# JSPS QUARTERLY

JAPAN SOCIETY FOR THE PROMOTION OF SCIENCE

FEATURE:

## Japan Launches Its Fifth Science and Technology Basic Plan

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# Japan Launches Its Fifth Science and Technology Basic Plan

In January, the Japanese government launched its 5th Basic Plan to systematically advance science and technology. Twenty years had passed since the enactment of the Science and Technology Basic Law in 1995. This 5th S&T Basic Plan sets forth a policy for advancing science, technology and innovation (STI)[1] over a 5-year period from 2016 to 2021. Clearly articulating the importance of scientific research, the Plan is expected to increase opportunities and platforms for the Japan Society for the Promotion of Science (JSPS) to contribute to STI advancement in Japan. This article introduces the Plan and its four policy pillars.

## The Fifth S&T Basic Plan

Rapid progress in science and technology and milestone advances in information and communication technology (ICT) are spawning new global movements, including an expanding globalization of various borderless societal activities, an added emphasis on open innovation, a flourishing of new knowledge frontiers, and a trend toward open science. Interaction among such complexly entwined trends is rapidly altering the world's economic and societal landscapes, ushering in a new and epic era of transformation. At the same time, Japan is beset by a litany of pressing issues, including scarce energy, material and food resources, an aging population and low birth rate, socioeconomic impoverishment of its regional communities, and an imperative to respond to recurring natural calamities, coupled by the need to create a safe and sound environment for its people. On a global plain, there is also a mountain of issues that Japan must be involved in addressing. These include infectious diseases and other threats to human wellbeing, climate change, and depleting biodiversity.

New paths will need to be blazed through the milieu of shifts and changes taking place in the world's economies and societies. To pave these paths and solve prevailing issues both domestic and global, Japan will need to refine itself into a country that possesses sustainable economic strength, that secures the safety and security of the nation and its people while guaranteeing them a high quality of life, that makes independent contributions to the sustainable development of global society, and that perpetually creates diverse and superlative knowledge assets while expediting their societal application in the form of new economic, social and public values. To accomplish these objectives, the government intends to make an R&D investment equivalent to 1% of the nation's gross domestic product (GDP) in the Plan. (At an average GDP growth rate of 3.3%, the total investment over the 5-year period would be ¥26 trillion.) In the coming period, STI will be advanced in Japan through programs and initiatives carried out under the following four pillars of the S&T Basic Plan.

### 1 Generating New Values toward Future Industrial Development and Societal Transformation

The Plan calls for the building of robust systems that give advent to a "super smart society," one that advances the kind of research and development that spawns non-continuous innovation, yielding a successive chain of new values and services—thus ushering in a new era of societal transformation.

- Advance R&D and foster human resources in ways that boldly tackle future challenges.
- Toward achieving a "super smart society" that fuses cyber and physical space (real world), carry out a series of "Society 5.0" initiatives in ways that spur cutting-edge cyberspace advances that deliver innovated services and new values.

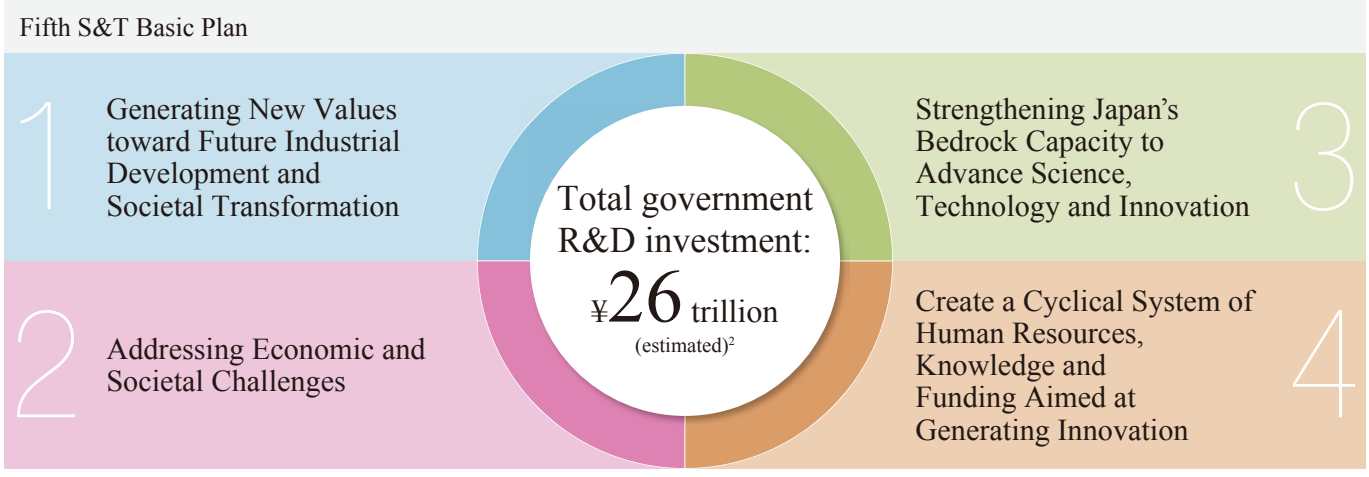
### 2 Addressing Economic and Societal Challenges

The Plan stipulates taking the vanguard in addressing emerging issues in both Japan and on the global plain, establishing a national strategy for tackling them, and advancing STI in ways that produce solutions.

- Advance R&D on various issues prevailing in Japan and on a global scale, coupled with the societal implementation of such initiatives.
- Strengthen over a long term science and technology aimed at strategically important frontiers, particularly those related to oceans and space.

### 3 Strengthening Japan's Bedrock Capacity to Advance Science, Technology and Innovation

To effectively and flexibly address the various changes that will




1. STI is defined here as a means of creating intellectual assets and cultural values based upon new knowledge generated from discovery, invention and other scientific advances, coupled with innovation in distilling such knowledge into the creation of new economic, social and public values.
2. Calculation: At an average GDP growth rate of 3.3%, the government's total R&D investment will be ¥26 trillion over the Plan's 5-year period.

occur in future society, Japan's fundamental capacity to advance science, technology and innovation will need to be bolstered by such means as fostering talented young researchers while actively engaging them in research initiatives at an early stage in their careers, and reforming universities while strengthening their research and education functions.

- Systematically advance the training and career development of young and female researchers; advance, reform and strengthen modalities of scientific research; and integrate the reform of the national universities with that of the government's research-funding systems.

### 4 Create a Cyclical System of Human Resources, Knowledge and Funding Aimed at Generating Innovation

To create new values and expedite their implementation within society, a system needs to be put in place for generating innovation that hurdles barriers impeding the virtuous cycling of human capital, knowledge assets and funding resources. Through it, solid linkage will need to be established among corporations, universities and public research institutions in synergistic ways that include the start-up of more venture businesses.

- Create and strengthen systems for advancing open innovation and inclusive innovation.

## Strengthening Japan's Bedrock Capacity to Advance Science, Technology and Innovation

Among these four policy pillars, it is this one in which JSPS will play major roles in implementing the following S&T Basic Plan's mandates.

(1) Strengthening human resource capacity

- Research support is to be strengthened in ways that give full expression to the abilities and interests of young researchers, who will play critical roles in shouldering the advancement of science, technology and innovation. Currently in Japan, their career paths lack clarity and their employment lacks stability, while an environment conducive to them carrying out independent research remains underdeveloped. Effort will be made to increase by 10% younger university faculty of up to 39 years old.
- University education reform is to be advanced through collaboration between the academic and industrial sectors, while fellowships and other student support is to be expanded.
- An environment is to be established and support provided for female researchers that accommodates childbirth and other life events while enabling them to advance their research activities and careers.
- Expanded initiative is to be taken in building networks with high-potential research institutions in other countries, in creating networks between Japanese researchers who have done research abroad and overseas researchers who have experienced living in Japan, and in inviting excellent overseas researchers to Japan for both purposes of collaboration and employment.

