

Seven Dialogues

for Future Research
and Science
with Early Career
Researchers

Program for the Development
of Next-generation Leading Scientists
with Global Insight (L-INSIGHT)

HeKKSaGOn·L-INSIGHT
Spin-off Program, 2022 [HLSP]

Online Forum

Friday 2 December, 2022
17:30-JST | 9:30-CET

Seven Dialogues *for* Future Research and Science *with* Early Career Researchers

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L-INSIGHT

The Program for the Development of Next-generation Leading Scientists with Global Insight (L-INSIGHT) aims to develop, validate, and spread programs to train the next-generation of world-class researchers with global insight who can spearhead new paths to the future.

Program Director: Prof. Dr. AKAMATSU Akihiko

HeKKSaGOn

The German-Japanese University Alliance (HeKKSaGOn) was founded in 2010 as an association of three German and three Japanese universities. HeKKSaGOn stands for the Heidelberg – Kyoto – Karlsruhe – Tohoku/Sendai – Göttingen – Osaka – alliance. The partner universities of HeKKSaGOn share the conviction that important global problems can be solved only through interdisciplinary and international cooperation and through the open exchange of knowledge. It places a strong value on high-quality teaching within an environment of internationally competitive research.

Introduction

On 2 December 2022, L-INSIGHT held the second “Seven Dialogues for Future Research and Science with Early Career Researchers.” In this forum, L-INSIGHT fellows and German university researchers engaged in dialogues on trans-disciplinary topics. These topics were proposed by the former as ones that should be discussed for the development of future research. This year’s event was jointly organized by Kyoto University, Heidelberg University, Karlsruhe Institute of Technology (KIT), and the University of Göttingen. It was the University of Göttingen’s first time joining. With the cooperation of the Kyoto University European Center, the forum’s network was expanded to cover all of German universities and institutions.. Forty speakers from twelve institutions discussed seven topics, and the audience consisted of people from twenty-five institutions in both Japan and Germany.

Professor YOKOYAMA Mika first offered opening remarks. She is the Director of Kyoto University’s European Center, which has played a central role as a liaison office for HeKKSaGOn (an alliance of six universities in Germany and Japan). Dr. Klaus Rümmele, the head of international affairs at KIT, then spoke about the importance of creating an environment where early career researchers can take advantage of their talents.

In the group dialogues, participants were divided into groups of three to seven speakers from multiple academic disciplines and engaged in lively discussions based on their own knowledge and perspectives chaired by seven L-INSIGHT fellows.

In the general discussion, the L-INSIGHT fellows who chaired the sessions shared things they had realized during the dialogues. This included differences and similarities in how issues are perceived in different cultures and fields, as well as the importance of promoting the involvement of early career researchers and citizens when making policies that implement research results in society.

In response, commentators offered their thoughts on the value of transdisciplinary research and how to continue such efforts. First, Professor Dr. TANAKA Motomu at Heidelberg University expressed his high hopes that the cross-disciplinary combination of physics, applied mathematics and information science could lead to breakthroughs in MRI imaging technology. Professor Dr. Thomas Kneib at the University of Göttingen, then suggested that establishing specific methodologies for collaboration, through data scientification and other means, will help researchers in different fields continue their relationships. Finally, Professor Dr. KONO Yasuyuki of Kyoto University noted that the real world is interdisciplinary, and that the essence of interdisciplinary discussions lies in understanding the unique logic of each discipline.

In closing, Nicole Dorn of Heidelberg University sent her compliments to the speakers and audience members and expressed her hope that people will continue to cross borders, such as those dividing academic customs and countries. The forum was brought to a close by Professor Emeritus AKAMATSU Akihiko, the director of the Strategic Development Hub for Early Career Researchers, who thanked all those involved. The forum was moderated by Sabine Schenk of the Heidelberg University Office, Kyoto (HUOK).

We plan to further deepen its collaboration mutually, and continue its efforts so that early career researchers can continuously use this series of forums as an open and international platform.

Plans are being made so that the researchers who spoke at this forum can begin reciprocal visits to gain new experiences and engage in further discussions.

—
On behalf of the organizers

—
Kyoto University

—
NAKANO Asa

Greeting 1

Good morning and good evening, everyone. Thank you for participating in today's meeting, Seven Dialogues for Future Research and Science with Early Career Researchers. My name is Mika Yokoyama. I'm a law professor at Kyoto University and the university's European Center director. Our mission at the center is to promote academic exchange with European universities. I'm very pleased to see you today.

This is a joint program organized by Kyoto University with HeKKSaGOn alliance members. It aims to facilitate academic exchange among the alliance's early career researchers so that they can examine today's interdisciplinary subjects from global and long-term perspectives and rethink their own ideas. We started this program last year with great success. It was really exciting for everyone, including early career researchers and senior researchers like me, to participate in the discussions. I'm very happy to join you today. I would like to thank the organizers for their thorough preparations, especially Asa Nakano. I hope all of you enjoy what we have to offer and get something from the discussions.

