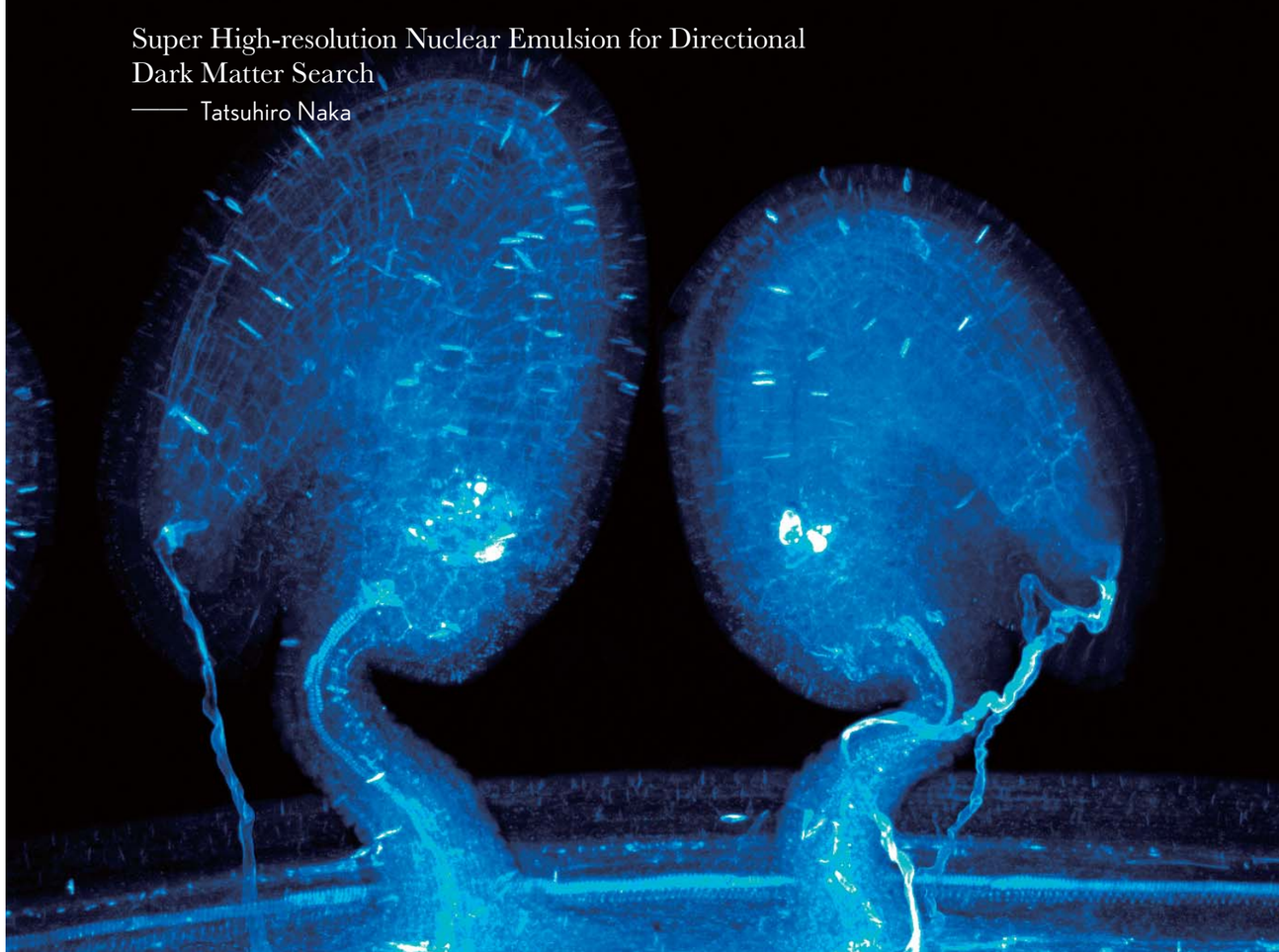
INSTITUTE FOR ADVANCED RESEARCH, NAGOYA UNIVERSITY
Telephone. +81-52-788-6051 Facsimile. +81-52-788-6151 E-mail. iar@adm.nagoya-u.ac.jp
http://www.iar.nagoya-u.ac.jp/

INSTITUTE FOR ADVANCED RESEARCH
LETTER
March 2016 Vol. 14

Special Interview

SCIENCE & PEACE —— Toshihide Maskawa
2008 Nobel Laureate in Physics

Research Highlights



For Further progress of the Institute

The Institute for Advanced Research (IAR) of Nagoya University was established in 2002 to promote academic studies, and is independent of the Schools and Departments in the University, as stipulated in the University Academic Charter. The fundamental objective of this institute is to foster and produce academic achievements at a prominent and internationally significant level. Such achievements are indispensable for the University not only to be widely recognized as a seat of learning but also to cultivate "courageous intellectuals." All members of the University should strive for an unsurpassed level of creative academic research. IAR has been and will be a center for assembling and coordinating various fields of state-of-the-art academic research in Nagoya University.

Internationally, IAR is a member of the Steering Committee of the University-Based Institutes for Advanced Study (UBIAS) and is leading international exchange activities in research and education. In this context, we are planning to host a UBIAS conference called "Intercontinental Academia (ICA)" from March 7th to 19th this year, where young researchers as well as Directors of UBIAS affiliates will gather to discuss a common theme, "Time." I sincerely hope that all participants in ICA at Nagoya University will enjoy discussing such a cross-disciplinary theme and exchanging ideas of mutual interest in the forum.

During the past 6 years, IAR has also been coordinating an important University program, the Young Leaders Cultivation (YLC) Tenure-track Program, which has played a crucial role in cultivating and supporting talented young researchers in various fields. The program has contributed greatly to converting the outcomes of excellent studies done by IAR researchers in individual Departments into the common property of all members of the University.

From the present issue, volume 14, "IAR LETTER" is described fully in English suitable for international distribution and has been entirely renewed in terms of its content as well as overall layout. In particular, readers may find the Special Interview and Research Highlights interesting, and the first (memorial) Interview is on Professor Toshihide MASKAWA, a winner of the 2008 Nobel Prize in Physics.

February 2016
Director of Institute for Advanced Research

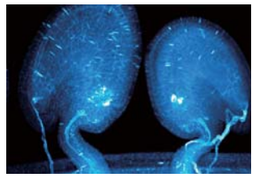
Director
Hisanori SHINOHARA

14
March 2016

INSTITUTE FOR ADVANCED RESEARCH

LETTER

CONTENTS


Cover Photo :
Two developing seeds receiving single (left) or double (right) pollen tube(s) in Arabidopsis thaliana. (Daisuke MARUYAMA, from Highlight Research, pp. 7-8.)

Toshihide MASKAWA

Dr. Maskawa was born 1940 in Nagoya, Japan. He graduated from Nagoya University in 1962 and received a Ph.D. in Physics from the same university in 1967 supervised by Professor Shoichi Sakata. He spent three years at Nagoya University as an assistant professor, then moved to Kyoto University where he had a fateful encounter with Makoto Kobayashi, a corecipient of the Nobel Prize in Physics in 2008. Since then, he has also showed enthusiasm for social activities and nowadays is also famous as an anti-war activist. In 1997, he became a professor at the Yukawa Institute for Theoretical Physics at Kyoto University and held a directorship at the institute. After 2003, he moved to Kyoto Sangyo University as a full professor and established the Maskawa Institute for Science and Culture. He has been a university professor at Nagoya University since 2009, as well as a director at the Kobayashi-Maskawa Institute for the Origin of Particles and the Universe, Nagoya University. Since 2010, he has been a member of the Japan Academy. He won the Nishina Memorial Award in 1979, followed by the J.J. Sakurai prize and the Japan Academy Prize in 1985. In 2008, he was awarded the Nobel Prize in Physics "for the discovery of the origin of the broken symmetry which predicts the existence of at least three families of quarks in nature."

SCIENCE & PEACE

—— You are an enthusiastic peace activist. Why?

MASKAWA: I cooperate with people who defend Article 9 of the Japanese Constitution. My peace activism began around 1964, when I got involved in movements opposing nuclear submarines calling at Japanese ports and the construction of nuclear power plants. In those days, I used to go around meeting small groups of mothers here and there. I used to be active at Nagoya University, too. When I moved to Kyoto University, Kansai Electric was planning to build a nuclear power plant in a small village on the Sea of Japan coast. The village was divided into two camps, for and against the project, fighting each other. I was commissioned to study and write a report on what would happen to the local river if cooling water was taken from there for the reactor. It was a well-paid job, but I used to work, and still work, without remuneration whenever I can be useful and provide the kind of knowledge that people need.

—— So you continued your peace activism at Kyoto University. That was the same period as your theoretical work with Dr. Makoto Kobayashi, with whom you shared the Nobel Prize.

MASKAWA: Yes. In those days, I was the Secretary of the Faculty Union. Kobayashi used to come to the University at around ten in the morning, and we would talk for about two hours and break for lunch. After lunch, Kobayashi went back to his office, and I ran around on campus carrying out my union activities. When I went home—and that was just after my second son's birth—I would ask my wife how my young family had spent the day and then went straight to work on my research from nine to one in the morning. My life was like this in those days. I was busy and was working efficiently. I didn't waste any time watching TV. After dinner, I immediately started work. Sometimes I worked for four hours from nine.

The broken symmetry (CP violation) on which we worked was first detected experimentally in 1964 by James Watson Cronin and others. I brought this news to my laboratory. It was during my first year or so in the doctoral course. I felt that something strange was going on but couldn't figure it out even if I tried hard to understand. So I assumed that it was not the right moment and that we weren't ready to tackle this mystery yet. I wanted a theory that would enable us to calculate. I kept it in the back of my mind. In 1967, Steven Weinberg presented his unification theory, but calculation was still impossible. In 1971, the Dutch genius Gerardus 't Hooft drew a formula with symbols. This made me think that it was now time to discuss the broken symmetry. In April that year, Makoto Kobayashi had come to Kyoto University, and when the dust had settled somewhat, we started working together on or around May 10. We completed the theory near the end of June. It took about fifty days. We had taken up the CP violation early and had been checking since 1964 to decide if it was time to tackle this question.

Even after we wrote our paper, it drew nobody's attention because it was written by young researchers in an unknown town in East Asia. Three years later, Nicola Cabibbo took up the same subject, without knowing about our work. In the "normal" course of events, the Italian becomes famous first, and somebody points to a similar work by some Japanese, allowing us to catch up with the rest of the world. This didn't happen, thanks to Prof. Yoichi Iwasaki, who later served as President of the University of Tsukuba. In those days, Prof. Iwasaki was at Kyoto and took notice of our work before moving to Tsukuba. He told Dr. Hirotaka Sugawara, Chief of the Physics Division at the High Energy Accelerator Research Organization, about our paper, and they decided to call someone in the United States to do a bit of PR for us, since they found our paper interesting. In fact, Dr. Sugawara himself expanded our paper a little for publication. So we owe our success to the two of them.