(2) Strengthening knowledge foundations

- Toward advancing scientific research driven by researchers' intrinsic motivation, which is the wellspring of innovation, programs are to be reformed and strengthened from a vantage point of making research pursuits more challenging, comprehensive, interdisciplinary, and international. The Grants-in-Aid for Scientific Research (KAKENHI) program is to be revised in ways that upgrade its selection system, promote international joint research, and strengthen support for researchers who take on novel and challenging research topics.
- Basic research is to be enhanced and strengthened based on demand and government strategy, and top world-level research hubs are to be built that provide an excellent research environment while boasting a high global research standard.
- While increasing the total number of research papers issued from Japan, a goal is set for 10% of them being included among the top 10% of most cited papers.

For more details about the 5th S&T Basic Plan, please see the following websites.
Outline of the Plan: http://www8.cao.go.jp/cstp/english/basic/5thbasicplan_outline.pdf
The full Plan: http://www8.cao.go.jp/cstp/english/basic/5thbasicplan.pdf

## Message from Dr. Yuichiro Anzai, President, Japan Society for the Promotion of Science

Inaugurated at this juncture, one of the most significant aspects of Japan's 5th Science and Technology Basic Plan is the solid incorporation of "scientific research" within its core policy. This is the greatest weight placed by the government on scientific research over the 20 years since the first Basic Plan was enacted in 1996. This Plan places special emphasis on advancing both scientific research and basic research by an array of concrete means such as reforming the Grants-in-Aid for Scientific Research (KAKENHI) system so as to boost support for scientific research initiatives, fostering talented young researchers while invigorating the participation of female scientists in research activities, and promoting international joint research while building ever-more robust international research networks. JSPS's programs are integrally related to all of these areas of the new S&T Basic Plan and will play an instrumental role in implementing them.

Going forward as Japan's core research funding agency and largest provider of support for scientific research, which is at the bedrock of the new S&T Basic Plan, the Japan Society for the Promotion of Science will strive to both enhance and strengthen its research support and promotion programs. In this endeavour, I ask for your greatly appreciated and continued cooperation.

I hope this article on Japan's 5th S&T Basic Plan will give the reader a deeper understanding of the initiatives being taken by Japan to advance science and technology.

# Award Ceremony Held for Sixth *Ikushi* Prize

Graced by the presence of Prince and Princess Akishino, the Sixth *Ikushi* Prize award ceremony was held by JSPS at the Japan Academy on 2 March. At the ceremony, 18 young researchers received an *Ikushi* certificate and medal.

In 2009, JSPS received an endowment from Emperor Akihito on the 20th year of his reign. Amidst a severe economic environment in Japan, His Majesty's desire was to encourage and support young scientists who are working diligently to advance their studies and research. In deference to his wishes, JSPS established the *Ikushi* Prize program and placed it into operation in FY 2010. It functions to formally recognize outstanding doctoral students who can be expected to contribute to Japan's future scientific advancement, while seeking to fan the flames of their enthusiasm for education and research pursuit.

For the conferral of the Sixth *Ikushi* Prize, last March a request to nominate candidates was sent out to 2,716 Japanese universities and academic societies, from which 150 nominations were received by June. Over a 6-month period, JSPS's Research Center for Science Systems conducted preliminary document and panel reviews on the nominees, upon which the program's Selection Committee made the final decisions. Meeting on 6 January, the Committee members engaged in a vigorous discussion of the nominees; taking into account their current research activities and future potential, the members came to the difficult decision on which 18 nominees to select for this year's Prize.

JSPS president Dr. Yuichiro Anzai opened the ceremony with introductory remarks, followed by Selection Committee chair Dr. Takeshi Sasaki, who reported on the vetting process. Then, Dr. Anzai presented an *Ikushi* certificate and medal to Ms. Minako Ito, a doctoral student in Keio University Graduate School of Medicine, who received them as a representative of all the awardees. This was followed by a congratulatory message from the Minister of Education, Culture, Sports, Science and Technology (MEXT), read by Mr. Tsutomu Tomioka, State Minister of MEXT. The program concluded with a message of appreciation and future resolve on behalf of the awardees by Ms. Ito.

After the ceremony, a tea party was held at the Japan Academy, in which Prince and Princess Akishino enjoyed pleasant conversation with Dr. Sasaki and the *Ikushi* laureates.

For additional information about the Award, please visit the following site:
https://www.jsps.go.jp/english/e-ikushi-prize/awards_fy2015_01.html

Research Fellowship Division

## On Receiving the Sixth *Ikushi* Prize
## By Ms. Minako Ito, Keio University Graduate School of Medicine

*On behalf of this year's 18 Ikushi Prize recipients, I wish to express our gratitude and to offer a short message. I first want to extend our deepest appreciation to Their Majesties the Emperor and Empress, who accord young researchers unceasing support and through whose graciousness this radiant Prize has been created to encourage us. Our sincerest appreciation is also extended to Prince and Princess Akishino, who honor us with their esteemed attendance in this ceremony. We greatly appreciate the opportunity given us to bask in the glory of receiving this treasured Prize, though it is an honor far too great to be deserved.*

*In my research, I am attempting to elucidate the molecular mechanisms of the inflammatory response that accompanies a stroke (cerebral infarction) with an eye to developing treatments for stroke sufferers. Despite the fact that strokes are a major cause of bedriddeness, as yet effective treatment is limited. As society ages, there is a heightening demand for advanced stroke treatments. I believe that our research takes a new step in developing such curative drugs.*

*It's my dream to be a medical researcher who contributes to the care and cure of many patients. Last year, Prof. Satoshi Ōmura received the Nobel Prize in physiology and medicine for his discovery of the wonder drug Avermectin. Though research that succeeds in discovering such new curative drugs is rare, I have set my goal on doing so. Working devotedly to achieve it, I believe I can contribute, if only in a small way, to elucidating the underlying science and developing new curative drug therapies.*

*Encouraged by the receipt of this Prize, our group of Ikushi laureates will continue challenging new frontiers, while never forgetting the joy of scientific pursuit no matter how daunting the task. We take this opportunity to extend a special word of gratitude to our mentors, who have provided us with superb research environments and given us invaluable guidance and instruction. We also want to extend a hearty thanks to our colleagues who work with and assist us in our joint endeavors, and to our families for their unrelenting support.*

# Twelfth Award of JSPS Prize

On 24 February, a ceremony was held to award the 12th JSPS Prize. Selected were 25 talented young researchers with excellent records of scientific inquiry and exceptional promise to be trailblazers of scientific research in Japan. The ceremony for this FY2015 Prize was held at the Japan Academy in the presence of Their Imperial Highnesses Prince and Princess Akishino.

## Selection of JSPS Prize Awardees

JSPS sent out requests for Prize nominations to 3,603 Japanese research institutions and academic societies, from which it received 254 responses in April. Adding the carryovers from the prior year, 370 nominees were screened by the researchers of JSPS's Research Center for Science Systems. Based on the results, the JSPS Prize Selection Committee, chaired by Dr. Ryoji Noyori (2001 Nobel laureate in chemistry) and comprising 13 members, made the final decision on the 25 awardees.

## Award Ceremony

The ceremony for awarding the JSPS Prize was held in conjunction with the awarding of the Japan Academy Medal. At the ceremony on 24 February, JSPS president Dr. Yuichiro Anzai offered an opening message, followed by a report on the selection process from Dr. Noyori. Then, Dr. Anzai presented the 25 recipients with a certificate of merit, a medal, and a purse of ¥1.1 million.

A tandem ceremony was held to confer the Japan Academy Medal on six of the JSPS Prize recipients. First, Japan Academy president Dr. Takashi Sugimura delivered welcoming remarks, after which Dr. Hideki Shirakawa, chairman of the Academy's selection committee, explained the vetting process. Then, Dr. Sugimura presented the

medal and a commemorative gift to each of the awardees. (Essays by the six awardees can be found on pages 6 and 7 of this newsletter.)

Prince Akishino offered remarks and Mr. Hiroshi Hase, Minister of Education, Culture, Sports, Science and Technology, gave a congratulatory message. To conclude the meeting, a message of appreciation from the Prize recipients was delivered by Dr. Osamu Takeuchi, professor, Institute for Virus Research, Kyoto University.

After the ceremony, a celebration party was held. Attended by Prince and Princess Akishino, the Prize recipients, their guests, and the ceremony attendees, an atmosphere conducive to pleasant conversation was enjoyed by all.

