.*



and tree-rings. Particularly I focus on the ancient rainfall anomaly in Asia because the region is especially a densely populated region and might suffer from terrible weather disasters such as flood and drought. I would like to contribute to the precipitation prediction based on "Asian past rainfall information" that is provided by my study, even in a small way.

**Yumiko Watanabe, PhD** *Assistant Professor, Graduate School of Science*

[www.kueps.kyoto-u.ac.jp/~web-tecto/](http://www.kueps.kyoto-u.ac.jp/~web-tecto/)



## SEISMO Seismometer

*A magical tool to measure waves.*

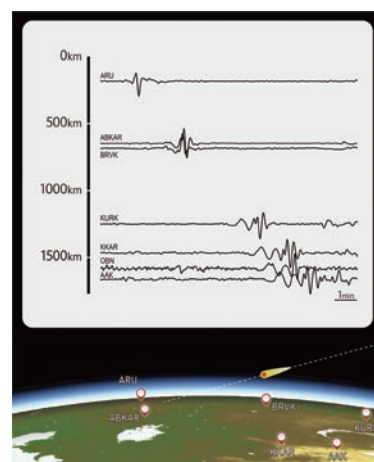
A seismometer is a sensor to measure seismic waves for determining the location and size of earthquakes. Today, we can determine these very fast (within a few seconds), so warnings of earthquakes can be sent to cell phones before the strong shaking arrives. Seismometers can also measure other kinds of waves. In February 2013, a meteorite fell in Russia producing a strong sonic boom, and the signal was recorded by seismometers. Shakings from huge landslides are also measured by seismometers, and their size, speed, and direction are estimated. Extracting secret information hidden in seismic records is an interesting challenge for us.



**Masumi Yamada, PhD**

*Assistant Professor, Disaster Prevention Research Institute*

[www.eqh.dpri.kyoto-u.ac.jp/~masumi/index.htm](http://www.eqh.dpri.kyoto-u.ac.jp/~masumi/index.htm)





## ECOL Sustainable Livelihood Based on the Blessings of Satoyama

*Assessing and planning local resource cycle systems in satoyama cultural landscapes.*

Satoyama is a cradle of diversity that dwells in local nature and culture. The importance of satoyama landscapes providing habitats for rare species and conserving biodiversity is widely acknowledged, and the concept of “living in harmony with nature” has become essential in environmental studies. What, however, does “living in harmony with nature” actually mean? In the Laboratory of Landscape Ecology and Planning, we use interdisciplinary methods to investigate satoyama-specific traditional resource cycling and risk avoidance techniques that can be revived today with a view to a sustainable society and effective risk management.



**Katsue Fukamachi, PhD**

*Associate Professor, Graduate School of Global Environmental Studies*

[www.ges.kyoto-u.ac.jp/cyp/modules/contents/index.php/shokai/faculty\\_staff/fukamachi\\_katsue.html?ml\\_lang=en](http://www.ges.kyoto-u.ac.jp/cyp/modules/contents/index.php/shokai/faculty_staff/fukamachi_katsue.html?ml_lang=en)



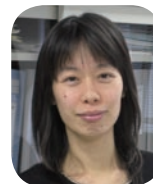
## ETHICS What Measures are Needed to Ensure Food Safety?

*The social science perspective.*



Food is a necessary nutritional source and it also brings a sense of enjoyment to life. Ensuring food safety is therefore of utmost importance for sustenance. While natural science research is clearly necessary in this regard, social science approaches are also essential. Without understanding the complexity of food systems and the behavior of food business operators, it would be impossible to consider and implement appropriate regulatory

measures. In addition, communication with consumers is another crucial aspect. In our laboratory, we conduct research into social systems for ensuring food safety (see the figure). I am particularly interested in cross-country comparative studies on food safety systems.