—— Do you think that your social activism has had an impact on your scientific work?

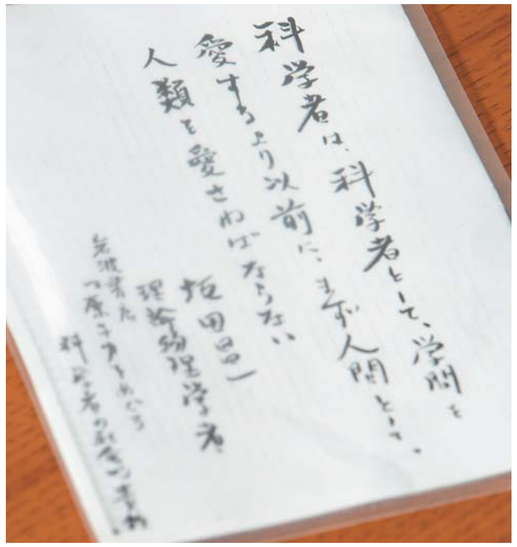
MASKAWA: It would be exaggerating if I said that my social activism and scientific work were mutually beneficial, but it doesn't mean that you can't do both. In Dr. Shoichi Sakata's laboratory, it was said that you were not a full-fledged scientist if you couldn't play more than one role. So I was always doing something besides my research. You can always find time to pursue two different things that interest you. If you have only one thing to do, you tend to slack off, but if you have two or more, you try to be efficient.

—— What was Dr. Sakata like?

MASKAWA: He never told us what to do. His students watched him work, and we learned that there was such a way to do such and such. In my office, I have a sheet of paper on the wall on which he wrote, "A scientist must love humanity as a human before he loves science as a scientist." He wrote this in 1969, when he was discharged after having been hospitalized for some time. I admire him for the strength of this message. I can't make such a statement. I have to add something like "... I think. Don't you?" at the end to attenuate the intensity. But he asserted himself.

Dr. Sakata took great interest in the laboratory's administration. Once I went to see him to report a decision made by the Graduate School's organization. After that, I left the room but noticed that I had forgotten something. Since I already knew that he was in, I only knocked and opened the door before I was told to come in. There, I saw him mopping the floor, stained with my footprints. He hadn't kept me from coming in the first time because of my muddy shoes. He thought that would have embarrassed me and discouraged me from casually dropping in to speak with him. I still recall the image of Dr. Sakata mopping the floor.

Toward the end of World War II, Dr. Sakata was already totally convinced that Japan would lose, so his focus was already on how the laboratory should be run after the war. In those days, a professor held a chair. In 1946, this system was changed when the University was reorganized. He said that all members of a laboratory were equal once they had begun research. In the new laboratory system, you were admitted into a laboratory as an autonomous researcher after publishing a paper or so. All members of a laboratory were equal, and anything was accepted with regard to the laboratory if it had been decided by vote.



A handwritten quote from Dr. Sakata.

—— Dr. Sakata had thought about the new system while the laboratory was evacuated to the countryside during the war and came back with the idea after the war. Was he involved in the war as a scientist?

MASKAWA: Dr. Sakata? No. Dr. Shin-ichiro Tomonaga (Nobel Prize in Physics in 1965) seems to have been mobilized to take part in a project to develop electromagnetic weapons. I have read the papers Dr. Tomonaga wrote at that time. I have the impression that he nicely managed to avoid getting involved. He did write papers, but none of his research would be applicable to any war purpose. But I'm sure there were scientists who collaborated because doing research was interesting. They developed steel materials, which must have been used to build the battleships Yamato and Musashi, and they didn't care what purposes their research achievements served. Some thought that it was none of their business.

—— Science can be used to serve both peace and war.

MASKAWA: Albert Einstein was gravely criticized for his suspected role during the war. Leo Szilard, a Hungarian scientist in exile in the United States, had heard a rumor that the Nazis were amassing uranium in Scandinavia and asked Einstein to talk to the American government about the possible ramifications of Nazi Germany beating the U.S. to make the world's first atomic bomb. So Einstein talked to the U.S. President. He must have been ashamed about this afterwards. When Hideki Yukawa went to the United States after the war, Einstein went to see him to apologize for his role of messenger, shedding tears and saying that his words had led the U.S. government to drop two atomic bombs on Japan. The Russell-Einstein Manifesto, an approximately two-page document that was published later, indicates that if you carefully read between the lines, Einstein was seriously concerned that a third world war would destroy the planet.

—— The starting point of your peace activism is related to nuclear power plants. What do you think of the utilization of nuclear power?

MASKAWA: We witnessed that accident in Fukushima. We know that the danger of nuclear power plants can be lowered if we spend more money. Is it appropriate to commercialize nuclear power at the current level? I don't think that we have arrived at such a technological stage. But fossil fuels will one day be depleted. Then, what should we do? There are moments when natural energy can't be harnessed. Without winds blowing continuously, wind farms can't generate power. Power storage is also difficult. I believe that the biggest mission of scientists today is to develop technologies for low-cost power storage. What is most important is to clearly recognize the energy-related challenges we have to overcome as a society.

—— In Japan, much concern is focused on what to do about the fast breeder reactor (FBR).

MASKAWA: Yes. It's been suggested that it be discontinued because it is not going well. But storing large quantities of plutonium is in itself a problem. With that much plutonium, we can make hundreds of atomic bombs within a year, which might then spread all over the world because they want to export nuclear power generation. In today's politics, nothing true is said. I believe that it is wrong to be allowed to store something that can be easily applied to another purpose. This is, by extension, a question of war and peace.

—— In such a situation, how do you think scientists should be involved in society?

MASKAWA: I take researchers out, even by deceiving them. If there is a peace assembly or some related meeting, I would say to them, "The weather is great; let's go for a walk," and take them to the meeting. They always undergo a change afterwards. They inevitably open their eyes when they contemplate society's actual situation and how it is changing and are forced to think of their children's and grandchildren's future lives.

Science begins with a question. Here are results, but how should you interpret them? Do they suggest Phenomenon X, or am I wrong? I call this a process of negation for affirmation. At the point where you can no longer say "No," you can at last say "Yes." The report on the possible discovery of the top quark was about 200 pages long, to demonstrate that it was NOT an erroneous signal. Without this, the report could have been about four pages long. At first, there were all sorts of contamination caused by false signals, which we had to deny one by one.

—— Finally, what is your message to young researchers? What would you like to tell them?

MASKAWA: I think that you need a sense of longing and adventure to develop as a research scientist. For example, in elementary school, a science teacher may make a digression and says, "A genius scientist called Einstein said that time passes differently for people in different motions." This is something quite unforgettable. Most kids think, "That's ridiculous," and stop there, while some make a mental note of it, plus the fact that no scientists are opposed to this theory. They study more and get closer to Einstein, experiencing feelings of adventure as they approach the object of their longing.

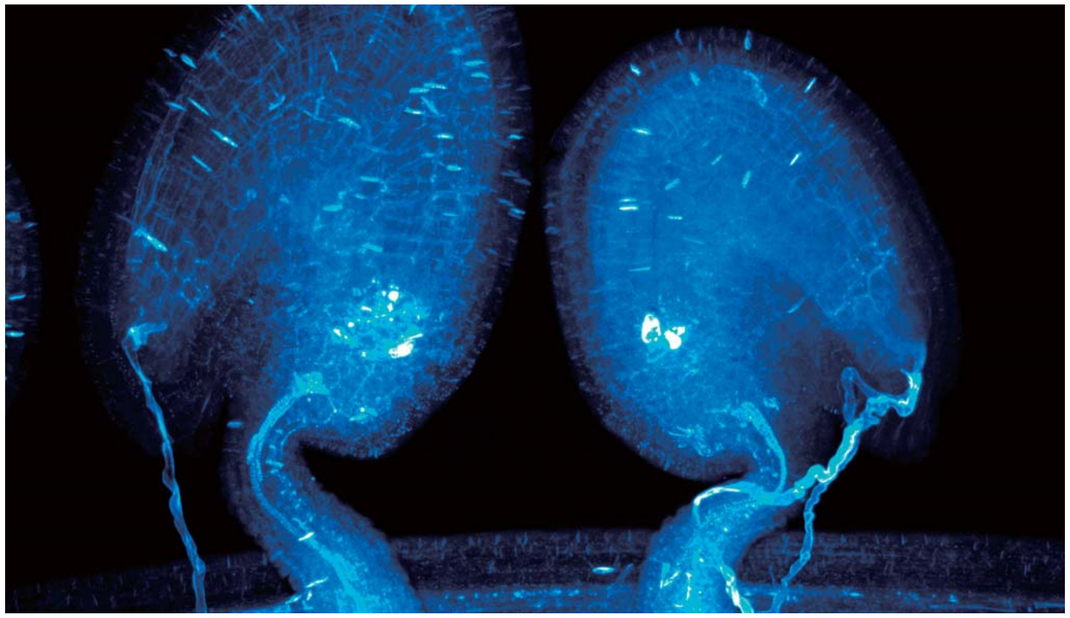
My object of longing was Dr. Sakata. It was in the autumn of my first year of senior high school. In 1955, he presented the Sakata model, the forerunner of the quark model. I read about it in a boxed article in a science magazine or something and felt quite excited to learn that such advanced research was being conducted in my hometown. In those days, senior high school science lessons covered only discoveries made in Europe up to the 19th century, and nothing contemporary. I discovered that something extraordinary was taking place in Nagoya. I felt that I had to be a student of Dr. Sakata.

—— Today, scientists are under pressure to produce results that serve society immediately.

MASKAWA: This is an extremely bad situation for science. We are not allowed to carefully and patiently work on something for a long time because it is intriguing, although the project might fail. Every year you must write annual reports and interim reports and fill out application forms to ask for grants. You spend more time writing interim reports than working on your research. This is an extremely unfortunate situation.

Interview with Prof. Maskawa was done by M. Kawachi (Nagoya IAR), A. Nishizawa (Nagoya IAR) and H. Nakazaki (Chunichi Shimbun Co., Ltd). This interview article was written by H. Nakazaki and translated to English under the responsibility of Nagoya IAR.