For additional information about this Prize, please visit the following site:
https://www.jsps.go.jp/english/e-jsps-prize/index.html

Research Fellowship Division

## Remarks by Dr. Ryoji Noyori, Selection Committee Chair

*As chair of the JSPS Prize Selection Committee, I wish to describe the selection process for the twelfth annual JSPS Prize and to offer some words of encouragement to the young recipients.*

*This time, the Committee received 370 nominations from universities, research institutes and related academic societies. The Research Center for Science Systems, established within the Japan Society for the Promotion of Science, carried out the preliminary screening, based on the results of which the 13-member Selection Committee chose the recipients for this year's JSPS Prize.*

*Having carried out a rigorous evaluation from multiple perspectives including the candidates' research results, originality, and future potential, the Committee selected you, the 25 gifted young researchers gathered here today as the 2015 JSPS Prize recipients. When considering the fact that only one out of about every 15 of the initial nominees was chosen, the Prize's vetting process, through which you were selected, was indeed a very competitive one.*

*On your selection for this prestigious award, I wish to extend both you and the colleagues who support your work a most hearty word of congratulations.*

*Last year again, Japanese researchers won the Nobel Prize, providing a beacon of encouragement for up-and-coming researchers of a younger generation. One of the important merits of scientific research is its ability to give people a sound life view and vibrant living capacity. Dr. Takaaki Kajita's research on neutrinos gives us pause to think about the wellspring of all things and the evolutional course we have travelled to get here. On the other hand, research advanced by Dr. Satoshi Ōmura on parasitic infection has saved the lives of many people in developing nations. It was by virtue of his fervent desire to serve humanity and by way of the international collaboration he pursued between academia and industry that Dr. Ōmura succeeded in developing the wonder drug Avermectin. The pointers imparted by his example should be of valuable reference to the wider scientific community.*

*The boundless quest for scientific enlightenment will continue to create new depths and genres of knowledge. Meanwhile, depleting energy resources and unprecedented climate change are severely impacting human society. This generation must muster all of its strength in taking responsibility to pass on optimum conditions for survival to future generations.*

*I entreat you, this year's JSPS Prize laureates across the spectrum of the natural sciences, humanities and social sciences, to bear this weighty responsibility in mind as you play leading roles in advancing science and collaborate with colleagues both here in Japan and abroad.*

# Twelfth JSPS Prize Awardees: Their Work and Aspirations

Twenty-five researchers were awarded the 12th JSPS Prize. Among them, six were also given the Japan Academy Medal. They describe their research initiates in the following essays.

For more information about the Japan Academy Medal, please visit the following website: http://www.japan-acad.go.jp/en/news/2016/011201.html

## Total History of Indonesian Local Society in the Early-Modern and Modern Eras

My research re-examines the history of Banten Sultanate, West Java, from 1750 to 1830. Many scholars have thought that Southeast Asia fell into decline in the 18th century due to declining local states and intensifying European control. More recent scholars argue that several local states continued to prosper, but no one has paid serious attention to local societies, nor attempted to situate them within global history.

Based on the examination of Dutch, Javanese, and other sources, I analyzed the natural environment, population, agriculture, and trade of Banten's local societies and their contacts with outside merchants. As a result, I've concluded that, whereas the power of the Dutch East India Company and the sultan declined, the local societies maintained their vitality. Local elites expanded their influence through the Dutch policy, allowing them to increase pepper production, while local people clandestinely sold their products, like pepper, to outside merchants such as the Chinese and British. As these products eventually reached the China market, the local societies became incorporated in the booming Sino-Southeast Asian trade. In this way the local people of Banten were able to connect themselves to the global economy.

In the future, I will continue to advance this sort of research on Indonesian local history in an effort to explore the dynamism springing from and the globalization incubated within its local societies.

### Dr. Atsushi Ota

2016-present: Associate Professor, Keio University
2012: Associate Professor, Graduate School of Letters, Hiroshima University
2008: Assistant Research Fellow, Research Center for Humanities and Social Sciences, Academia Sinica
2006: Postdoctoral Research Fellow, National University of Singapore
2005: Associate Research Fellow, Rutgers Center for Historical Analysis, Rutgers, State University of New Jersey
2005: Received Ph.D. from Leiden University
2003: JSPS Postdoctoral Research Fellow, Keio University
2000: JSPS Doctoral Course Fellow, Waseda University
1993: Graduated from Waseda University

## The Study of 'Tsujigahana' Textile Art: A Cultural Resources Study Perspective on Its Terminology and Technique

My study leads to a more accurate understanding of the true nature of *tsujigahana*, a classical art form that has long been misunderstood. The antique textiles known today by the term *tsujigahana* are fabrics characterized by motifs rendered in stitch-resist dyeing, which date from the late Muromachi to the early Edo period. In this study, I examined records remaining from the time when *tsujigahana* textiles were used, but could not find any stating that *tsujigahana* was produced using stitch-resist techniques.

My doctoral dissertation examined the term *tsujigahana* as it appeared in historical documents from the 15th–17th century, clarifying as much as possible the original nature of *tsujigahana* through detailed consideration of related factors, especially by analyzing the significance of *tsujigahana* in a Portuguese-Japanese dictionary published in the early 17th century. Additionally, I focused on the picture of a *katsurame* fish-vender wearing a *tsujigahana* kimono, painted in the late Muromachi period. As a result, I've speculated that *tsujigahana* was a summer garment with painted red peonies using stencils and/or paste-resist dyeing techniques. I also analyzed 289 fragments and costumes called *tsujigahana*, but found that there was no real *tsujigahana* fabric among them.

I will continue my research on both antique textiles and historical source books with the intent to elucidate the yet-unknown cultural history of Japanese textiles and costumes.

### Dr. Yuzuruha Oyama

2015-present: Senior Manager of Decorative Arts, Curatorial Research Department, Tokyo National Museum
2011: Received Ph.D. from Graduate School of Humanities and Sociology, University of Tokyo
2007: Graduated from Graduate School of Humanities and Sociology, University of Tokyo
2007: Senior Curator of Decorative Arts, Tokyo National Museum
2002: Assistant Curator of Decorative Arts, Tokyo National Museum
1995: Assistant Curator, Nara Prefectural Museum of Art
1994: Graduated from Ochanomizu University

## Origin of Seismic Hum

For a long time, it had been thought that only huge earthquakes excite Earth's free oscillations in very low frequency bands. In 1998, our group discovered that the Earth oscillates persistently even on seismically quiet days, giving rise to what is now known as "seismic hum." We inferred that its sources were located in the northern Pacific Ocean from November to April whereas they were located along the eastern and western Pacific rims through the Indian Ocean from May to October. Together with other observations, we proposed that its dominant excitation mechanism is topographic coupling between ocean infragravity waves and seismic waves on the sea-bottom horizon. To further understand these phenomena, we will consider the solid Earth, oceans, and atmosphere as a single system. My goal in the long term is to collaborate with related researchers in extending seismology to the atmosphere and oceans. Employing this new point of view, I would like to provide input for future seismic observations.

Seismic hum can be used as a vehicle for exploring the deep Earth's interior. Applicable also to exploring seismic inactive areas, it is feasible that seismic hum can even be used in investigating tectonically inactive terrestrial planets.

### Dr. Kiwamu Nishida

2013-present: Associate Professor, Earthquake Research Institute, University of Tokyo
2007: Assistant Professor, Earthquake Research Institute, University of Tokyo
2002: Research Associate, Earthquake Research Institute, University of Tokyo
2001: JSPS Postdoctoral Fellow, Earthquake Research Institute, University of Tokyo
2001: Received Ph.D. from School of Science, University of Tokyo
2000: JSPS Doctoral Course Fellow, University of Tokyo
1996: Graduated from Tokyo Institute of Technology

## Information Theory and Quantum Information Theory for Finite-Coding-Length

My research area is in classical and quantum information theory. Information theory is the research area in which discussion is advanced on various types of information processing, e.g., information transmission via noisy transmission channel, data compression, and the generation of secure secret keys. Quantum information theory addresses information processing based on a combination of devices subject to micro-mechanical law, while classical information theory addresses information processing based on a combination of devices subject to macro-mechanical law.