Deputy Executive Vice-President,
Director of Kyoto University European Center,
Kyoto University

—
Prof. YOKOYAMA Mika

Greeting 2

It's a great pleasure to welcome you to this event, Seven Dialogues for Future Research and Science with Early Career Researchers. I would also like to send you the warm greetings of Thomas Hirth, our Vice-President for Transfer and International Affairs. He would love to be here. As we heard, the internationalization of young researchers is an important aim of Kyoto University. This is one of the several aims and values that we share. We're working together to do this in HeKKSaGOn. At German universities such as KIT, promoting young talent plays an important role. One focus of this is enabling them to feel secure and open-minded in an international and intercultural environment.

This covers their abilities as experts in science and engineering; sharing, and also reflecting on, their ideas and scientific approaches with researchers from all over the world; and working side by side with such researchers in large research contexts, laboratories, and seminars. HeKKSaGOn is an excellent platform for fostering this distinctive experience. One example, which deals with today's topics, is the "Life & Natural Science Fusion" working group. It assists early career researchers from Japan and Germany in participating in interdisciplinary work and interacting with colleagues from various scientific and cultural backgrounds. It helps them to learn to cross borders.

This shows that promoting young talent goes beyond strengthening professional abilities. It's also about learning soft skills and broadening horizons. At KIT, this begins with the students. The House of Competence helps them to develop their learning strategies, digital capacities, and presentation techniques. The Karlsruhe House of Young Scientists supports doctoral students and postdocs in networking, funding, and mobility. And, moreover, KIT offers early career researchers a young investigator network where they can organize and speak for themselves.

They all have access to our Academy for Responsible Research, Teaching, and Innovation, which addresses the increasing social need for ethical reflection in engineering and scientific practices, and also promotes students, scientists, and engineers' critical mindsets.

Today's program is a great opportunity for all of you to discuss, interact, and network. I would like to thank our dear partners from Kyoto University for taking the lead in organizing this event. I wish all the participants hours of inspiration and fun. Enjoy it. Thank you very much.