Novel cell fusion terminates female courtship in plant



Two developing seeds receiving single (left) or double (right) pollen tube(s) in Arabidopsis thaliana

Daisuke MARUYAMA

Designated Assistant Professor of Young Leaders Cultivation Program
Institute for Transformative Bio-Molecules / Institute of Advanced Research, Nagoya University
Email: maruyama.daisuke@f.mbox.nagoya-u.ac.jp

In flowering plants, immotile sperm cells are kept inside a growing pollen tube and conveyed to an egg-containing structure known as an ovule. The fertilized ovule terminates the attraction to prevent additional fertilization by another pair of sperm cells from the second pollen tube. In this study, we discovered a cessation mechanism of the pollen tube attraction caused by novel cell-to-cell fusion in a plant.(1)

INTRODUCTION

In sexually reproducing organisms, a one-to-one relationship is formed between male and female cells (e.g., an egg and a sperm). In flowering plants, including the model plant used in this study, Arabidopsis thaliana, this pairing is established during pollen tube guidance. The pollen tube precisely targets an ovule due to the secretion of attractant peptides from two synergid cells, which are accessory cells adjacent to the egg cell. In the final stage of the guidance, the pollen tube discharges two sperm cells into a degenerating synergid cell, and each sperm cell fertilizes the egg cell and the central cell, creating the embryo and the endosperm, respectively. After the double fertilization, the ovule ceases to attract an additional pollen tube due to the inactivation of the remaining "persistent synergid cell" (see Figure 1). The prevention of the attraction of multiple pollen tubes is considered to play an important role in efficient male-female pairing in terms of the pollination of fewer pollen grains or the blockade of multiple fertilizations of the egg cell by more than two sperm cells. However, the inactivation mechanisms of the persistent synergid cell had previously been totally unknown.

Discovery of SE fusion

To elucidate the alteration of the persistent synergid cell, we performed time-lapse imagings of fertilized ovules from a transgenic plant expressing mitochondrion-localized Green Fluorescent Protein (GFP) under the control of a synergid-specific gene promoter. To our surprise, the GFP-labeled mitochondria began to migrate from the persistent synergid cell to the endosperm within a few hours after the double fertilization, indicating an efflux of mitochondria to the endosperm (Figure 2A). We thus assumed the existence of tiny "holes" between the persistent synergid cell and the endosperm. Electron micrographs of fertilized ovules revealed the absence of a cell wall separating the two cells (Figure 2B). These data strikingly show novel cell-to-cell fusion in flowering plants. It is well known that plant cells are usually surrounded by a thick cell wall. Therefore, this finding that we termed "synergid-endosperm fusion (SE fusion)" was surprising to many plant researchers. There are only two cell-fusion events identified in the normal developmental process in flowering plants: one is fertilization of the egg cell, and the other is fertilization of the central cell. The SE fusion is the third cell-to-cell fusion identified after 117 years since the discovery of double fertilization.

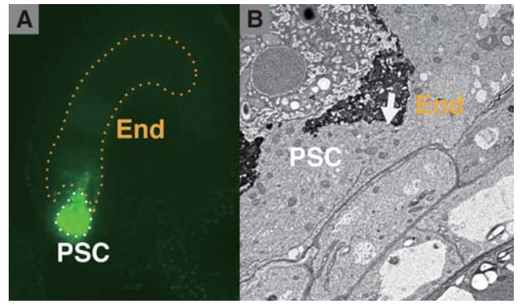
Roles of SE fusion

The identity of the persistent synergid cell must be drastically changed by the SE fusion, because the persistent synergid cell is diluted many fold by the efflux of a large volume of cellular contents to the endosperm. Time-lapse imagings of a transgenic plant visualizing AtLURE1, a pollen tube attractant peptide in Arabidopsis,(2) revealed that premature AtLURE1 accumulated in the persistent synergid cell exhibited a rapid decrease through SE fusion. Indeed, the ovules with the AtLURE1 signal also decreased in the early stages of the seed development in an immuno-staining experiment. Presumably, the cytoplasmic dilution in the persistent synergid cell would reduce AtLURE1 secretion and disrupt the gradient of mature AtLURE1 on the surface of the fertilized ovule, leading to rapid termination of further pollen tube attraction.

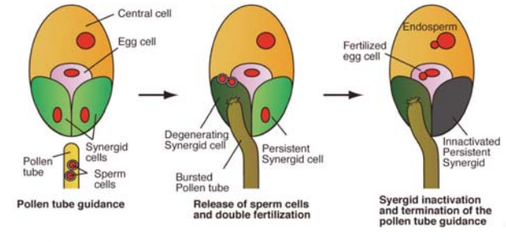
The SE fusion appears to result in disorganization of the persistent synergid nucleus, one of characteristic features of an inactivating synergid cell. Time-lapse imagings of nuclei in the entire ovule showed that the nuclear disorganization occurred by two to six hours after fertilization. Interestingly, dynamic chromosomal condensations of the nuclear disorganization were observed during the mitotic stage of the endosperm. Although the endosperm nucleus (or nuclei) gradually accumulated a mitotic-phase marker Cyclin B1;2-YFP, the persistent synergid nucleus exhibited abrupt accumulation of the marker, probably due to the influx of the endosperm contents caused by the SE fusion. These data indicate that the persistent synergid nucleus begins to share the same cytosol with the endosperm prior to preparation for mitosis (e.g., DNA synthesis), and is selectively eliminated by a failure of chromosome segregation known as a mitotic catastrophe.(3)

Model of synergid inactivation

Our previous data demonstrated independent roles of the egg cell and the central cell in the cessation of pollen tube attraction.(4) Thus, we examined whether SE fusion was one such mechanism. Single fertilization of either the egg cell or the central cell was induced by pollination of a mutant exhibiting reduced fertility, and the frequency of the SE fusion by an endosperm marker plant was analyzed. The SE fusion was never observed in the ovules after single fertilization of the egg cell, while the fusion took place in the ovules after the single fertilization of the central cell, suggesting the cessation of pollen tube attraction controlled by the central cell via the SE fusion. So, how does the egg cell in turn regulate the synergid inactivation? We focused on the signaling pathway of a gaseous hormone, ethylene, because the signaling activated after double fertilization is responsible for the nuclear disorganization of the persistent synergid.(5) Mutant-induced single fertilization analysis demonstrated that the egg cell, but not the central cell, predominantly stabilized EIN3, a key transcription factor in the ethylene signaling. Taken together, we proposed that a three-step synergid inactivation regulates two independent fertilizations. First, fertilization of the egg cell predominantly induces the activation of ethylene signaling and prepares nuclear disorganization of the persistent synergid. Second, fertilization of the central cell triggers the SE fusion, and the synergid contents including pre-secreted AtLURE1 are diluted, leading to acute disruption of the pollen tube guidance. Finally, the identity of the synergid cell completely disappears due to the nuclear disorganization of the persistent synergid during endosperm proliferation.



Synergid-endosperm fusion (SE fusion).
(A) Migration of mitochondria (green) from the persistent synergid (white dotted line) to the endosperm (orange dotted line). (B) Electron micrograph of fusion site (arrow). End and PSC are abbreviations of endosperm and persistent synergid cell, respectively.



Double fertilization and persistent synergid inactivation.
Schematic drawing of an ovule attracting a single pollen tube (left), the ovule receiving two sperm cells from the pollen tube (middle), and inactivation of the persistent synergid after double fertilization (right).

CONCLUSION

We successfully elucidated the inactivation mechanisms of the persistent synergid cell by a series of live-imagings and mutant analyses. The regulation of the second pollen tube attraction plays an important role in plant fertility, and understanding of the mechanism may contribute to the development of novel breeding techniques. The SE fusion process suggests novel types of programmed-cell-death mediated by cell-to-cell fusion, and has had a strong impact on basic cell biology as well as plant research. In the process of exploring the molecular mechanisms of SE fusion, we will learn more about the physiological functions of cell-to-cell fusion in various developmental scenes, which have been overlooked for years in botany.

Acknowledgements

I would like to thank Prof. Higashiyama and the lab members for giving me advice and continuous encouragement. I also highly appreciate the other co-authors: Völz, R.; Takeuchi, H.; Kawashima, T.; Mori, T.; Groß-Hardt, R.; Nishikawa, S.; Ito, M.; Igawa, T.; Umeda, M.; Kurihara, D.; and Ueda, M.

References

(1) Maruyama, D. et al., "Rapid elimination of the persistent synergid through a cell fusion mechanism" Cell 161, 907–918 (2015).
(2) Takeuchi, H. and Higashiyama, T., "A species-specific cluster of defensin-like genes encodes diffusible pollen tube attractants in Arabidopsis" PLoS Biol. 10, e1001449.
(3) Maruyama, D. et al., "Selective nuclear elimination in multinucleate cells" Oncotarget 6, 30447–30448 (2015).
(4) Maruyama, D. et al., "Independent control by each female gamete prevents the attraction of multiple pollen tubes" Dev. Cell 25, 317–323 (2013).
(5) Völz, R. et al., "Ethylene signaling is required for synergid degeneration and the establishment of a pollen tube block" Dev.Cell 25, 310–316 (2013).

Consequences of War : Japanese demographic transition and the marriage market

Consequences of War by Peter Paul Rubens (1637–1638: located at The Palazzo Pitti in Florence)

Mizuki KOMURA

Designated Assistant Professor of the Young Leaders Cultivation Program
Graduate School of Economics / Institute of Advanced Research, Nagoya University
E-mail: komura@soec.nagoya-u.ac.jp

Mizuki Komura received her PhD at Nagoya University, subsequently joining the Institute for Advanced Research at Nagoya University and IZA as a Research Affiliate in 2014. She is currently visiting the University of Florence in Italy. Her main research interests are household economics, labor economics, and public economics. Among the fields, she investigates the behaviors of families and their interrelationship with public polices, including the topics of fertility decisions by couples, arrangement of elderly cares by family members and intergenerational relations.

INTRODUCTION

Since the Second World War (WWII), Japan has witnessed rapid population aging. The crude birth rate (CBR, the number of live births per 1000 people) plunged by half in a decade, from a peak of 34.65 in 1947 to 17.58 in 1957. This drastic drop has attracted considerable attention from researchers all over the world, leading to attempts to explain this demographic transition, which was in turn followed by remarkable economic development. Ogasawara and Komura (2015) explore how the Japanese demographic transition was affected by the historical event of the war from the scope of the marriage market. This study specifically examined the effects of the imbalance in the sex ratio caused by the war on family planning of households.

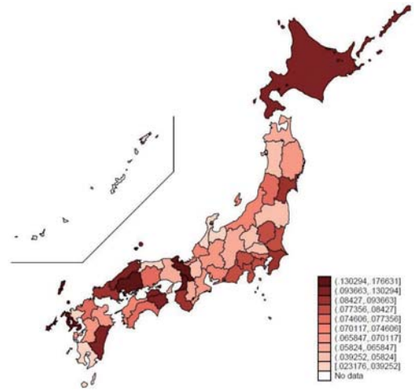
Intra-household bargaining over fertility and the sex ratio in the marriage market

Because it affects the population in the whole economy, the fertility decisions of each household are not separable from economic development and growth. Recent studies on development economics and population economics have pointed out the possibility of fertility decisions as a consequence of negotiation between the spouses involved, rather than that of a choice by the household as a single decision-making unit, and that such decisions relate to some extent to the power balance between men and women (Komura, 2013).