My main achievement to date is a finite block-length analysis in the area of classical and quantum information theory. Before my achievement, conventional classical and quantum information theory mainly discussed the asymptotic limits of information rates in various topics of interest. For example, in the case of information transmission via a noisy transmission channel, it focused only on the transmission rate of the error correcting code in an infinitely large coding block-length. However, a real code has only a finite block-length. So, we needed to account for the effect of finiteness in coding block-length for real application. To resolve this gap, I established a systematic solution that can be applied to various topics in classical and quantum information theory as well as to information transmission. I will continue to advance this research in the future.

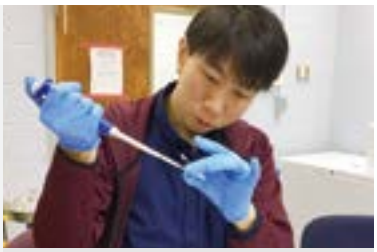

### Dr. Masahito Hayashi

2012-present: Professor, Graduate School of Mathematics, Nagoya University
2007: Associate Professor, Graduate School of Information Sciences, Tohoku University
2006: Group Leader, ERATO-SORST Quantum Computation and Information Project, Japan Science and Technology Agency (JST)
2003: Research Manager, ERATO Quantum Computation and Information Project, Japan Science and Technology Agency (JST)
2000: Researcher, Laboratory for Mathematical Neuroscience, Brain Science Institute, RIKEN
1999: Received Ph.D. from Graduate School of Science, Kyoto University
1998: JSPS Doctoral Course Fellow, Graduate School of Science, Kyoto University
1994: Graduated from Kyoto University


## Biological Control for Plant Disease; Grapevine Crown Gall

My research addresses grapevine crown gall, which is caused mainly by plant tumor-inducing bacteria called "*Agrobacterium* (=*Rhizobium*) *vitis* (Ti)." Though this is one of the most harmful diseases affecting grapevines around the world, there has been no effective method for controlling it. In conducting screening tests for potential biological control agents, we selected nonpathogenic A. vitis strain ARK-1. In a test with a 1:1 cell ratio of pathogen to non-pathogen on the grapevine and stems, strain ARK-1 proved effective in reducing the incidence of tumor formation. It also inhibited tumor formation in five different genotypes of A. vitis (Ti) strains isolated from different countries. When the roots of grapevine seedlings were soaked in a cell suspension of strain ARK-1 before planting in infested soil, ARK-1 significantly reduced the incidence of tumor formation in our field trials. We also found ARK-1 to be effective in controlling this disease in various other plant species besides grapevines. As ARK-1's biological control activity is likely based on the suppression of essential virulence genes, the mechanism by which it reduces the incidence of tumor formation is unique in that it appears to be previously unreported.

Even with these accomplishments, several important questions remain to be addressed. To understand ARK-1's effect mechanism in more detail, field validation of ARK-1 will need to be carried out under several conditions on crown gall infested vineyards in countries around the world. I believe that our research projects will contribute to controlling crown gall in not only grapevines but also diverse crop species throughout the world in the near future.




### Dr. Akira Kawaguchi

2016-present: Research Scientist, Western Region Agricultural Research Center, National Agriculture and Food Research Organization
2015: Chief, Department of Agriculture, Forestry and Fisheries, Okayama Prefectural Government
2010: Research Scientist, Research Institute for Agriculture, Okayama Prefectural Technology Center for Agriculture, Forestry and Fisheries
2009: Research Scientist, Agricultural Experiment Station, Okayama Prefectural General Agriculture Center
2007: Received Ph.D. from Graduate School of Natural Science and Technology, Okayama University
2002: Research Associate, Agricultural Experiment Station, Okayama Prefectural General Agriculture Center
2000: Graduated from Faculty of Agriculture, Kyushu University


## Molecular Mechanisms Underlying Inflammation Control in Innate Immunity

The innate immune system initially senses an invasion of pathogens via Toll-like receptors (TLRs). Innate immune cells recognizing pathogens evoke inflammatory responses by producing a set of cytokines. Whereas appropriate inflammation is critical for clearing infected organisms and inflammatory insults, excess and chronic inflammation leads to various inflammatory diseases, such as septic shock, autoimmune diseases, atherosclerosis and metabolic diseases. Therefore, inflammation is tightly controlled under various physiological conditions.

Current research in my group focuses on the molecular mechanisms regulating innate immune responses downstream of TLRs. We identified an RNase, Regnase-1, expressed in immune cells. Regnase-1 degrades messenger RNAs encoding cytokines and is critical for resolving inflammation. We found that a lack of Regnase-1 in mice results in the development of severe autoimmune inflammatory diseases, indicating the importance of Regnase-1 in the maintenance of immune homeostasis. We recently discovered that same cytokine mRNAs are degraded by two regulators, Regnase-1 and Roquin, in a spatiotemporally distinct manner. Roquin also prevents autoimmunity, demonstrating that multiple posttranscriptional regulators cooperatively control inflammatory responses.

The goal of our future studies is to understand innate immune regulatory mechanisms more comprehensively. I believe that this will be critical in deciphering the causes of inflammatory diseases, and in developing novel therapies for inflammatory diseases by manipulating innate immune reactions.


### Dr. Osamu Takeuchi

2012-present: Professor, Institute for Virus Research, Kyoto University
2007: Associate Professor, Research Institute for Microbial Diseases, Osaka University
2004: Assistant Professor, Research Institute for Microbial Diseases, Osaka University
2002: HFSP (Human Frontier Science Program) Long-Term Fellow, Dana-Farber Cancer Institute, Harvard Medical School
2001: Received Ph.D. from the Graduate School of Medicine, Osaka University
2000: JSPS Doctoral Course Fellow, Graduate School of Medicine, Osaka University
1995: Graduated from Osaka University and received M.D.

# Fifth GRC Annual Meeting Held in New Delhi


## Highlight of Annual Meeting 2016

On 26-27 May, the heads of research councils (HORCs) from around the world gathered in New Delhi to hold the fifth annual meeting of the Global Research Council (GRC). This high-level forum was attended by the heads and representatives of science promotion organizations from 45 countries and three international agencies. Cohosted by the Science and Engineering Research Board (SERB) of India and Research Councils UK (RCUK), this annual meeting addressed two themes: "Interdisciplinarity" and "Equality and Status of Women in Research." The vigorous discussions advanced on them culminated in the drafting of two proclamations: "Statement of Principles on Interdisciplinarity" and "Statement of Principles and Actions Promoting the Equality and Status of Women in Research." In adherence with these principles, GRC-member organizations will work to enhance their various research-funding policies and systems.


## Next Annual Meeting in 2017

Venued in Ottawa next May, the sixth GRC annual meeting will be cohosted by the Natural Sciences and Engineering Research Council of Canada (NSERC) and Consejo Nacional de Ciencia, Tecnología e Innovación Tecnológica (CONCYTEC), Peru. It will also address two themes: "Capacity Building and Connectivity among Granting Agencies Worldwide" and "The Dynamic Interplay between Fundamental Research and Innovation." In prelude to the annual meeting, over the next year five GRC regional meetings will be held in the Asia-Pacific, Americas, Europe, Middle East and North Africa, and Africa. The exchanges of views carried out on the two themes in each of the regional meetings will be compiled and reflected in the larger discussion at the Ottawa annual meeting.

## Future Directions

At this year's annual meeting, JSPS president Dr. Yuichiro Anzai was reelected for another one-year term as the chair of the GRC Governing Board, in which position he will continue to play a leading role in the program planning and operation of the Global Research Council. In tandem, JSPS will work to make solid contributions toward advancing the GRC's activities.

Major milestones have been achieved over the four years since the GRC was established. By strengthening yet further the GRC's programs and initiatives, it is expected that new and innovative frameworks and strategies will be developed that link even closer the world's HORCs in a consortium of research funding and science promotion aimed at robustly tackling common global "grand challenges."