Head of International Affairs Business Unit,
Karlsruhe Institute of Technology

—
Dr. Klaus Rümmele

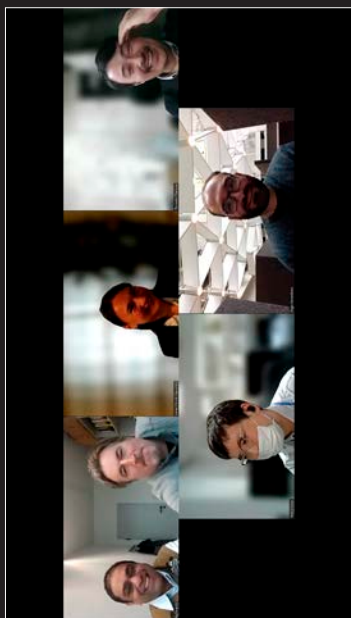




Topics & Speakers

JST	CET	Speakers	
Opening			
17:30	09:30	Opening remarks	<p><u>Prof. YOKOYAMA Mika</u> Deputy Executive Vice-President, Director of Kyoto University European Center, Kyoto University</p> <p><u>Dr. Klaus Rümmele</u> Head of International Affairs Business Unit, Karlsruhe Institute of Technology</p>
Parallel dialogues			
17:40	09:40	Dialogue — 1 Surgical management and biomarker-driven cancer therapy for gastrointestinal cancer patients	<p><u>Dr. OKAMURA Ryosuke</u> L-INSIGHT fellow / Kyoto University Hospital / Assistant Professor</p> <p><u>Prof. Dr. Anne-Christin Hauschild</u> Department of Medical Informatics, University Medical Center Göttingen, University of Göttingen</p> <p><u>Dr. Jörg Leupold</u> Department of Experimental Surgery, Cancer Metastasis, Heidelberg University <u>Dr. Nitin Patil</u> Department of Experimental Surgery, Cancer Metastasis, Heidelberg University</p>
		Dialogue — 2 Hydrological research in 2050	<p><u>Dr. TANAKA Tomohiro</u> L-INSIGHT fellow / Graduate School of Engineering, Kyoto University / Assistant Professor <u>Guyen Battuvshin</u> Institute of Geography, Heidelberg University <u>Prof. Dr. Martin Sauter</u> Geoscience Center, University of Göttingen</p> <p><u>Dr. Simon Schaub</u> Institute of Political Science, Heidelberg University <u>Dr. Aulia Febianda Anwar Tinumbang</u> Graduate School of Engineering, Kyoto University <u>Dr. YAMADA Masafumi</u> Disaster Prevention Research Institute, Kyoto University</p> <p><u>Dr. YAMAMOTO Eva</u> Disaster Prevention Research Institute, Kyoto University <u>Dr. YAMAMOTO Kodai</u> Disaster Prevention Research Institute, Kyoto University</p>
		Dialogue — 3 The role of epidemiology and statistics in healthcare science in 2030	<p><u>Dr. INOUE Kosuke</u> L-INSIGHT fellow / Graduate School of Medicine, Kyoto University / Assistant Professor <u>Prof. Dr. Tim Friede</u> Head of Department of Medical Statistics, University Medical Center Göttingen, University of Göttingen</p> <p><u>Dr. Maike Hohberg</u> Computational Statistics, Department of Medical Statistics, University Medical Center Göttingen, University of Göttingen <u>Junior-Prof. Dr. Tim Matthes</u> Department of Medical Statistics, University Medical Center Göttingen, University of Göttingen <u>MORI Yuichiro</u> Graduate School of Medicine, Kyoto University</p> <p><u>Pelin Ünal</u> Genomic Epidemiology Group, German Cancer Research Center (DKFZ) <u>Tomislav Vlaski</u> Division of Clinical Epidemiology and Aging Research, German Cancer Research Center (DKFZ) <u>apl. Prof. Dr. Volker Winkler</u> Heidelberg Institute of Global Health, Epidemiology of Transition, Heidelberg University Hospital, Heidelberg University</p>
		Dialogue — 4 How can/should we integrate the knowledge of phyllosphere plant-microbe interactions into policy dialogues at the global level?	<p><u>Dr. SHIRAIISHI Kosuke</u> L-INSIGHT fellow / Graduate School of Agriculture, Kyoto University / Assistant Professor</p> <p><u>Gideon Berghelm</u> Center for Organismal Studies, Heidelberg University</p> <p><u>Prof. Dr. Tobias Erb</u> Max Planck Institute for Terrestrial Microbiology, Marburg <u>Dr. Islam Khattab</u> Institute for Biological Interfaces, Karlsruhe Institute of Technology</p>
		Dialogue — 5 How human species will be, can be, should be	<p><u>Dr. ISOBE Masanori</u> L-INSIGHT fellow / Kyoto University Hospital / Assistant Professor <u>Kelly Amal Dhru, LL.M.</u> Faculty of Law, Universität Hamburg</p> <p><u>Dr. Jerome Foo</u> Department of Genetic Epidemiology in Psychiatry, Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University</p> <p><u>Konrad Waschkies</u> Department of Psychiatry and Psychotherapy, University of Göttingen</p>
		Dialogue — 6 How healthcare technology should overcome the digital literacy gap in the aged society?	<p><u>Dr. EGUCHI Kana</u> L-INSIGHT fellow / Graduate School of Medicine, Kyoto University / Program-Specific Assistant Professor</p> <p><u>Dr. Sebastian Herberger</u> Interdisciplinary Center of Sleep Medicine, Charité – Universitätsmedizin, Berlin</p> <p><u>Dr. Nicolai Spicher</u> Department of Medical Informatics, University Medical Center Göttingen, University of Göttingen</p>
		Dialogue — 7 Bridging the gap between macro and micro scale in tumor imaging	<p><u>Dr. IIMA Mami</u> L-INSIGHT fellow / Kyoto University Hospital / Assistant Professor <u>PD Dr. Sebastian Bickelhaupt</u> Institute for Radiology, University Hospital Erlangen</p> <p><u>A/Prof. Dr. Dimitrios Karampinos</u> Experimental Magnetic Resonance Imaging, School of Medicine & Munich Institute of Biomedical Engineering, Technical University of Munich</p> <p><u>Dr. Felix Kurz</u> Division of Radiology, German Cancer Research Center (DKFZ) <u>Dr. Van Anh Tu</u> Experimental Magnetic Resonance Imaging, School of Medicine & Munich Institute of Biomedical Engineering, Technical University of Munich</p>
General discussion			
18:55	10:55	Wrap-ups from each group (5min.×7groups)	
19:25	11:25	Comments from guests	<p><u>Prof. Dr. Thomas Kneib</u> Dean of research at the Faculty of Business and Economic Sciences, University of Göttingen</p> <p><u>Prof. Dr. TANAKA Motomu</u> Institute for Physical Chemistry, Heidelberg University</p> <p><u>Prof. Dr. KONO Yasuyuki</u> Vice President, Director International Strategy Office, Kyoto University</p>
19:40	11:40	Closing	<p><u>Nicole Dorn</u> International Relations Division, Department Study Abroad, Exchange Programmes, International Cooperation, Heidelberg University</p> <p><u>Prof. Dr. AKAMATSU Akihiko</u> Director, The Strategic Development Hub for Early Career Researchers, Kyoto University</p>

PART II
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DIALOGUES



- Kyoto University
- Dr. OKAMURA Ryosuke
- Heidelberg University
- Dr. Jörg Leupold
 - Dr. Nitin Patil
- University of Göttingen
- Prof. Dr. Anne-Christin Hauschild