The idea of fertility bargaining is that the couple has conflicting goals over family planning. The causes of these conflicts of interest include the asymmetric cost of having children (i.e., the biological cost of giving birth and the intervals imposed on one's career), and different weights of interest on the quantity and the quality of one's children. In the common situation wherein husbands prefer a larger family size than their wives, the empowerment of women is likely to induce a reduction in the number of children; conversely, weakening women's autonomy leads to an increase in the number of children. One of the determinants of the bargaining position is the sex ratio in the marriage market. The more possible partners a man or woman has in the marriage market, the greater the autonomy he/she wields within the household, since it enables him/her to seek an alternative marriage partner. Thus, our theory predicts that fertility rises in proportion to the ratio of women to men in the marriage market, and vice versa.

Identification strategy

Using the historical event of WWII as a natural experiment and longitudinal data sets of the 46 prefectures of Japan (similar to states in the US), we empirically demonstrated the relationship between the CBR and changes in the sex ratio (the ratio of women aged 15–59 to men of the same age group). The changes in the sex ratio were mainly caused by the tragic fatalities of soldiers. Soldiers were healthy and of prime marriageable age, and their destinations were less likely to reflect their own intentions than in the case of labor migration, so we can regard the changes in the sex ratio as exogenous events in the marriage market. Figure 1 shows the spatial distribution of the changes in the sex ratio from 1935 to 1947. The darker shades indicate that such regions experienced a severe scarcity of males as a consequence of the war. We can see that the changes were not concentrated in specific areas.



Spatial distribution of changes in the sex ratio in Japan from 1935 to 1947

Making use of the variation in the changes in the sex ratio discussed above, we hypothesized therefore that the CBR would be high in regions that experienced a severe scarcity of marriageable men due to the damage of WWII. Our theoretical interpretation was as follows: since men were scarce in the marriage market, it was relatively easy for them to find a marital partner. This led to favorable marriage outcomes for men, and thus households reflected more the intention of the husbands, who typically had a larger ideal family size than their wives.

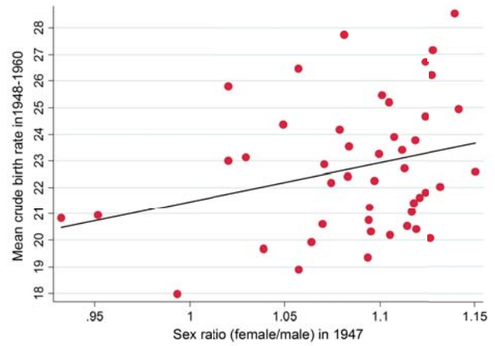
RESULTS

Our analysis estimated the causality relationship of the sex ratio on the fertility decisions of couples affected by the war. In Figure 2, the solid line represents the fitted line of the sex ratio in 1947 (the horizontal axis) and the mean value of the CBR from 1948 to 1960 (the vertical axis), in which changes in the sex ratio were considered to influence the marriage market. Figure 2 confirms that male scarcity (the higher sex ratio of women to men) in the marriage market in 1947 had a significantly positive effect on the CBR of post-war marriages (the estimated coefficient of the changes in the sex ratio is 14.69, with a standard error of 7.69), so our hypothesis is supported by the evidence.

From a historical point of view, the Japanese experience in the period immediately after WWII differed from those of other countries in that it accepted fundamental changes to its constitution and legislation imposed by the Allied powers. These changes entailed the disestablishment of the feudalistic family systems. One such change was the setting of a new equitable divorce law for both parties, which strictly prohibited having other partners outside marriage, while only wives had been punished for such transgressions under the previous law. The other change was a new unfavorable inheritance law for out-of-wedlock children. These changes dissuaded couples from having extra marriages, resulting in a weakened adjustment mechanism of the marriage market. Thus, although the constitutional changes were regarded as a form of female empowerment in society introduced by the Allied powers, they led that an unfavorable situation in the marriage market was reflected more in intra-household allocation, including fertility decisions. Indeed, significant increases in out-of-wedlock children as a form of polygamy were commonly observed due to the scarcity of men after wars in France, Germany and Russia, while the number of out-of-wedlock children remained relatively low in Japan even right after WWII.

CONCLUSION

In this study, we confirmed fertility bargaining in the history of Japan, demonstrating the effects of the exogenous historical event of WWII on fertility decisions as an outcome of intra-household bargaining, and found that the regions that had experienced large changes in the sex ratio experienced slower declines in the fertility rate compared to regions with fewer changes. Our study from the viewpoint of the marriage market did not exclude the possibility of determinants of fertility in the Japanese post-war period that had already been raised by existing studies: increased access to and strategies for birth control, enriched living standards, and urbanization, followed by shifts in parental interest from the quantity to the quality of their children, and the emergence of female labor participation in the final part of our period of interest.* However, understanding the effects of this seemingly unique historical event on the marriage market may contribute to providing a new insight into future interventions in countries suffering from sequential civil wars that are aiming at economic development combined with gender empowerment.



The causal relationship of the sex ratio in 1947 on the mean CBR of 1948-1960

Note: The figure uses the available data of 46 prefectures showing the causal relationship of sex ratio (female/male, aged 20-50) in 1947 on the mean value of crude birth rate (the number of live birth per 1,000 population) from 1948 to1960. The fitted line indicates the significant positive relationship between two variables (the estimated coefficient of the changes in the sex ratio is 14.69, with a standard error of 7.69).

References

(1) Komura, M. (2013). "Fertility and endogenous gender bargaining power" Journal of Population Economics, 26(3), 943–961.

(2) Ogasawara, K. and Komura, M. (2015). "Marriage market, social reform and intra-household bargaining: evidence from Japanese experience of WW2" mimeo.

＊More formal analyses with control variables are carried out in Ogasawara and Komura (2015). Figures are used from Ogasawara and Komura (2015).

Super High-resolution Nuclear Emulsion for Directional Dark Matter Search

Fig.1 Underground laboratory of the Gran Sasso National Laboratory (LNGS), Italy

Tatsuhiro NAKA

Designated Assistant Professor of the Young Leaders Cultivation Program
Center of Experimental Studies, Kobayashi-Maskawa Institute / Institute of Advanced Research, Nagoya University
Email: naka@flab.phys.nagoya-u.ac.jp

The problem of dark matter is one of the most important subjects for natural science; elucidation of its character leads to understanding of the very origins of the universe. Direct dark matter search on the earth is the most promising method for discovering and understanding its character. In particular, direction-sensitive dark matter search is a powerful method for searching with high reliability, because the direction of dark matter on the earth is expected to exhibit unisotropy, and data thereof should constitute evidence for identifying dark matter signals. This study proposed using a super high-resolution nuclear emulsion as a detector, and the development of various new devices and technologies raised the possibility of carrying out such a method. International collaboration has now been established and promoted as the "NEWS (Nuclear Emulsion for the WIMPs Search)" project at the Gran Sasso National Laboratory, Italy.

INTRODUCTION

The advance of technologies for observing the universe have resulted in the understanding that, in particular very high precision measurement of cosmic microwave backgrounds (CMB) indicate that elements comprising ordinal matter account for just 5% of the total energy of the universe, while the remainder consists of unknown dark elements [1]. In particular, dark matter observed due to the effect of gravity (e.g., the rotation of the galaxy and gravitational lensing) is currently one of the most important subjects to be grasped in natural science. The existence of dark matter in the Milky Way galaxy has been understood by measuring rotational velocity [2][3], and local dark matter density around the solar system can be estimated as 0.4 GeV/cm^3. This means that the flux of dark matter on the earth is expected to be approx. 10^6/cm^2/sec in the case of hydrogen equivalent mass. Therefore, direct dark matter search on the earth is the most important approach for directly elucidating this.

Direct detection of dark matter through direction sensitivity

Direct search for dark matter is possible in principle by the detection of recoiled nuclei induced by dark matter. However, the possibility of finding such recoiled nuclei depends on the event rate, which is affected by interaction possibilities, the mass of dark matter particles, the amount of target mass, the detectable energy threshold, and background levels.

There are two main methods used to identify dark matter: that using annual modulation, and that using direction asymmetry. For example, the number of signals varies depending on the relative velocities between the dark matter and the earth moving around the sun. This means the dark matter signals are expected to exhibit behavior with annual modulation. Current major experiments aim to observe this behavior, but as it has a modulation of a few percent, there are some difficulties in identifying dark matter clearly. The direction-sensitive method is a powerful method for identifying dark matter using the asymmetry of the angular distribution of signals and lower statistics than the annual modulation method [4]. However, no appropriate detectors have been made yet that exhibit perfect performance, because the technologies for obtaining directional information to target energy (less than approx. 100 keV) for dark matter detection are currently poor.

The motivation of this study is to make feasible an original direction-sensitive detector for an interesting dark matter model, and to promote a project to carry out large scale directional dark matter search.

Directional dark matter search with nuclear emulsion

We proposed a super-high resolution nuclear emulsion as a direction-sensitive dark matter detector. However, this was a big challenge because, although nuclear emulsion detectors have a very long history, in this study, quite new devices, readout systems and various technologies for background rejection with quite different qualities from current technologies had to be created from scratch. In the following section, summaries and the statuses of new technologies and projects will be introduced.

Fine-grained nuclear emulsion

The requirements for a direction-sensitive dark matter detector are very high spatial resolution, scalability, and low background. In particular, such resolution requires detection performance of better than submicron level of nuclear recoil signals due to dark matter in order to obtain directional information, but no such detector yet exists in the world. Here, we focused on nuclear emulsion. Nuclear emulsion is kind of photographic film, but it functions as a particle or radiation detector that can obtain 3D information of tracks with very high spatial resolution (approx. 1 μm). However, its current performance is very poor for this purpose. So, to improve the resolution, the idea was to micronize a silver halide crystal, which worked as a sensor for the device similar to a CCD camera. In 2010, the original machine designed to realize this was installed in Nagoya University, and the original production method was established. Here, the crystal size was controlled to the accuracy of several nanometers, and the new device was named the Nano Imaging Tracker (NIT) [5] (Fig.2). Intrinsically, this device can detect particle tracks of more than 50 nm in length, and the detector has the highest resolution in the world. Additionally, we succeeded in the demonstration of detection performance to target energy for dark matter search.

High resolution readout

Recorded events at the NIT have to be read out and output as data automatically. Readout technologies and performance are one of the most important factors for defining the achievable experiment scale and sensitivity. As technologies for achieving this, quite new methods and algorithms were proposed [6] and demonstrated (this was an innovative approach, because conventional nuclear emulsions have continued to utilize fundamentally the same algorithms for 30 years).