For further details on GRC activities, please see the following website: http://www.globalresearchcouncil.org/

International Policy Planning Division

# Eighth HOPE Meeting Held in the Spring

On 7-11 March, the eighth in the annual series of HOPE Meetings was held in Tsukuba, Japan. This year's theme was physics, chemistry, and physiology or medicine (including related fields). It attracted 107 outstanding young researchers, specializing in various fields, from 18 countries and areas of the Asia-Pacific and Africa. Receiving lectures from eight distinguished scientists including six Nobel laureates, the young researchers also participated in small-group discussions with them. In putting together poster sessions and team presentations, they exercised ingenuity in communicating their ideas to other participants with different scientific and cultural backgrounds. Adding another dimension to their HOPE experience, Japanese cultural activities were carried out along with an observation visit to research facilities in Tsukuba City.

JSPS delights in the opportunity provided by HOPE Meetings to expand the young participants' horizons through interdisciplinary discussions with Nobel laureates and other distinguished scientists, while giving them a platform to build collegial networks with peers from other countries in the participating regions. Amidst the still-buzzing vibrations of this meeting, we look forward to welcoming another group of talented young scientists to next year's ninth HOPE Meeting.

For more information about HOPE Meetings, please visit our webpage: https://www.jsps.go.jp/english/e-hope/outline8.html

Research Cooperation Division

## Lecturers

Prof. Makoto Kobayashi (Chair, the Eighth HOPE Meeting)
Nobel Laureate in Physics 2008

Prof. Serge Haroche
Nobel Laureate in Physics 2012

Prof. Shuji Nakamura
Nobel Laureate in Physics 2014

Prof. Jean-Marie Lehn
Nobel Laureate in Chemistry 1987

Prof. Ada Yonath
Nobel Laureate in Chemistry 2009

Prof. Barry J. Marshall
Nobel Laureate in Physiology or Medicine 2005

Prof. Gunnar Öquist
Professor Emeritus, Umeå University, Sweden
Former Secretary General of the Royal Swedish Academy of Sciences

Prof. Tetsuro Matsuzawa
Professor, Primate Research Institute, Kyoto University


Team presentation

## Comments from the participants:

"In this eighth HOPE Meeting, the scientific, technical and poster sessions, along with the lectures by the Nobel laureates, were all so excellent that they stimulated and strengthened our scientific thinking while motivating us to excel in our research activities."

"I feel really inspired to go back and cultivate a creative and curiosity-driven lab environment and to participate in global research through newly formed collaborations."

"This HOPE Meeting provided an excellent demonstration of the talents possessed by upcoming scientists in the Asia-Pacific and African regions. I hope that these meetings will continue and provide more opportunities for young researchers to hear from great scientists while fostering collaborative ties."

## HOPE Dialogue — Side Event for Younger Participants

Led by Profs. Ada Yonath and Barry J. Marshall, the HOPE Dialogue was held on Tuesday, 8 March as a side event to the HOPE Meeting. Some 44 students recruited from high schools that have participated in JSPS's Science Dialogue Program attended its one-hour group discussion sessions, followed by a 30-minute free talk session.

The students were divided into two groups so as to intensify their discussions with each session lecturer. They asked the lecturers volleys of questions, such as about their research activities, life experiences from childhood, and what motivated them to become a researcher.

After the meeting, some students commented as follows: "It was a valuable experience for me to listen to a Nobel laureate talk at such a close distance." "I felt that the lecturers were very earnest in answering every question." "I was stimulated by my interaction with students from other high schools."

Overseas Fellowship Division

Dr. Barry J. Marshall and students

# AAAS Annual Meeting Highlights Japan's WPI Program

The 2016 annual meeting of the American Association for the Advancement of Science (AAAS) was held in Washington DC on 11-15 February. JSPS set up a booth at it to introduce the World Premier International Research Center Initiative (WPI program). Operated for three days from the 12th to 14th, the booth disseminated information on the research activities of the nine WPI centers in Japan, while providing a sphere for facilitating science communication on the world's most advanced research undertakings.

The team participating in the meeting from Japan worked to raise the international visibility of the WPI program by introducing the leading-edge research activities of the various WPI centers while engaging in exchanges of views with other booth exhibitors, researchers, science journalists, and representatives of US research institutions. Manning the booth were WPI staff from the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and JSPS along with outreach personnel from each WPI center, who briefed some 320 visitors on the program's initiatives and activities. Decorated with a panel introducing the WPI program and a tapestry showing

the nine WPI centers, the booth provided exhibits and distributed pamphlets and promotional items on each center, thus serving to widely circulate information on the WPI program's frontier of science activities.

JSPS will continue conducting outreach activities like this one to raise the level of international awareness in the WPI program and WPI centers.

For further information, please see the following websites:
AAAS URL: http://www.aaas.org/page/2016-aaas-annual-meeting
WPI URL: http://www.jsps.go.jp/english/e-toplevel/index.html

Planning and Analysis Division

# JSPS-NIH Forum Held in Bethesda

On 11 March, the JSPS Washington Office and the Fogarty International Center (FIC) of the National Institutes of Health (NIH) held the 2016 JSPS-NIH Forum at Stone House, located on the NIH campus.

This Forum was held for three main purposes: To circulate within NIH information about the "JSPS Research Fellowship for Japanese Biomedical and Behavioral Researchers at NIH (KAITOKU-NIH)" program; to promote networking between the JSPS Research Fellows and NIH researchers; and to launch a new presentation-based format that builds upon the Forum's past orientation for newly arriving JSPS Research Fellows.

The Forum started with opening remarks by JSPS executive director Dr. Yasuhiro Iye, Mr. Tomohiko Arai, science counselor, Embassy of Japan, and Dr. Yoh-suke Mukouyama, chair of KAITOKU-NIH Review Panel, National Heart, Lung, and Blood Institute (NHLBI). They were followed by two invited speakers: NIH Earl Stadtman Investigator and KAITOKU-NIH host researcher Dr. Keisuke (Chris) Nagao and Rutgers assistant professor Dr. Miho Matsuda. Then, three Japanese fellows with a year or more tenure in the KAITOKU-NIH program delivered presentations on their research, followed by 13 new fellows who gave 3-minute talks on their research plans at NIH. These presentations spurred a highly animated Q&A session to end the Forum on a vibrant note.

After it, a reception, hosted by JSPS Washington Office director Dr. Mitsuaki Nozaki, started with welcoming remarks from Dr. Keiko Ozato, former chair of Review Panel, National Institute of Child Health and Human Development

Dr. Keisuke (Chris) Nagao


From the left: Dr.Kilmarx, Dr.Iye, Dr.Nozaki (Photo by FIC photographer Karin Zeitvogel)

(NICHD), and Fogarty International Center deputy director Dr. Peter Kilmarx, and with a toast proposed by NIH Office for Intramural Research deputy director Dr. Michael Gottesman. The reception was attended by some 90 people including JSPS fellows, NIH-affiliated researchers, and KAITOKU-NIH Review Panel members, who all enjoyed the opportunity that it gave them to make and renew collegial acquaintances.

Held on 11 March, the 5th anniversary of the Great East Japan Earthquake, the Forum opened with a minute of silence in remembrance of the victims.

For more information, please see the following website:
http://jspsusa.org/wp/3112016_2016-jsps-nih-forum-bethesda-maryland/

JSPS Washington Office

# JBUK Meeting Held for Japanese Researchers Based in the UK

On 3 February, the JSPS London Office held its 11th meeting for Japanese Researchers Based in the UK (JBUK). Venued in London, this JBUK meeting was mainly attended by principal investigators (PIs) holding professor, lecturer and other faculty position in British universities and research institutions. In the meeting, they discussed the JBUK network, how it constitutes a pillar of UK-Japanese scientific exchange and, as such, ways to elevate its presence in both the UK and Japan. Ideas voiced for that purpose included creating a JBUK logo mark, establishing a cooperative relationship with the JSPS Alumni Association of the UK and the Republic of Ireland, and planning events that will benefit young researchers. Segueing to common issues encountered by Japanese researchers residing in the UK, the participants discussed Britain's unique research environment, including the intense competition for research funding and rising bench fees, and the obstacles it poses to advancing research and collaboration.