1

→ 12p



- Kyoto University
- Dr. TANAKA Tomohiro
 - Dr. Aulia Febianda Anwar Tinumbang
 - Dr. YAMADA Masafumi
 - Dr. YAMAMOTO Eva
 - Dr. YAMAMOTO Kodai
- Heidelberg University
- Guyen Battuvshin
 - Dr. Simon Schaub
- University of Göttingen
- Prof. Dr. Martin Sauter

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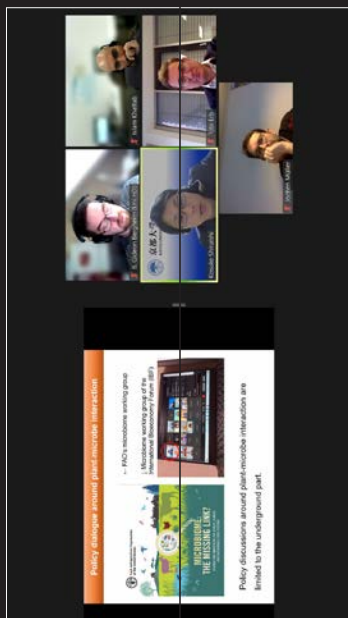
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- Kyoto University
- Dr. INOUE Kosuke
 - MORI Yuichiro
- German Cancer Research Center (DKFZ)
- Pelin Ünal
 - Tomislav Vlaski
- Heidelberg University
- apl. Prof. Dr. Volker Winkler
- University of Göttingen
- Prof. Dr. Tim Friede
 - Dr. Maike Hohberg
 - Junior-Prof. Dr. Tim Mathes

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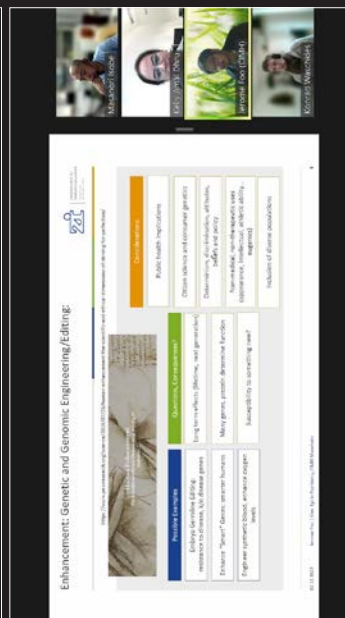
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- Kyoto University
- Dr. SHIRAISHI Kosuke
- Heidelberg University
- Gideon Bergheim
- Karlsruhe Institute of Technology
- Dr. Islam Khattab
- Max Planck Institute for Terrestrial Microbiology, Marburg
- Prof. Dr. Tobias Erb

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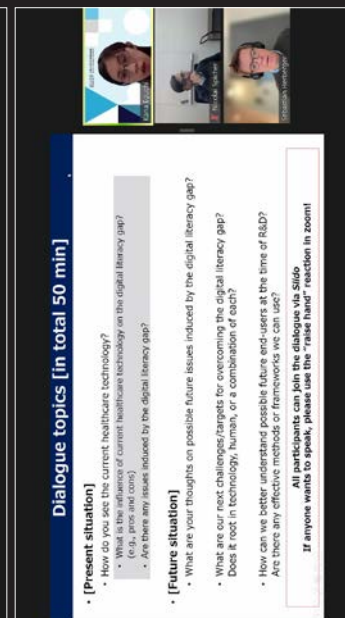
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- Kyoto University
- Dr. ISOBE Masanori
- Heidelberg University
- Dr. Jerome Foo
- University of Göttingen
- Konrad Waschkies
- Universität Hamburg
- Kelly Amal Dhru, LL.M.

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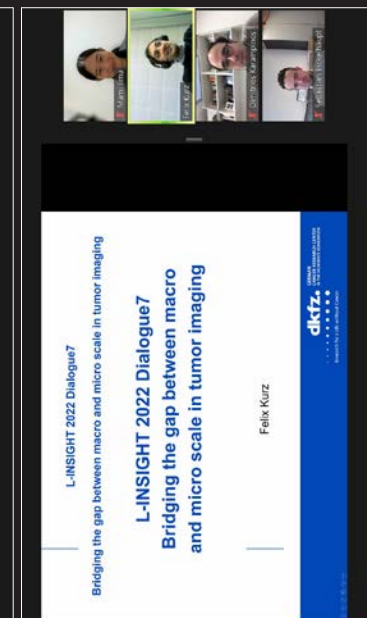
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- Kyoto University
- Dr. EGUCHI Kana
- University of Göttingen
- Dr. Nicolai Spicher
- Charité – Universitätsmedizin, Berlin
- Dr. Sebastian Herberger

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→ 31p



- Kyoto University
- Dr. IIMA Mami
- German Cancer Research Center (DKFZ)
- Dr. Felix Kurz
- Technical University of Munich
- A/Prof. Dr. Dimitrios Karampinos
 - Dr. Van Anh Tu
- University Hospital Erlangen
- PD Dr. Sebastian Bickelhaupt