In this research, a new analysis system based on an optical microscope was constructed, and it became possible to read out submicron length tracks of more than 100 nm automatically, with an angular resolution better than 30 degrees. This system would perform the function of screening candidate tracks, and an additional step to distinguish and confirm the signals from the backgrounds would be required. Such systems were also newly developed in this research. For example, a hard X-ray microscope was one of the tools used to realize this, because this system can achieve both non-destructive and super resolution (of about 60 nm). In this study, a new system using a hard X-ray microscope at Spring-8 of JASRI was developed in collaboration with SPring-8 [7]. As an additional method, localized surface plasmon resonance (LSPR) is a very interesting phenomenon, and can be applied to super-resolution analysis, and this is already demonstrated to achieve 10 nm spatial resolutions under an optical microscope. We are constructing a practical application system using such new information.

Low-background technologies

As the interaction strength of dark matter to standard matter should be very low, various contaminations have to be considered as the background source. For example, environment radioisotopes will produce serious background noise despite being very low-level. Environmental radiation from radioisotopes around the detector can be shielded in principle; however, intrinsic radioactivity etc., is the most serious. We were able to obtain data for the quantitative amount of such radiation using a pure Ge detector and ICP-MS, etc.. Currently, background rejection studies are the main topic of study, and we are developing various technologies to reject background (e.g., chemical sensitivity control, cryogenic devices, and so on).

The news project

The above technical breakthrough proved to be an important step for promoting the project. Now, international collaboration has been established as the "NEWS (Nuclear Emulsion for WIMPs Search)" project, and organization of the project and the making of a proposal are under way. Currently, the participating countries are Japan, Italy, Turkey and Russia, and about 50 persons have signed the previous Letter of Intent.

As cosmic rays or radiation induced by cosmic rays present the risk of producing fake signals in the search for exotic particles such as dark matter, an experimental field located deep underground is required, with rock providing a shield from cosmic rays. This project will be started at the Gran Sasso National Laboratory (LNGS) in Italy, which has a very large laboratory about 1000 m underground (Fig.1). We will start the first pilot run in the coming two years.

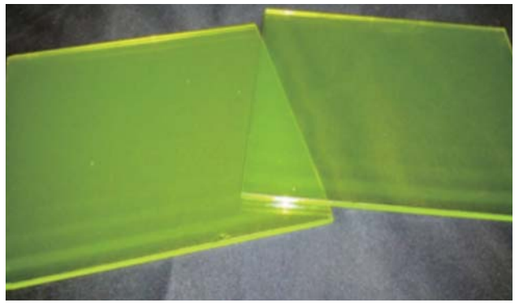


Fig.2 Fine-grained nuclear emulsion device for directional dark matter search developed by our group at Nagoya University

Acknowledgements

This work was supported by JSPS KAKENHI Grant Number 23840018, 25800140, 15H05446 26104005, and the YLC program of the Institute for Advanced Research at Nagoya University.

References

(1) P. A. R. Ade (and Planck collaboration), Astronomy & Astrophysics, 571, A10 (2014)
(2) D.P.Clemens, Astrophys. J. 295, 422–436 (1985)
(3) C. S. Oh, H. Kobayashi, M. Honma, T. Hirota, K. Sato and Y. Ueno, Publ. Astron. Soc. Japan 62, 101–114(2010)
(4) D.N.Spergel, Phys. Rev. D 37, 1353(1988)
(5) T. Naka et al., Nucl. Inst. Meth. A 718 (2013) 519–521
(6) K. Kimura and T. Naka, Nucl. Inst. Meth. A 680, 12–17 (2012)
(7) T. Naka et al., Rev. Sci. Instrum. 86, 073701 (2015)

IAR Core Faculty Committee

The IAR Core Faculty Committee is composed of the Institute Director, Deputy Directors, Full-Time Faculty Members, and member of the clerical staff, who promote the Institute's activities, and make proposals to the IAR Committee.

Hisanori SHINOHARA
Director

Affiliation : Director of Nagoya IAR/ Professor of the Graduate School of Science
Research Interests : Nanoscience and Nanotechnology of Carbon Nanomaterials (Fullerenes, Carbon Nanotubes, Graphene) and Other Atomic Layered Materials

MAJOR WORKS

"Bottom-up Formation of Endohedral Mono-Metallofullerenes is Directed by Charge Transfer" P.W.Dunk, M.Mulet-Gas, Y.Nakanishi, N.K.Kaiser, A.Rodriguez-Fortea, H.Shinohara, J.P.Poblet, A.G.Marshall and H.W.Kroto, *Nature Commun*., vol. 5, art. 5844 (2014)
"Growth of Carbon Nanotubes via Twisted Graphene Nanoribbons" H.E.Lim, Y.Miyata, R.Kitaura, Y.Nishimura, Y.Nishimoto, S.Irle, J.H.Warner, H.Kataura and H.Shinohara, *Nature Commun*., vol. 4, art. 2548 (2013)

Nasohi SUGIYAMA
Deputy Director

Affiliation : Deputy Director of Nagoya IAR/ Professor of the Graduate School of Science
Research Interests : Cosmology, Astrophysics, Structure Formation in the Universe

MAJOR WORKS

"Cosmic Background Anisotropies in Cold Dark Matter Cosmology", Naoshi Sugiyama, *Astrophysical Journal Supplement*, vol.100, pp. 281-305 (1995)
"The physics of microwave background anisotropies", Wayne, Hu, Naoshi Sugiyama, Joseph Silk, *Nature,* vol. 386, Issue 6620, pp. 37-43 (1997)

Hajime WADA
Deputy Director

Affiliation : Deputy Director of Nagoya IAR/ Professor of the Graduate School of Law
Research Interests : Atypical employment policy, Comparative study of standard labor relations in Japan and Germany, Comparative study of deregulation of labor law in Japan and the Republic of Korea

MAJOR WORKS

"Analysis of work hours policy of Abenomics", Quarterly Labor Law, Nr. 245, pp. 32-46 (2014)
"Gesetzliche Regelungen zum befristeten Arbeitsvertrag in Japan", *Moderne Arbeitswelt: Festschrift für Rolf Wank, edited by Martin Hensler, Jacob Joussen, Martin Matius and Ulrich Preis Verlag, C.H. Beck München*, pp. 617-633 (2014)

Hitoshi SAKAKIBARA
Deputy Director

Affiliation : Deputy Director of Nagoya IAR/ Professor of the Graduate School of Bioagricultural Sciences
Research Interests : Molecular Plant Physiology

MAJOR WORKS

"*Arabidopsis* ABCG14 is essential for root-to-shoot translocation of cytokinin.", Ko, D., Kang, J., Kiba, T., Park, J., Kojima, M., Do, J., Kim, K.Y., Kwon, M, Endler, A., Song, W.-Y., Martinoia, E., Sakakibara, H. and Lee, Y., *Proc. Natl. Acad. Sci. U.S.A.*, vol. 111, pp. 7150-7155 (2014)
"Copper mediates auxin signalling to control cell differentiation in the copper moss, Scopelophila cataractae.", Nomura, T., Itouga, M., Kojima, M., Kato, Y., Sakakibara, H. and Hasezawa, S., *J. Exp. Bot.*, vol. 66, pp. 1205-1213 (2015)

Dapeng CAI
Full-Time Faculty

Affiliation : Associate Professor at Nagoya IAR
Research Interests : Industrial organization. Environmental and resource economics

MAJOR WORKS

"Protection versus Free Trade: Lobbying Competition between Domestic and Foreign Firms" Cai, D. and Li, J., *Southern Economic Journal*, Vol. 81, pp. 489-505 (2014)
"Limit of the Solutions for the Finite Horizon Problems as the Optimal Solution to the Infinite Horizon Optimization Problems", Cai, D. and Nitta, T., *Journal of Difference Equations and Applications*, Vol. 17, pp. 359-373 (2011)

Miki KAWACHI
Full-Time Faculty

Affiliation : Associate Professor at Nagoya IAR
Research Interests : Plant physiology, Biochemistry

MAJOR WORKS

"Amino acid screening based on structural modeling identifies critical residues for function, ion selectivity and structure of *Arabidopsis* MTP1", *The FEBS Journal*, vol. 279, pp. 2339-2356 (2012)
"Deletion of a histidine-rich loop of AtMTP1, a vacuolar Zn^{2+} /H^{+} antiporter of *Arabidopsis thaliana*, stimulates the transport activity", *Journal of Biological Chemistry*, vol. 283, pp. 8374-8383 (2008)

Atsushi NISHIZAWA
Full-Time Faculty

Affiliation : Designated Lecturer at Nagoya IAR
Research Interests : Observational Cosmology, Astronomy

MAJOR WORKS

"The integrated Sachs-Wolfe effect and the Rees-Sciama effect", A.J. Nishizawa, *Progress of Theoretical and Experimental Physics*, vol. 6, PTEP 6B101 (2014)
"Perturbation theory for the non-linear halo power spectrum: the renormalized bias and halo bias", A.J. Nishizawa et al, *MNRAS*, vol.433 pp. 209-220 (2013)

IAR Steering Committee

The IAR Steering Committee plan, discuss, and decide on the Institute's academic activities.

Hideyo KUNIEDA
Steering Committee

Affiliation : Vice President of Nagoya University, Professor of Graduate School of Sciences
Research Interests : X-ray Astronomy · X-ray Optics

MAJOR WORKS

"Gravitationally Redshifted Emission Implying an Accretion Disk and Massive Black Hole in the Active Galaxy MCG-6-30-15", Y. Tanaka, K. Nandra, A.C. Fabian, H. Inoue, C. Otani, T. Dotani, K. Hayashida, K. Iwasawa, T. Kii, H. Kunieda, F. Makino, and M. Matsuoka, *Nature*, Vol. 375, 659-661 (1995)
"Rapid Variability of the Iron Fluorescence Line from the Seyfert 1 Galaxy NGC6814", H. Kunieda, T. J. Turner, H. Awaki, K. Koyama, R. Mushotzky, and Y. Tsusaka;, *Nature*, Vol. 345, 786-788 (1990)

Akira FUJIMAKI
Steering Committee

Affiliation : Vice Trustee of Nagoya University/ Professor of the Graduate School of Engineering
Research Interests : Superconductor Device, Integrated Circuit, Detector System

MAJOR WORKS

"Cryogenic ferromagnetic patterns with controlled magnetization for superconducting phase-shift elements," S. Taniguchi, H. Ito, K. Ishikawa, H. Akaike, and A. Fujimaki, *Japanese Journal of Applied Physics*, vol. 54 , art. 043101 (2015)
"Rapid single-flux-quantum circuits fabricated using 20-kA/cm² Nb/AlOx/Nb process," M. Tanaka, M. Kozaka, Y. Kita, A. Fujimaki, S. Nagasawa, and M. Hidaka, *IEEE Trans. on Appl.Supercond.*, vol. 25, art. 1100304 (2015)

Toru KUGINUKI
Steering Committee

Affiliation : Professor of the Graduate School of Letters
Research Interests : Japanese Linguistics Phonological History of Japanese. Grammatical Historuy of Japanese Theoretical HIstory of Japanese