This year, JSPS expanded JBUK support including for holding symposiums by JBUK PIs and inviting speakers from Japan under JSPS London's symposium scheme. This fiscal year, three such symposiums are planned. Acting upon the discussion advanced in the meeting, the London Office established a "JSPS London JBUK Japan Award" to augment its support for JBUK PIs by subsidising their travel cost when making short-term visits to Japan. In so doing, the Award works to promote the building, sustaining and expansion of UK-Japanese scientific collaboration.

Having had 126 members in 2011, in just five years JBUK membership has tripled to 380. The group continues to build its network in ways that enhance its presence not only quantitatively but also qualitatively.

For more details about the Japanese Researchers Based in the UK (JBUK) program, please see the following website:
http://www.jsps.org/institute/files/11th_jbuk_for_website2.pdf

JSPS London Office

# Symposium on Sustainable Resource Development Held in Africa

On 24 March, the JSPS Nairobi Research Station held a symposium on energy and resources in Africa. Titled "Symposium on Capacity Building in Sustainable Resource Development in Africa," it was an official event held in advance of the Tokyo International Conference on African Development (TICAD 6) scheduled for 27-28 August. Energy and resource development is also a pressing issue for Japan. Venued in Nairobi, TICAD 6 will take up this critical challenge from both regional and international perspectives.

Among the strategically important people attending the symposium were from Kenya: Hon. Dan Kazungu, cabinet secretary, Ministry of Mining, and Dr. Moses Rugutt, chief executive officer, National Commission for Science, Technology and Innovation. From Japan: Mr. Mikio Mori, deputy chief of mission, Embassy of Japan, Ms. Keiko Sano, chief representative, JICA Kenya Office, and Prof. Yoshio Ichinose, professor and leader, Nagasaki University Kenya Research Station. Altogether, more than 50 people, mostly from universities and the mining resources industry, attended the event.

Invited to speak were researchers with an in-depth knowledge of issues related to energy and resource development. They hailed from Japan (Faculty of International Resource Science, Akita University), South Africa (University of the Witwatersrand, Johannesburg), Tanzania (University of Dar es Salaam), Botswana (Botswana International University of Science and Technology), France (École des hautes études en sciences sociales), and Kenya (Kenyatta University and United States International University-Africa).

A vigorous discussion was advanced on ways and means to promote capacity building toward achieving the sustainable development of resources on the Continent, accented by an exchange

of views on the role of collaboration between Africa and Japan. It is expected that the discussion, which took a fresh look at the subject, will bear fruit in promoting sustainable development in both Africa and Japan.

As a side note, Japanese Prime Minister Shinzo Abe visited Africa in 2014 to discuss solutions for energy and resource issues. As backdrop to his visit, the three countries of East Africa had suffered a paucity of mining resources until petroleum was successfully drilled in Uganda in 2005 and in the area around Kenya's Lake Turkana in 2012. Since then, the region has been experiencing an oil boom.

Please see the following website for more information on the symposium program:
http://www.jspsnairobi.org/en/info_en/1873.html

JSPS Nairobi Research Station

## JSPS-JAAT-NRCT Seminar Held on Academia Responsibility for Sustainable Society

On 25 February, JSPS teamed up with the JSPS Alumni Association of Thailand (JAAT) and the National Research Council of Thailand (NRCT) to hold an international seminar titled "Academia Responsibility for Sustainable Society—Lessons Learned from Social Business." Venued in Bangkok, the seminar assembled 130 participants. It marked the first time for a seminar in this series to have guest panelists from the Bangladesh JSPS Alumni Association (BJSPSAA) and JSPS Alumni Association of the Philippines (JAAP).

The seminar started off with the welcome remarks by Ms. Jintanapa Sobhon, NRCT senior advisor for research, Mr. Kazunori Higuchi, JSPS Tokyo Headquarters, and Dr. Sunee Mallikamarl, JAAT president. The morning session featured lectures and a panel discussion by Japanese, Thai, Bangladeshi and Filipino researchers and administrators. Prof. Yuji Suzuki, professor emeritus, Hosei University, delivered a keynote lecture titled "Challenges and Prospects of Higher Education and Research Institutions in Asia," in which he discussed how academia can enhance its activities to realize a sustainable society through cooperation with industries and communities. Another keynote lecture was given by Dr. Edward Rubesch, director, Innovation Driven Entrepreneurship Programs, University of the Thai Chamber of Commerce, themed "Social Enterprise: Overview," in which he introduced examples of social business and described their impact on society.

The panel discussion was chaired by Dr. Gwang-Jo Kim, director, UNESCO Bangkok. Three panelists, Dr. Jaime C. Montoya, JAAP president, Prof. Dr. M. Afzal Hossain, BJSPSAA president, and Dr. Ayame Suzuki, professor, Doshisha University, gave presentations based on their respective research areas on academia's responsibility for creating a sustainable society. Dr. Montoya, executive director, Philippine Council for Health Research and Development, Department of Science and Technology (DOST-PCHRD), introduced projects conducted by his department to promote sustainable health and build a healthcare system. Dr. Hossain, dean, Faculty of Agriculture, Bangladesh Agricultural University, introduced the Grameen Bank as a successful example of a social business, showing how academia and social business can cooperate in a variety of ways. Dr. Suzuki spoke on the theme "Transformation from a learner to a change agent," describing how her students had acquired deepened "knowing" through their fieldwork in Mukugawa, Japan.

Shifting to the afternoon session, it also featured a keynote lecture

and panel discussion. Whereas the morning session was conducted in English, the afternoon session was conducted in the Thai language. The keynote lecture was delivered by Dr. Phiphat Nonthanathorn, director, Social Enterprise Leadership Center, Kasetsart University, who described the history and structure of social enterprise and introduced examples of successful social business.

Chaired by Dr. Wichet Leelamanit, assistant professor, Mahidol University, the panel discussion was carried out by three panelists: Mr. Vudhigorn Suriyachantananont, executive vice president, Toyota Motor Thailand Co., Ltd., Mr. Yodphot Wongrukmit, senior executive vice president, The Bangchak Petroleum Public Company Limited, and Dr. Tanit Changthavorn, acting director general, Biodiversity Based Economy Development Organization (BEDO). They gave presentations on the activities of their organizations' initiatives to create a sustainable society, including such subjects as corporate philanthropy, social innovation, and sustainable biodiversity based on community involvement.

On 26 February, JAAT held its executive committee meeting, which was followed by a JSPS-NRCT RONPAKU Medal Award Ceremony, presentations by the 2014 awardees on their PhD theses, and a JAAT general assembly. Five out of seven awardees who successfully obtained PhD degrees in 2014 attended the ceremony. BJSPSAA president Dr. Hossain and general secretary Dr. Nur Ahamed Khondaker spoke at the ceremony, voicing their desire to strengthen the collaborative relationship among JAAT, JAAP and BJSPSAA.

For more information on this seminar, please visit the following website: http://jsps-th.org/jsps_en/2016/02/25/884/

JSPS Bangkok Office

## JSPS Alumni Club in Denmark Holds First Assembly

The JSPS Alumni Club in Denmark (ACD) held its inaugural general meeting on 12 February. It was preceded by a meeting of ACD's newly elected board members. Both meetings were held on the campus of Technical University of Denmark at Lyngby.

The board meeting opened with remarks by ACD chair Dr. Sam Steffensen. He was followed by self-introductions from the participants. Then, Mr. Kazunori Higuchi, head of JSPS's Overseas Fellowship Division, spoke on the theme "Independent Activities of JSPS Alumni Association." He introduced activities initiated by other JSPS alumni associations in different parts of the world to illustrate how alumni associations are invited to be creative in carrying out their own autonomous programs and operations. Dr. Steffensen explained the plan for ACD's activities and their upcoming schedule.

Then, the inaugural general assembly commenced with messages from Dr. Steffensen and JSPS inspector general Dr. Keiko Nishikawa, who presented alumni badges to the ACD members. An exchange of views was carried out among the members on the theme and venue of the association's upcoming science event and on activities to facilitate researcher interaction.

After the general assembly, an event titled "Japan Alumni and Researcher Assembly 2016" was held. Featuring presentations and a reception, the event was organized by the JSPS Stockholm Office, JSPS Alumni Club in Denmark, the Embassy of Japan in Denmark, and Tokai University Alumni Association in Denmark. It assembled over 70 participants.