**Haruyo Kudo, PhD**

*Associate Professor, Food and Agriculture Safety and Ethics (Contributed Chair)*

[www.foodsaet.kais.kyoto-u.ac.jp/index\\_en.html](http://www.foodsaet.kais.kyoto-u.ac.jp/index_en.html)

## GEOPHYS What Does Water Do for Earthquakes?

*Earthquake physics studied by seismic waves and numerical simulations.*

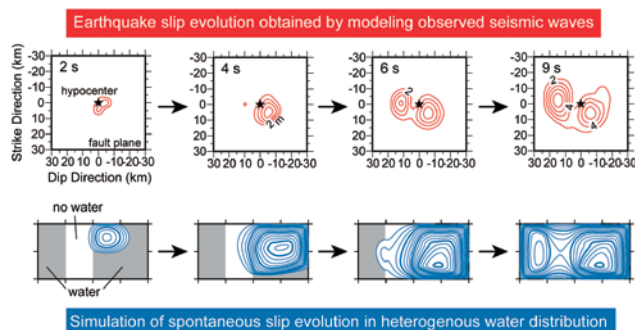
Earth is a planet with water, which exists not only in the ocean but also inside the earth. As water can make rocks soft and weak, it is expected that water plays significant roles in the dynamics of the earth. However, these mechanisms have not been fully understood yet. My challenge is to clarify the role of water in earthquakes. Seismic waves are a tool for my studies. My colleagues and I interpret observations by performing numerical simulations based on physics and results from rock experiments. We have found that slip evolution of a large earthquake could be governed by a water distribution within a subducting plate.



**Keiko Kuge, PhD**

*Associate Professor,  
Graduate School of Science*

[www-seis1.kugi.kyoto-u.ac.jp/](http://www-seis1.kugi.kyoto-u.ac.jp/)



## LAW Gender and Politics

*An Emerging Field of Political Science.*

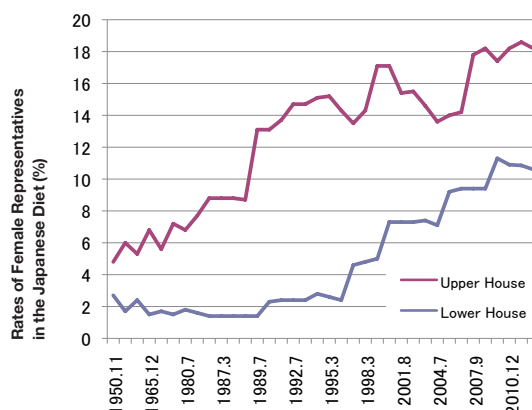
How do politics and policies construct gender in a society, and how does gender affect politics and policies? These questions have become quite important in contemporary Japan where the rapidly aging population combined with low birthrates is suspected to impede the sustenance, let alone the growth, of the economy. A series of 'structural reforms' of the Japanese political economy since the 1990s did not only aim at transforming the production system, but also at restructuring the social reproduction system, including

family and gender relations. My current task is to uncover the structural and ideational transformations of Japanese politics from the perspective of gender, and to elucidate how they are related to social changes.



**Yuki Tsuji, PhD** Associate Professor, Graduate School of Law

[kyouindb.iimc.kyoto-u.ac.jp/e/sD7bM](mailto:kyouindb.iimc.kyoto-u.ac.jp/e/sD7bM)



## ENVIRON The Surprising Eloquence of Everyday Garbage

*Looking towards a sustainable society through a study of garbage.*



Unopened food from household waste

The department where I belong to, has been carrying out a "household waste composition study" for roughly 35 years. We collect household waste, sift through it, and sort the contents into approximately 300 categories according to its material and usage. It is time-consuming and painstaking work; however, the result gives us a glimpse into the current "wasteful" (*mottainai* in Japanese) lifestyle and society. For example, we often find packages of food thrown out unopened and plastic shopping bags which have been used once and thrown away. We are pressing forward with their studies to find ways to reduce waste according to the 3Rs policy (reduce, reuse, recycle), and to move toward a more advanced recycling society.



**Misuzu Asari, PhD**

Assistant Professor, Environment Preservation Research Center  
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About the Cover



## The Kyoto University Clock Tower

The most recognizable structure of the Kyoto University campus, the Clock Tower was designed by Goichi Takeda, the university's first Professor of Architecture, and completed in 1925. With attention given to Secession-style design in all of its facets, the sonorous feel of the exterior makes for a building of immense historical significance.