MAJOR WORKS

"The Formation and the Academic School of Modern Japanese Luinguistics", Hitsuji Shobo(2013)
"Study on KANAZUKAI in early modern times", NAGOYA University Press (2007)

Takaki MIYATA
Steering Committee

Affiliation : Professor of the Graduate School of Medicine
Research Interests : Neural Development

MAJOR WORKS

"TAG-1–assisted progenitor elongation streamlines nuclear migration to optimize subapical crowding", Okamoto, M., Namba, T., Shinoda, T., Kondo, T., Watanabe, T., Inoue, Y., Takeuchi, K., Enomoto, Y., Ota, K., Oda, K., Wada, Y., Sagou, K., Saito, K., Sakakibara, A., Kawaguchi, A., Nakajima, K., Adachi, T., Fujimori, T., Ueda, M. Hayashi, S., Kaibuchi, K., Miyata, T., *Nature Neuroscience*, vol. 16, pp. 1556-1566 (2013)
"Asymmetric inheritance of radial glial fibers by cortical neurons", Miyata, T., Kawaguchi, A., Okano, H., and Ogawa, M., *Neuron*, vol. 31, pp. 727-741 (2001)

Shigeyuki KONDO
Steering Committee

Affiliation : Professor of the Graduate School of Mathematics
Research Interests : Mathematics, Algebra, Algebraic Geometry

MAJOR WORKS

"The automorphism group of a generic Jacobian Kummer surface", Shigeyuki Kondo, *J. Algebraic Geom.*, vol. 7, pp. 589—609 (1998)
2) "A complex hyperbolic structure of the moduli space of curves of genus three", Shigeyuki Kondo, *J.Reine Angew. Math.*, vol. 525, pp. 219—232 (2000)

IAR Faculty

The IAR Faculty members commit themselves to obtaining the outstanding results that their superior projects suggest. In addition, they are expected to contribute to the overall improvement of research at the University and to work towards increasing the University's reputation as a site of advanced learning.

Shoichi SATO
IAR Faculty

Affiliation : Emeritus Professor at Nagoya University/ the Japan Academy, Institut de France, Correspondant de l'Académie des Inscriptions et Belles-Lettres
Research Interests : History of Medieval Europe

MAJOR WORKS

"*An Abbey and its Peasants in the Touraine of the Merovingian Times. Study of the Accounting Documents from Saint-Martin of Tours*" (in Japanese), Nagoya University Press, pp. 775 (1997)
"*Studies of the Frankish History in Post-Roman Era*" (in Japanese), Iwanami Publishers, pp. 344 (2000)

Osamu IYAMA
IAR Faculty

Affiliation : Professor of the Graduate School of Mathematics
Research Interests : Algebra

MAJOR WORKS

"Mutation in triangulated categories and rigid Cohen-Macaulay modules", O. Iyama, Y. Yoshino, *Invent. Math*, vol. 172 pp.117-168 (2008)
"Higher-dimensional Auslander-Reiten theory on maximal orthogonal subcategories", O. Iyama, *Adv. Math.*, vol. 210 pp. 22-50 (2007)

Takao KONDO
IAR Faculty

Affiliation : Designated Professor of the Graduate School of Science
Research Interests : Chronobiology, Circadian clock, KaiC ATPase, Plant Physiology

MAJOR WORKS

"Expression of a gene cluster kaiABC as a circadian feedback process in cyanobacteria", Ishiura M, Kutsuna S, Aoki S, Iwasaki H, Andersson, CA, Tanabe A, Golden SS, Johnson CH, Kondo T, *Science*, vol. 281, pp. 1519-1523 (1998)
"Reconstitution of Circadian Oscillation of Cyanobacterial KaiC Phosphorylation *in vitro*", Nakajima M, Imai K, Ito H, Nishiwaki T, Murayama Y, Iwasaki H, Oyama T, Kondo T. *Science*, vol. 308, pp. 414-415 (2005)

Yasuo
FUKUI
IAR Faculty

Affiliation : Professor of the Graduate School of Science
Research Interests : Radio astronomy

MAJOR WORKS

"A Detailed Study of the Molecular and Atomic Gas toward they-Ray Supernova Remnant RX J1713.7-3946: Spatial TeVγ-Ray and Interstellar Medium Gas Correspondence", Fukui, Y., 15 colleagues, *Astrophys. J*, vol. 746, pp. 82-99 (2012)
"Molecular Loops in the Galactic Center : Evidence for Magnetic Flotation", Fukui, Y., 13 colleagues, *Science*, vol. 314, pp.106-109 (2006)

Toshio
FUKUDA
IAR Faculty

Affiliation : Visiting Professor of the Graduate School of Engineering/ Professor at Meijo University
Research Interests : Intelligent Robotic and Mechatronic System, Cellular Robotic System, and Micro- and Nano-robotic System

MAJOR WORKS

"On-chip Fabrication of Magnetic Alginate Hydrogel Microfibers by Multi-Layered Pneumatic Microvalves", *Microfluidics and Nanofluidics*, vol. 17, pp. 457-468 (2014)
"Micro-assembly of a Vascular-like Micro-channel with Railed Micro-robot Team-coordinated Manipulation", *International Journal of Advanced Robotic Systems*, vol. 11, p. 115 (2014),

Takaho
ANDO
IAR Faculty

Affiliation : Visiting Professor at Nagoya University / Professor at Chubu University
Research Interests : History of Social Thought

MAJOR WORKS

"Establishment of French liberalism" (in Japanese), Nagoya University Press, (2007)
"France 's modern thought" (in Japanese) *Annual Report of the Society for the History of Social Thought*, vol. 37, pp.33-53 (2013)

IAR Tenure-Track Faculty

The Institute selects and supports young researchers who are expected to lead the research of the University in the next generation as the Tenure-track Faculty.

Kazuyuki
SHIMADA
Tenure Track Faculty
(YLC-t)

Affiliation : Designated Lecturer at Nagoya IAR / Graduate School of Medicine
Research Interests : Understanding the intractable mechanisms and developing the novel therapies in malignant lymphoma

MAJOR WORKS

"Retrospective Analysis of Intravascular Large B-Cell Lymphoma Treated With Rituximab-Containing Chemotherapy As Reported by the IVL Study Group in Japan", Shimada K *et al., J Clin Oncol*. vol. 26, pp. 3189-3195 (2008)
"Presentation and management of intravascular large B-cell lymphoma", Shimada K *et al., Lancet Oncol*. vol. 10, pp. 895-902 (2009)

Tomoko
NISHIYAMA
Tenure Track Faculty
(YLC-t)

Affiliation : Designated Lecturer at Nagoya IAR and Graduate School of Science
Research Interests : Chromosome Biology

MAJOR WORKS

"Sororin mediates sister chromatid cohesion by antagonizing Wapl", Nishiyama T, Ladurner R, Schmitz J, Kreidl E, Schleiffer A, Bhaskara V, Bando M, Shirahige K, Hyman AA, Mechtler K, Peters JM., *Cell*. Vol. 143, pp. 737-49 (2010)
"Aurora B and Cdk1 mediate Wapl activation and release of acetylated cohesin from chromosomes by phosphorylating Sororin", Nishiyama T, Sykora MM, Huis In 't Veld PJ, Mechtler K, Peters JM., *PNAS*, vol. 110, pp. 13404-13409 (2013)

Bisei
OHKAWARA
Tenure Track Faculty
(YLC-t)

Affiliation : Designated Lecturer at Nagoya IAR and Graduate School of Medicine
Research Interests : Development, Neurobiology, Mechanism of Extracellular proteins in Neuromuscular Junction

MAJOR WORKS

""LRP4 third β-propeller domain mutations cause novel congenital myasthenia by compromising agrin-mediated MuSK signaling in a position-specific manner", Ohkawara B, Cabrera-Serrano M, Nakata T, Milone M, Asai N, Ito K, Ito M, Masuda A, Ito Y, Engel AG, Ohno K., *Hum Mol Genet*, vol. 23, pp. 1856-1868 (2014)
"Requirement of prorenin receptor and vacuolar H+-ATPase-mediated acidification for Wnt signaling", Cruciat CM*, Ohkawara B*, Acebron SP, Karaulanov E, Reinhard C, Ingelfinger D, Boutros M, Niehrs C, *Science*, vol. 327, pp. 459-63 (2010) *:equal contribution

YLC Program Faculty

YLC Faculty members are promising young researchers recruited under the Nagoya University Young Leaders Cultivation Program (YLC Program).

Yuichiro SHINDO

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Medicine
Research Interests : Respiratory Medicine; Pneumonia; Infectious Diseases; Immunotherapy

MAJOR WORKS

"Risk factors for 30-day mortality in patients with pneumonia who receive appropriate initial antibiotics: an observational cohort study", Shindo Y, Ito R, Kobayashi D, et al., *Lancet Infect Dis*, vol. 15, pp. 1055-1065 (2015)
"Risk Factors for Drug-Resistant Pathogens in Community-Acquired and Healthcare-Associated Pneumonia", Shindo Y, Ito R, Kobayashi D, et al., *Am J Respir Crit Care Med*, vol. 188, pp. 985-995 (2013)

Tatsuhiro NAKA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Experimental Studies, Kobayashi-Maskawa Institute
Research Interests : Particle physics, Dark Matter, Radiation physics

MAJOR WORKS

"A novel approach to dark matter search based on nanometric emulsions", A. Alexandrov T. Asada N. D'Ambrosio G. De Lellis, A. Di Crescenzo, N. Di Marco, S. Furuya, V. Gentile, K. Hakamata, M. Ishikawa, T. Katsuragawa, K. Kuwabara, S. Machii, T. Naka, F. Pupilli, C. Sirignano, Y. Tawara, V. Tioukov, A. Umemoto and M. Yoshimoto, *JINST*, vol. 9, C12053 (2014)

Kousuke NOGAWA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Engineering
Research Interests : Micro/Nanomachines

MAJOR WORKS

"Development of Local Environmental Control System by Combination of Microfluidic Chip and Pipette", Kousuke Nogawa, and Fumihito Arai, *Proceedings of 2014 IEEE International Conference on Robotics and Automation*, pp. 5842-5847 (2014)"Miniaturized load sensor using quartz crystal resonator constructed through microfabrication and bonding", Yuichi Murozaki, Kousuke Nogawa, Fumihito Arai, *ROBOMECH Journal*, vol. 1, pp. 7 (2014)

Kazuma SAKAMOTO

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Medicine
Research Interests : Neuroscience, Biochemistry

MAJOR WORKS

"Mechanisms of axon regeneration and its inhibition: roles of sulfated glycans", Kadomatsu K, Sakamoto K., *Arch Biochem Biophys.*, vol. 15, pp. 36-41 (2014)

Shinya MATSUZAKI

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Nagoya University
Research Interests : Research on Origin of Mass