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→ 38p

Surgical management and biomarker-driven cancer therapy for gastrointestinal cancer patients

Dr. OKAMURA Ryosuke	L-INSIGHT fellow / Kyoto University Hospital / Assistant Professor
Prof. Dr. Anne-Christin Hauschild	Department of Medical Informatics, University Medical Center Göttingen, University of Göttingen
Dr. Jörg Leupold	Department of Experimental Surgery, Cancer Metastasis, Heidelberg University
Dr. Nitin Patil	Department of Experimental Surgery, Cancer Metastasis, Heidelberg University



Background

Despite the recent development of surgical technology, we unfortunately see postoperative disease recurrence in many of advanced GI cancer cases. We surgeons should know the limits of surgical strategy for controlling tumor spread. How should current precision oncology, such as molecular profiling and biomarker-driven cancer therapy, be combined with surgery to improve GI cancer patients' outcomes?

Summary

The title of my dialogue session is Surgical Management and Biomarker-Driven Cancer Therapy for GI Cancer Patients. Here, I wanted to discuss oncology, especially novel treatment concepts such as molecular profiling or biomarker-driven cancer therapy. I'm really delighted to have three panelists; Dr. Leupold and Dr. Patil from Heidelberg University and Professor Hauschild from Göttingen University. Also, we had many participants as audience.

First of all, I talked about my career briefly, and then explained the points to be discussed in this session. I perform surgery and try to improve surgical outcomes for cancer patients, but unfortunately still see postoperative disease recurrence in advanced cancer cases. I think that we surgeons should know the limits of surgical strategy for controlling tumor spread. There are unmet need to understand the biology of cancers and also to find novel therapeutic approaches. In our dialogue, we focused on molecular oncology, tumor environment, and bioinformatics.

Dr. Leupold and Dr. Patil shared their research works regarding microRNA regulating tumor progression and metastasis. Also, they showed a novel powerful and time saving *in vivo* method, the Chicken Egg CAM assay. This can investigate the invasion and metastasis cascade of cancer cells. Professor Hauschild's works are focusing on machine learning of biomedical data for patient's clinical decision support. She talked about a federated AI framework, the FAIRPaCT system. This is an AI system for optimizing pancreatic cancer treatment. In the discussion part, we talked about how we can apply them to the clinical setting. I think that bioinformatics and molecular profiling are both keywords in the oncology field. That's why the session was really stimulating to me. I hope we can further discuss cancer treatment.



Background/Motivation

- ✓Despite the recent development of surgical technology, we unfortunately see postoperative disease recurrence in many of advanced GI cancer cases. We surgeons should know the limits of surgical strategy for controlling tumor spread.
- ✓How should current precision oncology, such as molecular profiling and biomarker-driven cancer therapy, be combined with surgery to improve GI cancer patients' outcomes?

Dialogue topics

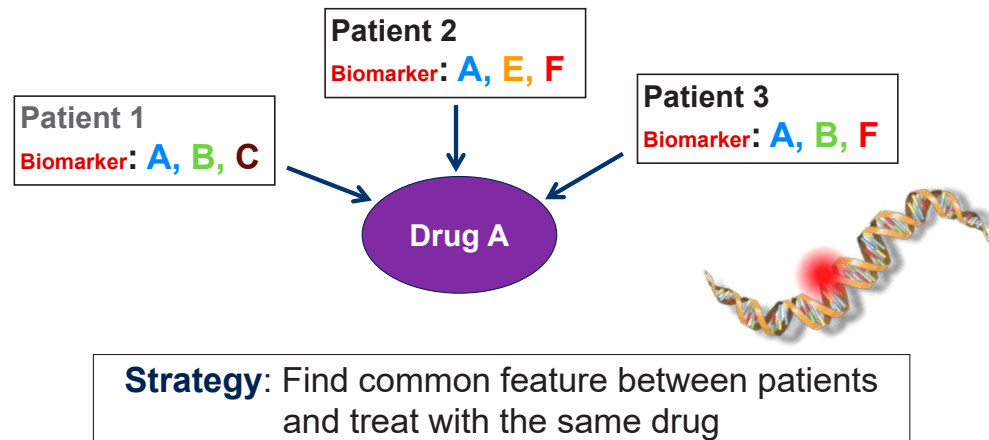
[Present situation]

- How do you see the current cancer treatment?
- Please share your past works or present researches (as openly as possible).

[Future situation]

- What are your thoughts on future cancer treatment.
- Please share your next challenges (as openly as possible).

Precision Oncology Approach



Dialogue 2

Hydrological research in 2050

Dr. TANAKA Tomohiro

L-INSIGHT fellow / Graduate School of Engineering, Kyoto University / Assistant Professor

Guyen Battuvshin

Institute of Geography, Heidelberg University

Prof. Dr. Martin Sauter

Geoscience Center, University of Göttingen

Dr. Simon Schaub

Institute of Political Science, Heidelberg University

Dr. Aulia Febianda Anwar Tinumbang

Graduate School of Engineering, Kyoto University

Dr. YAMADA Masafumi

Disaster Prevention Research Institute, Kyoto University

Dr. YAMAMOTO Eva

Disaster Prevention Research Institute, Kyoto University

Dr. YAMAMOTO Kodai

Disaster Prevention Research Institute, Kyoto University

Hydrology in 2050?