For more information about the new Denmark alumni association, please visit its website at: http://www.jsps-sto.com/alumnidenmark.aspx

JSPS Stockholm Office

# Science Dialogue

## Scientific Adventure of an American Fellow in Japan

Dr. Chelsea Robles

On 10 May, Dr. Robles visited Nishio Senior High School in Aichi Prefecture to give a lecture under JSPS's Science Dialogue program to 98 third-year students. Hailing from the US, she is currently carrying out research in the field of international and comparative education at Nagoya University.

Dr. Robles' academic and professional career encompasses both multi-national and multi-cultural endeavors, including research for international development projects in the Middle East, Africa and Asia. During her doctoral research at the University of Oxford, she carried out a series of field studies in Bhutan. In pursuing that research, Dr. Robles used a qualitative methodology to explore the tensions that arise when "traditional" cultures undergo "modern" national development, including rapid educational and societal transition. She finds that in non-western countries, western educational models introduce curricula that contain knowledge and values which differ from those considered indigenous, creating tensions that can impact teaching and learning processes.

In her Science Dialogue lecture, Dr. Robles talked about "comparative education theory," a topic that would normally be difficult for Japanese high school students to understand. However, Dr. Robles eased into it by first describing her own high school experiences in the US. She, then, used the research that she has conducted in Bhutan to develop her presentation. Its educational strategy boasts a "Gross National Happiness Policy," which works to merge "traditional" and "modern" ideas within an educational framework. She described how Bhutan's education system offers an example that other countries can emulate in trying to localize adopted curricula and pedagogies. Throughout, she kept the students captivated with a series of slides that showed Bhutan's exquisite blend of natural beauty and cultural charm. Although geographically far removed from both America and Bhutan, the Japanese students were absorbed in Dr. Robles' discussion of her research in Bhutan and her experience with the Bhutanese people.

After the lecture, Dr. Robles told us how much she enjoyed engaging in face-to-face communication with the students in this her second Science Dialogue experience. As a JSPS fellow, Dr. Robles has already conducted a survey of 100 students in Bhutan in the course of developing an article to be published during her remaining fellowship tenure, scheduled to end in November.

Overseas Fellowship Division

The following fellows participated in JSPS's Science Dialogue Program during the period from January through March 2016. For details about the program, please see its website: www.jsps.go.jp/english/e-plaza/e-sdialogue

| Venue | Lecturer | Nationality |
|---|---|---|
| Akita Prefectural Yokote Seiryou Gakuin High School | Sujoy K. Modak | India |
| Yamagata Prefectural Yonezawa Kojokan Senior High School | Fabio Denis Romero | Belgium |
| Fukushima Prefectural Iwaki High School | Mohammad Aslam | India |
| Ibaraki Prefectural Takezono High School | Deependra Kumar | India |
| Gunma Prefectural Kiryu High School | Robert A. Nawrocki | USA |
| Saitama Prefectural Kumagaya High School | Safdar Ali | Pakistan |
| | Thierry N. Fouquet | France |
| | Hermina Nedelescu | USA |
| | Alexandros-Panagiotis Poulidis | Greece |
| Junior and Senior High School at Komaba, University of Tsukuba (Tokyo) | Anne-Lise M. Jouen | France |
| Soka Senior High School (Tokyo) | Wei Zhang | Australia |
| Tokyo Metropolitan Hibiya High School | Ulrich Ebling | Germany |
| Tokyo Metropolitan High School of Science and Technology | Lisandro N. Kaunitz | Argentina |
| Hosei Univ. Girls' High School (Kanagawa) | Hsiang-Yin Chen | Taiwan |
| | Nopporn Chutiwitoonchai | Thailand |
| | Benjamin D. Lindner | Germany |
| | Krisztina Rosner | Hungary |
| | Jiso Yoon | Korea |
| Fukui Prefectural Fujishima Senior High School | Sanjay Kumar | India |
| | Mason J. Pember | UK |
| Fukui Prefectural Koshi Senior High School | Mohd Asmadi B. Mohammed Yussuf | Malaysia |
| | John C. Sha | Singapore |
| Fukui Prefectural Wakasa High School | Michaela Gerlach | Germany |
| | Md. Kamruzza | Bangladesh |
| | Manoj K. Singh | India |
| Yamanashi Prefectural Hikawa High School | Stephanie J. Win | New Zealand |

| Venue | Lecturer | Nationality |
|---|---|---|
| Yamanashi Prefectural Tsuru High School | Chandra S. Goit | Nepal |
| | Jae-Ho Lee | Korea |
| | Richa Tambi | India |
| Yamanashi Prefectural Yoshida High School | Barbara U. Geilhorn | Germany |
| Yashiro High School (Nagano) | Marian Matejdes | Slovakia |
| | Sanjog S. Nagarkar | India |
| Gifu Prefectural Ena High School | Gregory B. Bonn | USA |
| | Sridhar Ravi | India |
| | Alexander H. Viborg | Denmark |
| Shizuoka Kita High School | Isac M. Heden | Sweden |
| | Tung T. Ng | Vietnam |
| Shizuoka Kita Junior High School | Cheng-Hsiu Tsai | Taiwan |
| Shizuoka Prefectural Kakegawanishi High School | Francis H. Shand | Australia |
| Aichi Prefectural Kasugai High School | Chiashain Chuang | Taiwan |
| Mie Prefectural Kawagoe High School | Subramanian Sankaranarayanan | India |
| | Katalin Volgyi | Hungary |
| Shiga Prefectural Hikone Higashi High School | Dmitry Kolomenskiy | Russian Federation |
| Shiga Prefectural Moriyama Junior and Senior High School | Shamik Chakraborty | India |
| Kyoto Prefectural Katsura Senior High School | Hushna Ara N. Most. | Bangladesh |
| Kyoto Prefectural Yamashiro High School | Belinda J. Goldie | Australia |
| Hyogo Prefectural Kobe High School | Ambadas B. Rode | India |
| Wakayama Prefectural Koyo High School | Paavo A. Penttilae | Finland |
| Tokushima Prefectural Jonan High School | David Muranyi | Hungary |
| Miyazaki Prefectural Miyazaki Kita High School | Tjasa Kogovs | Slovenia |
| Okinawa Prefectural Kyuyo Senior High School | Faye Abigail T. Cruz | Philippines |
| | Beata Grzywacz | Poland |
| | Farzana Hakim | Bangladesh |
| | Tommi P. Tynell | Finland |

Research and Life in Japan
By a JSPS Fellow
No. 38

# Dr. Ndubuisi Samuel Machebe

*Cloning of Domestic Animals*

JSPS Postdoctoral Fellow, Kindai University, 2014-present
Lecturer, University of Nigeria, Nigeria, 2005-present
Ph.D. (Animal Reproductive Physiology), University of Nigeria, Nigeria, 2010

*Hailing from Nigeria, Dr. Machebe is conducting research with his host professor Dr. Yoko Kato at Kindai University under a JSPS Postdoctoral Fellowship. We asked him to tell us about his research and life in Japan.*

Q: What are you currently researching under your JSPS fellowship?

My current research conducted in the Laboratory of Animal Reproduction at Kindai University is centered on the production of porcine cloned pre-implantation embryos. I am investigating somatic cell nuclear transfer (SCNT) using stem cells as the nuclear donor cells.

Q: When and how did you decide upon your research subject?

I became interested in my research subject in 2007 when I was still conducting my PhD research with pigs in the Department of Animal Science at the University of Nigeria, Nsukka. My research goal was to improve the reproductive efficiency of female pigs by altering the energy and protein contents in their feed ration. I chose the pig as my model animal because I was convinced that any improvement in their reproductive potential could not only boost the supply of animal protein to many households in Nigeria and other developing countries but also expand employment opportunities for young people in these countries. The pig is a highly prolific domestic farm animal with a short generation interval and efficient carcass yield.

That year, I read about the pioneering work advanced by Dr. Shinya Yamanaka and his colleagues, reported in 2006. These researchers successfully reprogrammed adult cells into induced pluripotent stem (iPS) cells. With that impetus, I became very interested in porcine iPS cell research because of its tremendous potential for numerous applications in agriculture, medicine and biotechnology.

Q: How did you get to know your Japanese host researcher?