## PRIM Origins of the Human Mind

*Perspectives from Primatology and Developmental Psychology.*

Studies on nonhuman primates are essential to gain a better understanding of the human mind. Comparative developmental studies tell us about how the human mind was formed during cognitive development and evolutionary history. Chimpanzees are the closest living relatives to humans and their developmental process can be examined in an identical test-setting to human infants. Face-to-face tasks using blocks and cups illuminated fundamental similarities as well as some differences between the cognitive development of the two species. Field observation of wild primates also sheds

light on the evolutionary origin of mother-infant bonds, social interaction with group members, and ecological adaptation to various environments.



**Misato Hayashi, PhD**

Assistant Professor, Primate Research Institute  
[langint.pri.kyoto-u.ac.jp/ai/index.html](http://langint.pri.kyoto-u.ac.jp/ai/index.html)



## ANTHROPOL How to Live in a City

*Urban anthropological insights from Africa and Japan.*



Majoring in urban anthropology, I have conducted fieldwork on the Bamiléké, a group which migrated to Yaoundé, the capital of Cameroon. Through my research, I have observed how the Bamiléké immigrants formed hometown associations to help one another and circulate money between the city and their hometowns. Currently, I am also studying the Rotating Savings and Credit Association (ROSCA) in Naha, Okinawa, called Moai, through which its members can deepen their friendships. From the associational lives of the Bamiléké in Yaoundé and Okinawans in Naha, my colleagues and I can learn how to foster supportive relationships to enhance life in large cities.

**Misa Hirano-Nomoto, PhD**

Associate Professor, Graduate School of Asian and African Area Studies  
[jambo.africa.kyoto-u.ac.jp/member/hirano.html](http://jambo.africa.kyoto-u.ac.jp/member/hirano.html)



When I began studying at Kyoto University in early April 1999, I was astonished by the sheer number of undergraduates cycling on Higashi-ichido Street. I have never seen such a high density of cyclists anywhere in the world.... Somehow I felt then that part of the campus and the Clock Tower belong to these undergraduates — the real *Kyodai-sei* — and not to myself, having just joined from graduate school.

However, when I first saw a photograph of this scenery in my Hong Kong office, including the cherry blossom at the front and Hidari-Daimonji mountain at the back, I felt that I too used to belong there, and that now I can draw the Clock Tower.

**Kiyoko Yamaguchi, PhD** (Her profile is next page)



About  
the Clock Tower



## PSYCHOL Do We Need Psychological Problems?

*Researching kokoro from the perspective of clinical psychology.*



During times of great disaster, the human psyche exhibits no psychological symptoms. The reality of the danger does not allow space for inner conflict. After the disaster, however, many psychological symptoms emerge. We found such phenomena in the care work for the Great East Japan Earthquake. Even when peace is attained in the outer world, we need some inner struggles to work with. Our psyche keeps some tasks in any circumstances to change itself. Clinical psychologists research into the psychological problems and their transformation through the psychotherapy, which shows us the resilience and potential of our psyche.



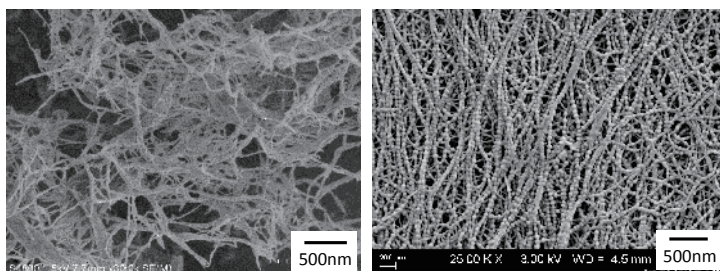
**Chihiro Hatanaka, PhD** *Uehiro Assistant Professor, Kokoro Research Center*  
[kokoro.kyoto-u.ac.jp/en/index.html](http://kokoro.kyoto-u.ac.jp/en/index.html)