MAJOR WORKS

"Holographic QCD Integrated back to Hidden Local Symmetry", M.Harada, S.Matsuzaki and K.Yamawaki, *Phys.Rev.* vol. 82, art. 076010 (2010)"Is 125 GeV techni-dilaton found at LHC?", S.Matsuzaki and K.Yamawaki, *Phys.Lett.B* vol. 719, pp. 378-382 (2013)

Shinji MIYATA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Bioscience Biotechnology Center
Research Interests : Glycobiology, Neuroscience

MAJOR WORKS

"Persistent cortical plasticity by upregulation of chondroitin 6-sulfation", Miyata, S., Komatsu, Y., Yoshimura, Y., Taya, C., Kitagawa, H., *Nature Neuroscience*, vol. 15, pp. 414-22 (2012)
"Co-expression of two distinct polysialic acids, α2,8- and α2,9-linked polymers of N-acetylneuraminic acid, in distinct glycoproteins and glycolipids in sea urchin sperm", Miyata, S., Yamakawa, N., Toriyama, M., Sato, C., Kitajima, K., *Glycobiology*, vol. 21, pp 1596-1605 (2011)

Yasuyoshi YONEZAWA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Law
Research Interests : Investment Arbitration, Tax Sovereignty, Competition Law and Policy, Energy Law and Policy

MAJOR WORKS

"Quantum (sl(n),ΛVn) link invariant and matrix factorizations", Yasuyoshi Yonezawa, *Nagoya Math. J*, vol. 204, pp. 69-123 (2011)"sl(n) web categories", Marco Mackaay and Yasuyoshi Yonezawa, arXiv:13066242, (2013)

Alisher UMIRDINOV

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Law
Research Interests : Investment Arbitration, Tax Sovereignty, Competition Law and Policy, Energy Law and Policy

MAJOR WORKS

"Competition Law of Uzbekistan in Transition-current situation and challenges", with Shuya Hayashi in *International Enforcement of Antimonopoly Law*, Nihonhyoronsha, pp. 259-302 (2012)
"Investment Treaty Arbitration and Protection of Host State`s Discretion Power in Tax Disputes", *Japanese Yearbook of International Economic Law*, vol. 22, pp. 191-215 (2013)

Yuko URAKAWA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Science
Research Interests : Early universe, Quantum field theory in curved spacetime, Gauge/gravity correspondence

MAJOR WORKS

"Loops in inflationary correlation functions," *Classical and Quantum Gravity*, Vol. 30, art. 233001 (2013)"Holographic inflation and the conservation of ζ," *Journal of High Energy Physics*, vol. 1406, art. 086 (2014)

Chuan XIAO

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Information Science
Research Interests : Databases

MAJOR WORKS

"Efficient Error-tolerant Query Autocompletion", Chuan Xiao, Jianbin Qin, Wei Wang, Yoshiharu Ishikawa, Koji Tsuda, and Kunihiko Sadakane. *Proceedings of VLDB Endowment*, vol. 6, pp. 373-384 (2013)."Efficient Similarity Joins for Near Duplicate Detection", Chuan Xiao, Wei Wang, Xuemin Lin, Jeffrey Xu Yu, and Guoren Wang. *ACM Transactions on Database Systems*, vol. 36, pp.15:1-15:41 (2011)

Yin WANG

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Institute of Transformative Bio-Molecules (WPI-ITbM)
Research Interests : Plant physiology, Plant ecophysiology, Photosynthesis

MAJOR WORKS

"Multiple roles of the plasma membrane H+-ATPase and its regulation", Yin Wang, Ken-ichiro Shimazaki, Toshinori Kinoshita, *The Enzymes*, vol. 35, pp. 191-211 (2014)

Itaru KUSHIMA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Medicine
Research Interests : Neuropsychiatry, Genetics

MAJOR WORKS

"Analysis of the VAV3 as candidate gene for schizophrenia: evidences from voxel-based morphometry and mutation screening", *Schizophr Bull.*, vol. 39, pp. 720-728 (2013)"Resequencing and association analysis of the KALRN and EPHB1 genes and their contribution to schizophrenia susceptibility", *Schizophr Bull.*, vol. 38 pp. 552-560 (2012)

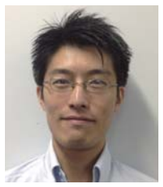
Mizuki KOMURA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Economics
Research Interests : Economics of the Household, Labor Economics, Public Economics

MAJOR WORKS

"Fertility and endogenous gender bargaining power", *Journal of Population Economics*, vol. 26, pp. 943-961 (2013)"Tax reform and endogenous gender bargaining power", *Review of Economics of the Household*, vol. 11, pp. 175-192 (2013)



Daisuke MARUYAMA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor of Nagoya IAR and Institute for Transformative Bio-molecules (ITbM)
Research Interests : Pollen tube guidance, Polytubey block, Double fertilization.

MAJOR WORKS

"Rapid Elimination of the Persistent Synergid through a Cell Fusion Mechanism", *Cell*, vol. 161, pp. 907-918 (2015)"Independent Control by Each Female Gamete Prevents the Attraction of Multiple Pollen Tubes", *Developmental Cell*, vol. 25, pp. 317-323 (2013)

Yuya MIZUNO

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Mathematics
Research Interests : Mathematics, representation theory of algebras

MAJOR WORKS

"A Gabriel-type theorem for cluster tilting", Y. Mizuno, *Proc. London Math. Soc*. vol.108 (4): pp. 836-868 (2014).
"Classifying τ-tilting modules over preprojective algebras of Dynkin type", Y. Mizuno, *Math. Z*. vol. 277, 3, pp. 665-690 (2014).

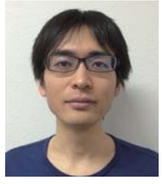
Fusa MIYAKE

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Institute for Space-Earth Environmental Research
Research Interests : Cosmogenic nuclides, solar activity

MAJOR WORKS

"A signature of cosmic-ray increase in AD 774–775 from tree rings in Japan", *Nature*, vol. 486, pp. 240-242 (2012)
"Cosmic ray event of A.D. 774–775 shown in quasi-annual 10Be data from the Antarctic Dome Fuji ice core", *Geophys. Res. Lett*., vol. 42, pp. 84-89 (2015).



Kunihiro MORISHIMA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Institute of Material and Systems for Sustainability
Research Interests : Fundamental particle physics. Astrophysics. Radiation detectors.

MAJOR WORKS

"Development of a new automatic nuclear emulsion scanning system, S-UTS, with continuous 3D tomographic image read-out", *Journal of Instrumentation*, vol. 5, P04011 (2010)"First demonstration of cosmic ray muon radiography of reactor cores with nuclear emulsions based on an automated high-speed scanning technology", *RADIATION DETECTORS AND THEIR USES Proceedings of the 26th Workshop on Radiation Detectors and Their Uses in KEK*, pp. 27-36 (2012)

Sayuri YOSHIDA

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Letters
Research Interests : Cultural Anthropology. Ethnology. African Studies

MAJOR WORKS

"*The Reality of Discrimination: Ethnography of the Kafa and the Manjo in Ethiopia*" (Shumpusha, 2014, in Japanese).
"Struggle against Social Discrimination: Petitions by the Manjo in the Kafa and Sheka zones, Southwest Ethiopia" *Nilo-Ethiopian Studies*, No. 18, pp. 1-19 (2013)

Simon DALGLEISH

Young Leaders Cultivation Program Faculty (YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Research Center for Materials Science
Research Interests : Organic electronics and optoelectronics, Near-infrared dyes, Low bandgap semiconductors, Electrochemistry, Organic synthesis

MAJOR WORKS

"Utilizing Photocurrent Transients for Dithiolene-Based Photodetection: Stepwise Improvements at Communications Relevant Wavelengths", *Journal of the American Chemical Society*, vol. 134, pp. 12742-12750 (2012)
"Electrodeposition as a Superior Route to a Thin Film Molecular Semiconductor", *Chemical Science*, pp. 316-320 (2011)

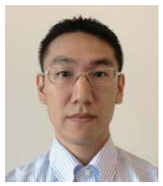
Cyrus Tristan ROY

Young Leaders Cultivation Program Faculty
(YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Mathematics
Research Interests : Nonlinear dispersive equations, Long-time dynamics

MAJOR WORKS

"On control of Sobolev norms for some semilinear wave equations with localized data", T. Roy, *J. Funct. Anal.*, vol. 265, pp.2724–2752 (2013)
"Global existence of smooth solutions of a 3D log-log energy-supercritical wave equation", T. Roy, *Anal. PDE*, vol. 2, pp. 261–280 (2009)



Takuya MATSUMOTO

Young Leaders Cultivation Program Faculty
(YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Mathematics
Research Interests : Lie superalgebras, Quantum groups, AdS/CFT correspondence

MAJOR WORKS

"Lunin–Maldacena backgrounds from the classical Yang–Baxter equation — Towards the gravity/CYBE correspondence", T. Matsumoto and K. Yoshida, *J. High Energy Phys.*, no. 6, 135 (2014)"A quantum affine algebra for the deformed Hubbard chain" N. Beisert, W. Galleas and T. Matsumoto, *J. Phys.* A, vol. 45, no. 36, 365206 (2012)

Akira ICHIKAWA

Young Leaders Cultivation Program Faculty
(YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Letters
Research Interests : Mesoamerican Archaeology, History of periphery zone, Archaeology of Disaster

MAJOR WORKS

"Prehistoric Salt Production on the Pacific Coast of Southeastern Mesoamerica: Case Study of Nueva Esperanza, El Salvador", *Journal of the Japanese Archaeological Association*, vol. 40, pp. 1-18 (2015)
"Estudio Arqueológico de Nueva Esperanza, Bajo Lempa, Usulután" Dirección de Publicaciones e Impresos, Secretaría de Cultura de la Presidencia (2011)

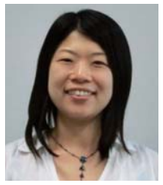
Yoshiko UMEKAWA

Young Leaders Cultivation Program Faculty
(YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of law
Research Interests : Political Science. Political Thought. History of Social Thought. Canadian Politics.