- Cross-cutting keywords?
 - AI
 - Aging society
 - Climate change
 - Carbon emission
 - Nature-based solutions
 - Ecosystem
- Common research keywords?
 - Nation-wide flood forecast
 - Socioeconomic pathways
 - Land use (agriculture, plantation)
 - Water resources, irrigation
 - Water quality, pollution
 - Climate change policy
- Climate change and hydrological research in 2050?
 - Modelling and real world fusion
 - More observations for modelling
 - The more complex the model is, the more data it requires
 - Digital twin (modelling world and real world)
 - If climate change projection in each CO2 emission becomes perfect (or enough reliable), how will it affect climate policy?
 - Studies on science

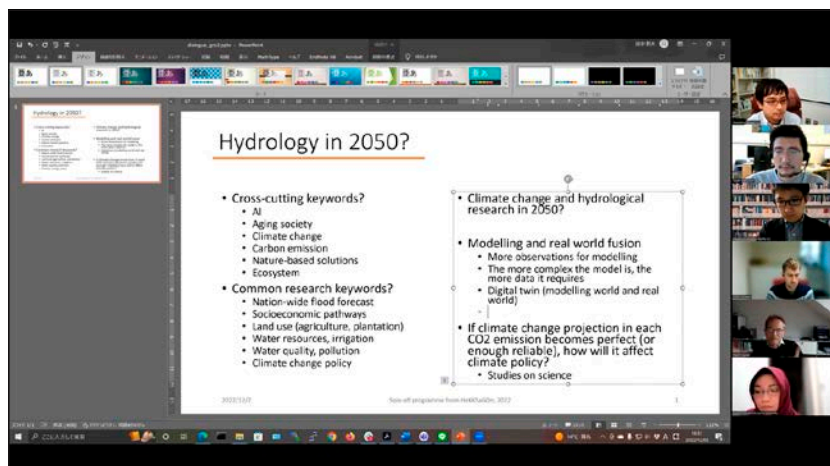
Background

Water sciences, such as hydrology, climatology, limnology, oceanology, coastal engineering, etc., pay the ever-strongest attention to climate change (CC) and its impact assessments. In 1990s and 2000s, CC research in hydrology was simply translating future projected rainfall to the resultant water cycle. Now, this topic became further more sophisticated, including more detailed hydraulic analysis such as inundation, landslides and their translation into economic impacts. The urgent needs of society for climate change adaptation accelerated such studies during this short period. In 2050, when climate change more explicitly emerges, how will or should our hydrological research, especially for CC assessments/adaptation/mitigation go? I would like to discuss the future of hydrology research: more social sciences associated, climate change validation, hydrological modelling, hydrological observation, etc.

In this group, I had three German researchers as introduced in the beginning of this event. We had four people officially, but just before the event, I also invited some of my colleagues from Kyoto University, making a big group of seven participants. It took almost three-fourths of the whole time to just make each research introduction. Still, it was good to know each other. In our group, I prepared some spreadsheet to share our link to introduction webpage so that we can further know each other through individual website, and we can make another contact even after the event.

The Japan side is mainly focusing on hydrological research, especially for the numerical modeling to reproduce the water cycle or climate change impact on the computer. German side, Dr. Simon's was a bit different background of climate policy, so we have a different aspect, discipline, but shared climate change issue. Also, Mr. Guyen works on the field measurement of hydrological phenomena such as snow cover/melting and forestry information. Finally, Professor Martin kindly joined and introduced about the groundwater research situation.

We had small talk discussion about the huge scope in hydrology in 2050. Now we stand on the modeling and observation sides, and they may come together in future; but, still there should be some gap. Our primary purpose is to reproduce the real world about water cycle on a computer; in addition, this is also helpful for understanding for more people, especially public people to get more interested in hydrological sciences. Furthermore, real-world simulation also supports the policy decision-making, educating the people and giving more literacy, and welcoming more younger generations to us. The modeling is a kind of a keyword to connect the future scope of climate change research as well as the implementation policy. That was kind of general outline we made the discussion. Thank you very much.