## BIO-MATS Make Biomass Value-Added Materials

*Studies of converting biomass into plastics as well as nanofiber.*

Efforts to improve added value are being carried out in all materials. Such improvements can be made by changes in the material itself, or by using it in a form more excellent as the material. To convert biomass with an insoluble and infusible nature into biomass with solubility and fusibility is an example of the former method of improvement. Conversion of cellulose (existing in the largest quantity

as a biomass component) into nanofibers as a reinforcing material is an example of the latter method. My colleagues and I are trying to impart plastic properties to biomass. We are also receiving a Japan Science and Technology Agency (JST) subsidy for our work seeking to improve the properties of lithium ion battery separator film by adding cellulose nanofibers.



**Mariko Yoshioka, PhD**

*Lecturer, Graduate School of Agriculture*  
[www.fukugou.kais.kyoto-u.ac.jp/frame\\_index.html](http://www.fukugou.kais.kyoto-u.ac.jp/frame_index.html)



**Kiyoko Yamaguchi** was born in Shiga Prefecture, Japan, in 1976 and studied architectural design at UC Berkeley. After obtaining a PhD in Southeast Asian Area Studies from Kyoto University in 2005 and conducting her research on Philippine architectural history as a JSPS post-doctoral fellow, she taught at the History Department of The Chinese University of Hong Kong from 2006 to 2014. As her architectural drawing was selected for The Royal Watercolour Society 2014 Competition, she decided to change her career path and become an artist.

**WEB** [www.history.cuhk.edu.hk/kyamaguchi.html](http://www.history.cuhk.edu.hk/kyamaguchi.html)

## MED Living with Natural Disasters

*The effect of disasters depends on our preparedness in everyday life.*



There are not many people who consider disasters to be their own problem. When a large-scale disaster occurs, every victim says “I never thought it would happen to me.” The damage incurred depends on the degree of structural and social measures taken in preparation for disasters. My research examines how to save people’s lives in a disaster and everyday preparedness for disaster survival. If we understand the causes and circumstances of deaths from disasters and the measures we should take in everyday life, we can decrease not only the number of deaths, but also the difficulty of life after a disaster.

**Maki Koyama, PhD**

*Associate Professor, Unit for Liveable Cities, Graduate School of Engineering/Medicine*  
[researchmap.jp/makik/?lang=english](http://researchmap.jp/makik/?lang=english)



## LETTER Homo sum: Humani nil a me alienum puto

*Epistemological philosophy questions human activities that give birth to scientific knowledge.”*

I may be as curious and meddling as the ancient playwright Terence (190?-159 BC) who wrote “I am a human being: I regard nothing that concerns human beings as foreign to my interests.” That is why I study epistemology, a branch of modern philosophy focusing on human knowledge. A French philosopher of the 20<sup>th</sup> century, Michel Foucault (1926-1984) once asserted that what philosophy should reveal today is that which is visible but which people ignore, while science, on the other hand, should reveal what has previously been invisible. So, what exactly do human beings see and know today?



**Yuriko Tanaka** *Assistant Professor, Institute for Research in Humanities*  
[www.zinbun.kyoto-u.ac.jp/e/](http://www.zinbun.kyoto-u.ac.jp/e/)



## NEURO What is Mental Health in an Internationalized Society?

*Scientifically investigating health and internationalization.*

At the Sakagami Laboratory, Medical doctors and experts in international education gather at this laboratory to engage in research on health and internationalization from various perspectives. The stigma regarding mental health varies from country to country, and in our laboratory, my colleagues and I examine the personal and social stigmas associated with mental diseases in various regions of the world. My laboratory also conducts research on the health of students who are planning to go abroad. We investigate risk factors associated with health problems that may arise while studying abroad. Also, working in cooperation with external medical institutions, my laboratory engages in research on occupational stress. Due to the rapid development of internationalization, occupational mental health-related problems are expected to become even more complex and challenging in the future. At my laboratory, we hold a weekly meeting to discuss our research and share ideas. We strive to build on our research on a daily basis, with the sincere wish that our results may benefit society.



**Yu Sakagami, MD, PhD**

*Associate Professor, The International Center*  
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