I first learned about my Japanese host researcher, Prof. Yoko Kato, when searching the Internet for Japanese professors who might host me as a postdoctoral fellow. In that process, I found that Prof. Kato and her research team at Kindai University had produced the first cloned calf using a SCNT method in 1998. That greatly stimulated my interest and desire to conduct my postdoctoral research in her laboratory.

I was lucky to have two colleagues from Nigeria conducting research in the same department as Prof. Kato. They highly recommended me to her laboratory for a postdoctoral fellowship. With their support, Prof. Kato and I immediately initiated the application process for a JSPS fellowship.

Q: Did you have any other reasons for choosing Japan to pursue your research?

My dream and desire as a scientist has always been to make meaningful scientific contributions in response to the numerous unanswered questions that I come across when studying textbooks on animal physiology. In pursuing this quest, I have always desired to work with the best and most well-known researchers in the world irrespective of the location of their laboratories on the globe. I saw the light and made my choice of Japan when I found out about the pioneering work on iPS cells and the production of the first cloned bovine animals done by Japanese researchers. That greatly stimulated my interest and desire to carry out my research at a laboratory in Japan.

Also, Kindai University is well known as an excellent institution of higher learning where a sound education can be acquired by both Japanese and overseas students. The university boasts a high level of expertise and facilities in many fields of science and technology, including agriculture.

Q: What have you achieved so far under your JSPS fellowship?

My research achievements have included the successful production of cloned porcine embryos using porcine iPS cells and fibroblast cells as nuclei donors. Based on my findings, I observed that there is no difference between the in-vitro development rate of porcine cloned embryos produced by somatic cell nuclear transfer with fibroblast cells and that when iPS cells are used as nuclei donor cells. This research work has already been completed and was presented at the First International Symposium on the Future of

Nuclear Transfer and Nuclear Reprogramming, held on 10 March 2016 at Yamanashi University, Japan.

In another experiment, I evaluated the impact of pre-exposure before fusion and activation of nuclear transferred oocytes to a plant extract called phytohaemagglutinin (PHA) on the developmental efficiency of porcine cloned embryos. I found that the developmental competence of porcine cloned embryos could be enhanced by incubation in PHA for five minutes prior to fusion and activation. That research has also been concluded and the findings presented at the 121st Meeting of the Japanese Society of Animal Science (JSAS), held 27-30 March 2016 at Nippon Veterinary and Life Science University in Tokyo. I am happy to mention that I am now a registered member of JSAS and the Japan Society for Research and Development (JSRD).

Q: What do you think of life in Japan—its culture and customs?

Life in Japan is to me a blend of tradition and modern lifestyles. I honestly find it difficult sometimes to fully comprehend the underlying essence of some of the culture and customs practiced by the Japanese, such as wearing *kimono*, using *ohashi* (chopsticks), performing the tea ceremony, and holding festivals to local gods amidst Japan's modern setting and lifestyle. All the same, I realized that these cultural practices and traditions are what give the Japanese a happy, polite, peaceful, gentle, and accommodating way of living.

Q: May we ask what you plan to do after your fellowship ends?

My simple answer is "continue my research!" With sincere gratitude extended to JSPS and people of Japan, after my two-year fellowship ends, I have been granted another 10 months of research funding to collaborate with my host researcher, Prof. Kato. This extended research period is centered on a technology transfer termed "Development of simple $CO_2$ incubator-free system for in-vitro production of pig embryos." This system, when successfully developed, will enable me to conduct research and training on embryo production and nuclear transfer at my home university in Nigeria at relatively low cost, while applying the skills I've acquired through my research experience in Prof. Kato's laboratory.

Q: How would you like to contribute to social development in your home country?

I suppose that by "social" development you mean development centered on people. So, I intend to conduct practical training of students and researchers in animal science and other related research areas, while applying and using my acquired skills, knowledge and techniques in enhancing Nigerian research in animal reproductive biotechnology. By virtue of my participation in this JSPS fellowship program, I have built a strong scientific network with many well-known Japanese researchers in different laboratories around Japan. Using this network, I intend to encourage and assist my students and young Nigerian researchers who may desire to visit Japan to do research with Japanese mentors and colleagues.

Finally, please permit me to use this opportunity to reiterate my appreciation to JSPS and people of Japan for supporting this exceptional postdoctoral research program. I could not have achieved my research goals without the expert advice and caring guidance provided by my host scientist, Prof. Kato, who always encouraged me to work through difficult times while providing me with a serene atmosphere for conducting my research in her lab. I also appreciate the generous support and help given to me by Dr. Tetsuya Tani, Dr. Koji Yoshioka and all the members of our laboratory.

*After our interview, Dr. Machebe took us around the facilities of Kindai University. Coming from Nigeria, where the blazing sun reigns, it was only natural yet rather amusing to hear him say, "Gosh, it's cold today!" on a warming springtime afternoon in Nara. During our stroll around the facilities with Dr. Machebe, we were impressed by his calm demeanor that contrasted with his vibrant enthusiasm for scientific discovery. As he continues working on the development of an incubator-free system for in-vitro production of pig embryos, we look forward to his results contributing to the solution of the global food-supply problem. Though it may be colder in Japan than Nigeria, we are sure that Dr. Machebe's burning passion for the work will continue firing the kiln of his important research at Kindai University.*

## Introducing Japan: Nara

Nara is strategically located in less than a one-hour drive from Kyoto and Osaka. It is one of the most popular spots visited by foreign tourists. The city is a calm and peaceful place with a rich historical background, having been Japan's first capital way back in the 8th century. Nara hosts a cluster of historical heritage sites, including the world-famous bronze Buddha Tōdai-ji temple, the great Kohfuku-ji temple, and many other remnants depicting the origins of Japanese culture. I would recommend anyone intending to visit Nara to come in the spring or autumn seasons. I think you will be captivated by the many hundreds of cherry blossom (*sakura*) trees that adorn the city's parks, temple and castle grounds, and adjoining hills in the spring and the leaves emblazoned with dramatically changing colors in the fall.

One of the best and most favorite visiting places is Nara Park. The park is unique because of the presence of an estimated 1,500 wild deer roaming everywhere throughout it. During my stay in Nara, I often spend time with my family visiting Nara Park. My four children like playing with the deer, often touching and feeding them as they are very friendly and not hostile to visitors in their territory.

Throughout the year, there are many cultural events that take place at city's temples and shrines, such as Nara To-kae Festival. Held in August every year and occasionally in the winter as well, the festival attracts many foreign and Japanese visitors alike. About 20,000 lanterns are lit at night with shades of their light that penetrate the colored lantern paper shed upon building walls and water surfaces. It is an absolutely dreamy and fantastic site to see.

Nara is also known for its many traditional Japanese foods. A typical Nara cuisine is *kakinoha zushi*, a kind of *sushi* made of vinegar-seasoned rice topped with slices of fresh salmon or salted mackerel and formed in the shape of a cube wrapped in a persimmon leaf "*kakinoha*." It's very traditional, delicious, healthy, and highly nutritious! Aside from such local traditions, Nara offers very nice alternative spots like the Bar Arena and Mellow Café where foreign visitors can eat, drink, relax and enjoy Nara's peaceful lifestyle and warm hospitality.


Dr. Machebe's family at Nara Park

**Cover photo:**
In Japan, bamboo is used for a myriad of purposes including building beautiful fences, even several story-high scaffolding. Bamboo "trees" decorated with colorful paper strips animate the summer Tanabata festival.

## About JSPS

The Japan Society for the Promotion of Science (JSPS) operates as an independent administrative institution to perform the following main functions: fund scientific research, foster researchers, promote international scientific exchange, and advance university reform.

## Crowing Rooster

From days of old in Japan, it has been the belief that the vigorous cry of the rooster in the gray of the morning augurs the coming of a new and bright day. As the crowing rooster can therefore be thought of as a harbinger of the kind of new knowledge that promises a brilliant future for humankind, it was chosen as the emblem of the Japan Society for the Promotion of Science. This emblem was designed in 1938 by Professor Sanzo Wada of Tokyo Fine Arts School to depict the rooster that symbolizes the breaking dawn in a verse composed by Emperor Showa.

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