MAJOR WORKS

"Charles Taylor and Hungarian Incident, 1956-1957 (1)(2)" Yoshiko UMEKAWA, *The Nagoya journal of law and politics*, vol. 257, pp. 109-136 (2014) and vol. 259, pp. 113-132, (2014)
"Charles Taylor as a New Left, 1956-1960 (1)(2)", Yoshiko UMEKAWA, *The Nagoya journal of law and politics*, vol. 261, pp. 99-125, (2015), and vol. 262, pp. 177-210 (2015)



Sachiko KUROYANAGI

Young Leaders Cultivation Program Faculty
(YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Science
Research Interests : Cosmology and Gravitational Waves

MAJOR WORKS

"Implications of the B-mode polarization measurement for direct detection of inflationary gravitational waves", *Physical Review D*, vol. 90, 063513 (2014)

Hidetoshi SANO

Young Leaders Cultivation Program Faculty
(YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Science
Research Interests : Radio Astronomy, High-Energy Astrophysics

MAJOR WORKS

"A detailed study of non-thermal X-ray properties and interstellar gas toward the γ-ray supernova remnant RX J1713.7–3946", *The Astrophysical Journal*, vol. 799, pp. 175-184 (2015)
"Non-thermal X-rays and interstellar gas toward the γ-ray supernova remnant RX J1713.7-3946: Evidence for X-ray enhancement around CO and HI clumps", *The Astrophysical Journal*, vol. 778, pp. 59-77 (2013)

Mana KANO-NAKATA

Young Leaders Cultivation Program Faculty
(YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Bioagricutural Sciences
Research Interests : Crop science, Weed science

MAJOR WORKS

"Nitrogen application enhanced the expression of developmental plasticity of root systems triggered by mild drought stress in rice", *Plant Soil*. vol. 378, pp. 139-152 (2014)
"Effect of various intensities of drought stress on $\delta^{13}C$ variation among plant organs in rice", *Am. J. Plant Sci*. vol. 5, pp. 1686-1693 (2014)

Takahiro HORIBE

Young Leaders Cultivation Program Faculty
(YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Engineering
Research Interests : Organic Chemistry, Development of Catalyst

MAJOR WORKS

"Stable And Versatile Gold(III) Catalysts by Oxidative Addition of a Strained Carbon-Carbon Bond", Chung-Yeh Wu*, Takahiro Horibe* , Christian B. Jacobsen, F. Dean Toste, *Nature*, vol. 517, pp. 449-454 (2015) (*These authors contributed equally)

Chun LI

Young Leaders Cultivation Program Faculty
(YLC)

Affiliation : Designated Assistant Professor at Nagoya IAR and Graduate School of Science
Research Interests : Molecular Genetics, Molecular Biology

MAJOR WORKS

"The growth factor SVH-1 regulates axon regeneration in *C. elegans* via the JNK MAPK cascade", Chun Li, Naoki Hisamoto, Paola Nix, Shuka Kanao, Tomoaki Mizuno, Michael Bastiani and Kunihiro Matsumoto, *Nature Neuroscience*, vol. 15, pp. 551-557 (2012)
"Axon regeneration is regulated by Ets–C/EBP transcription complexes generated by activation of the cAMP/Ca^{2+} signaling pathways", Chun Li, Naoki Hisamoto and Kunihiro Matsumoto, *PLOS Genetics*, vol. 11, art. e1005603 (2015)

The Nagoya University Lecture 2015

On September 6, 2015, the Nagoya University Lecture 2015 was held at the Toyota Auditorium in Nagoya University, hosted by IAR Nagoya and Chunichi Shimbun Co., Ltd. The Nagoya University Lecture is positioned as the most important academic lecture at the University to be hosted by the President. The lecturers, selected from international researchers of the highest caliber, are awarded Nagoya University Lectureships. It is open to the general public.

This year, Dr. Hiroshi Amano, a professor of the Graduate School of Engineering at Nagoya University, was awarded the Nagoya University Lectureship. He had won the 2014 Nobel Prize in Physics "for the invention of efficient blue light-emitting diodes (LEDs) which has enabled bright and energy-saving white light sources" with Dr. Isamu Akasaki and Dr. Shuji Nakamura. When he was a graduate student at Nagoya University, he succeeded in the crystallization of gallium nitride and developed a blue LED with his supervisor Prof. Isamu Akasaki (Nagoya University/Meijo University). Their invention enabled the development of very energy-efficient lighting and is widely used in our lives. Moreover, due to their low energy consumption, their invention has brought light to 1.5 billion people in Africa and Central Asia. On that day, Dr. Akasaki gave a memorial lecture titled “How the blue light emitting diode was created,” following which Dr. Amano gave a lecture titled “LEDs that have illuminated the world.” After the lecture, Dr. Amano invited high school students onto the stage and answered questions from the students. He encouraged students with his words “Please find something that you can really get into and challenge yourself. One day, you will find something that only you can do.” About 1,000 people including 172 junior high and high school students attended the lecture.

Lectureship award ceremony

1st Intercontinental Academia

The 1st Intercontinental Academia under the theme of “TIME” consists of a São Paulo workshop (first phase) and a Nagoya workshop (second phase). The first phase was held at the University of São Paulo in Brazil from April 17 to 29, 2015. Thirteen young researchers that had been selected based on recommendations from their respective Advanced Research Institutes all over the world and over 30 senior researchers from different fields attended the São Paulo workshop. They discussed the theme of “TIME” from a multidisciplinary approach and made a plan for a joint project to create a Massive Open Online Course (MOOC) on the knowledge of “TIME.” The second phase will be held from March 7 to 18, 2016 at Nagoya University.

Group photo of the São Paulo workshop

Ryoji Noyori Academy Salon

Since January 2013, University Prof. Ryoji Noyori, a 2001 Nobel Laureate in Chemistry, has contributed numerous articles to "Kamitsubute" in the Japanese daily newspaper Chunichi Shimbun. Based on these articles, he holds regular academic discussions with students at Nagoya University. In 2015, six (the 13th to 18th) Ryoji Noyori Academy salons were held. Prof. Noyori and students from different academic fields at Nagoya University discussed the topics. The topics were “My Mentor and Me” (13th), “The Fascination of Chemistry” (14th), “For the Proper Evaluation of Research Performance” (15th), “Globalization and Internationalization” (16th), “English Ability for Scientists” (17th) and “Science and Technology for Innovation” (18th).

The 18th Roji Noyori Academy Salon

Symposium on frontier and next generation researches at Nagoya University

The Annual Symposium of Nagoya IAR was held on November 5, 2015. Twenty-three researchers and six research groups presented their research results, and about 150 people attended the symposium.

Foreign PI Fellowship Program

The Foreign Principal Investigator (PI) Fellowship program is a program inviting excellent researchers from foreign countries with outstanding research achievements for three to four months’ fellowship, to promote the University’s academic research. In the academic year 2015, Prof. Kirill Ole Thompson, professor and associate dean for Humanities at the Institute for Advanced Studies in Humanities and Social Sciences of National Taiwan University was selected for this fellowship. While he was visiting Nagoya University, he undertook a research project called “Relational humanism in early Chinese thought, with implications for agrarian ethics” and gave a lecture titled “Lessons from Early Chinese Humanist Impulses” on September 28, 2015 at Nagoya University.

2015 Young Leaders Cultivation Program

The Young Leaders Cultivation (YLC) Program, through which Nagoya University regularly and systematically recruits and trains young faculty members, is a strategic program based on the premise that it is important to secure an appropriate quantity and quality of young faculty members, in order to sustain the development of outstanding education and research in the future. In the academic year 2015, Akira Ichikawa (Grad. Sch. of Letters), Yoshiko Umekawa (Grad. Sch. of Law), Sachiko Kuroyanagi (Grad. Sch. of Science), Hidetoshi Sano (Grad. Sch. of Science), Mana Nakata (Grad. Sch. of Bioagricultural), Takahiro Horibe (Grad. Sch. of Engineering), and Chun Li (Grad. Sch. of Science) were newly employed as a designated assistant professors of the YLC program.

Joint Project between FRIAS and Nagoya IAR 2015–17

The Freiburg Institute for Advanced Studies (FRIAS) and the Institute for Advanced Research, Nagoya University (Nagoya IAR) had called for a joint project group between FRIAS and Nagoya IAR. The aim of this program was to strengthen the collaboration between researchers of the two universities and to support highly original joint research combining the strengths of the two universities. The support is worth 28,000 euros + 4,000,000 yen in total for 24 months. Through the peer review procedure and the selection conference by the selection committee, two project groups out of six were selected for funding. The project titles and coordinator’s names were “Multicomponent Supramolecular Catalysis for Sustainable Chemical Synthesis” (Prof. Bernhard Breit, Institute of Organic Chemistry, Freiburg University, and Prof. Tahashi Ooi, Institute of Transformative Bio-Molecules, Nagoya University) and “Social Governance by Law—Substantive Standards and Procedural Enforcement” (Prof. Alexander Bruns, Institute for German and Foreign Civil Procedural Law, Freiburg University and Prof. Masabumi Suzuki, Graduate School of Law, Nagoya University).

IAR Freshmen Lecture Series

Targeting freshmen of the University, this lecture series includes lectures delivered by members of the Academy, IAR Faculty members, IAR Fellows, and researchers of Nagoya University. It is aimed at communicating the fun of academic research. In the academic year 2015, the following 14 lectures were given:

1.“The laws of science and development,”
Prof. Toshihide Maskawa (Director of the Kobayashi Maskawa Institute, 2008 Nobel Laureate in Physics)

2.“The dark universe,”
Prof. Naoshi Sugiyama (Grad. Sch. of Science/Deputy Director in IAR Nagoya)

3.“Chemistry challenges for important issues in the 21st Century,”
Prof. Susumu Saito (Grad. Sch. of Science)

4.“The boundary of chemistry and biology,”
Prof. Yoshito Watanabe (Grad. S ch. of Science/Vice President)

5.“Interpretation—among living, knowing and bereaving—”
Prof. Kazuhiro Matsuzawa (Grad. Sch. of Literature)

6.“What is social justice?”
Prof. Hajime Wada (Grad. Sch. of Law, Deputy Director of IAR Nagoya)

7.“What is the economy?”
Prof. Tasturo Kuroda (Grad. Sch. of Environmental Study)

8.“Fascination with an introduction to the history of thought,”
Prof. Takaho Ando (Chuo University/Sixth Director of IAR Nagoya)

9.“Searching for the mystery of languages,”
Prof. Ken Machida (Grad. Sch. of Letters)

10.“Bench & bed,”
Prof. Takashi Takahashi (Grad. Sch. of Medicine)

11.“Genome breeding to solve the food crisis,”
Prof. Makoto Matsuoka (Grad. Sch. of Bioagricultural Sciences)

12.“Society that will be transformed by LEDs,”
Prof. Hiroshi Amano (Grad. Sch. of Engineering, 2014 Nobel Laureate in Physics)

13.“Proteins to measure time,”
Prof. Takao Kondo (Grad. Sch. of Science/Fifth Director of IAR Nagoya)

14.“Science starts from seeing,”
Prof. Sumio Iijima (Meijo University/Distinguished Invited Professor of Nagoya University)

Awards

Dr. Sumio Iijima (University Professor at Meijo University / Distinguished Invited Professor of Nagoya University and IAR Academy) won the European Inventor Award 2015 in the category of Non-European Countries.

Dr. Tomoko Nishiyama (Designated Lecturer of the YLC-t Program) won the 2015 Young Scientists’ Prize of the Commendation for Science and Technology from the Minister of Education, Culture, Sports, Science and Technology.