Dialogue 3

The role of epidemiology and statistics in healthcare science in 2030

- Dr. INOUE Kosuke** L-INSIGHT fellow / Graduate School of Medicine, Kyoto University / Assistant Professor
- Prof. Dr. Tim Friede** Head of Department of Medical Statistics, University Medical Center Göttingen, University of Göttingen
- Dr. Maike Hohberg** Computational Statistics, Department of Medical Statistics, University Medical Center Göttingen, University of Göttingen
- Junior-Prof. Dr. Tim Mathes** Department of Medical Statistics, University Medical Center Göttingen, University of Göttingen
- MORI Yuichiro** Graduate School of Medicine, Kyoto University
- Pelin Ünal** Genomic Epidemiology Group, German Cancer Research Center (DKFZ)
- Tomislav Vlaski** Division of Clinical Epidemiology and Aging Research, German Cancer Research Center (DKFZ)
- apl. Prof. Dr. Volker Winkler** Heidelberg Institute of Global Health, Epidemiology of Transition, Heidelberg University Hospital, Heidelberg University

What should we think about and do to improve the current situation

- Hard to explain (black box), but if it's interpretable it will change the current clinical practice beyond the guideline
- "Education": communication risk with patients
- Importance of validation
- Who should be responsible to fill the gap?

Future opportunities for collaboration to maximize this dialogue!

Background

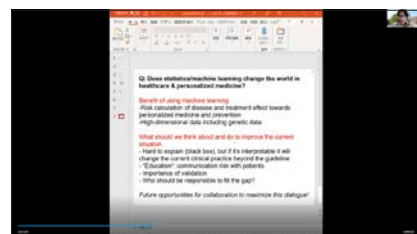
Given the recent rapid advancement of computer science, big data, and machine learning as well as increasing concern over social disparity, what knowledge and skill-sets would be appreciated in future science and medicine? What can we do to improve health towards precision medicine (in real meaning)?

In this dialogue, we had a big party particularly with statisticians and epidemiologists in healthcare science; me and Tomislav, Volker, Tim Mathes, Pelin, Tim Friede, Maik Hohberg, and Amir. We had a very intense discussion on the following question: “Does statistics/machine learning change the world in healthcare and personalized medicine?” We talked the potential of machine learning such as calculation of specific disease or treatment effect towards personalized medicine.

If we can estimate risk and benefit using machine learning in a precise calculation, we can improve current clinical practice. Machine learning also allows us to use high-dimensional data including genetic data or other big data, which lead to the improvement of the precise estimation about whether these patients really have a burden of the disease or the benefit of the treatment.

We also discussed what should we think about and do to improve the current situation because we have a huge gap between theory and clinical practice. In theory, we improved knowledge and skillsets of machine learning a lot, but we have barely used that in the real-world clinical setting. One reason is that machine learning has a black box and hard to explain. If we can make them more interpretable, it will change the current clinical practice using the guideline and policies.

Another important topic we talked was how to communicate with clinicians about the statistical results, i.e., how clinicians can understand our algorithms or our machine learning facts? Education and communication risk with clinicians and patients as well as the validation of the algorithm itself would be very important. Lastly, and most importantly, we briefly talked about future opportunities for collaboration to maximize this dialogue, and we will keep talking on this topic together.



Q: Does statistics/machine learning change the world in healthcare & personalized medicine?

Benefit of using machine learning

- Risk calculation of disease and treatment effect towards personalized medicine and prevention
- High-dimensional data including genetic data

What should we think about and do to improve the current situation

- Hard to explain (black box), but if it's interpretable it will change the current clinical practice beyond the guideline
- “Education”: communication risk with patients
- Importance of validation
- Who should be responsible to fill the gap?

Future opportunities for collaboration to maximize this dialogue!

How can/should we integrate the knowledge of phyllosphere plant-microbe interactions into policy dialogues at the global level?

Dr. SHIRAIISHI Kosuke L-INSIGHT fellow / Graduate School of Agriculture, Kyoto University / Assistant Professor
Gideon Bergheim Center for Organismal Studies, Heidelberg University
Prof. Dr. Tobias Erb Max Planck Institute for Terrestrial Microbiology, Marburg
Dr. Islam Khattab Institute for Biological Interfaces, Karlsruhe Institute of Technology

Background

Plant-microbe interaction is a complex, dynamic and continuous process. It has been shown to support plant growth and increase host resistance to pathogens, and the rhizosphere, the underground part, has been the center of the research. Recently, the phyllosphere, the plant leaf surface, has attracted many scientists and phyllosphere microbes have been recognized as important players. New insights have been put into practical applications such as biostimulants for crop yield promotion and plant protection from pathogens. Looking at the accumulating evidence from the perspective of scientific advice for policy-making, the plant-microbe interaction of the rhizosphere has been discussed in international policy dialogues, whereas that of the phyllosphere is stuck in dialogues among researchers. Through some international expert communities, we have started to share new knowledge on phyllosphere microbiology with the expectation to bring the discussion to international policy dialogues for food security and environmental protection.

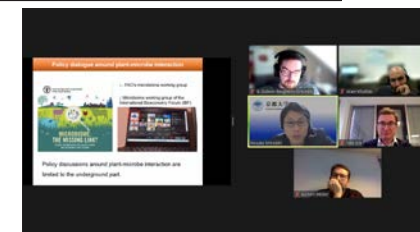
Summary

Phyllosphere microbes, except for pathogens, have been recognized as important players in plant-microbe interaction in the last decade. New insights are being put into practical applications such as biostimulant for crop yield promotion, plant protection from pathogens and mitigation of green house gasses.

At Parallel Dialogue, we discussed the physiology and ecology of phyllosphere microbes, and their potential application to agriculture, together with rhizosphere, marine and synthetic microbes. Given that phyllosphere microbiology is relatively a new study field, it is important to bring the knowledge from other fields to accelerate the research at the science level. Its effective use can contribute to increasing food production and therefore food security. We need to feed 7 billion people and the number is rapidly increasing.

However, potential risks of applying phyllosphere microbes to agriculture need to be assessed from various perspectives like human health and environmental angles. Application of microbes to the real world, especially to foods, can sound unacceptable to some people. In this regard, we touched upon discussions around genetically modified organisms (GMO). Although approved GMOs are safe for human consumption and environment from scientific perspectives, there are many people who cannot accept the concept and avoid consumption. This may become the same case as the utilization of phyllosphere microbes in the future.

We concluded that advancement of phyllosphere microbiology as the research topic is must, but, at the same time, risk and benefit assessments, as well as science communication/education, need to be performed to bring new insights of phyllosphere microbiology to policy dialogues and also to spread the concept throughout society from the early stage.



Parallel dialogue 4



Kosuke Shiraishi



Tobias Erb



Gideon Bergheim



Islam Khattab

Welcome!

Keywords: plant-microbe interaction, policy dialogue

Agenda

Time (JST)	Time (CET)	Content
17:30	09:30	Starts
17:30-17:40	09:30-09:40	Opening remarks
Parallel dialogue		
17:40~	09:30~	Introduction by Kosuke Shiraishi
		Quick roundtable from all participants + photo session
		Panelist presentation by Prof Tobias Erb + Q/A
		Panelist presentation by Mr Gideon Bergheim + Q/A
		Panelist presentation by Dr Islam Khattab + Q/A
		Dialogue
18:50-18:55	10:50-10:55	Wrap-up
18:55-19:25	10:55-11:25	General discussion & Wrap-ups from each group
19:25-19:40	11:25-11:40	Comments from guests
19:40-19:45	11:40-11:45	Closing remarks

Self-introduction

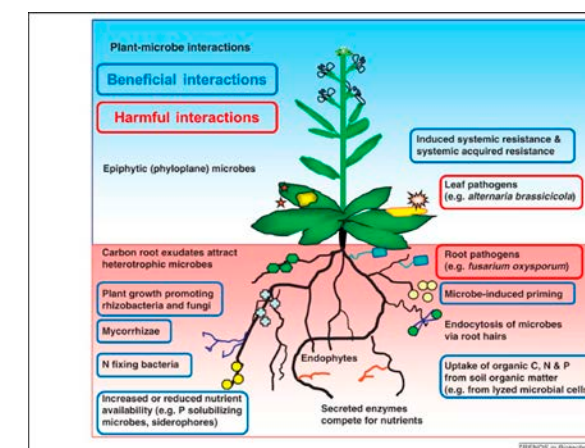
- Name: Kosuke SHIRAISHI
- Work: Assistant Professor, Kyoto University
- Expertise: applied microbiology, molecular cell biology
- Research keywords: microbe-plant interaction, yeast, phyllosphere (plant leaf surface), RNA, autophagy
- Previous work: Ministry of Foreign Affairs, UN-FAO (Food and Agriculture Organization)

Theme

How can/should we integrate the knowledge of **phyllosphere plant-microbe interactions** into **policy dialogues** at the global level?

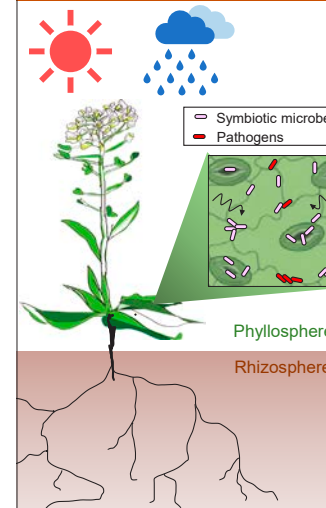


Microbe-plant interactions above-/ under-ground



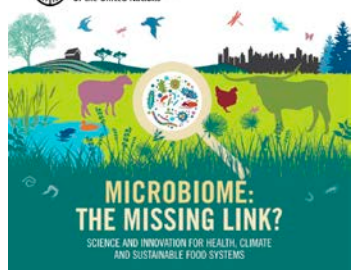
Schenk et al., *Trends Biotechnol.* 2012

Phyllosphere microbes



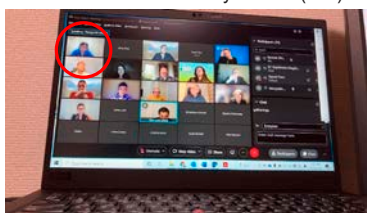
- Phyllosphere microbes (except non-pathogenic) have been recognized as an important player in plant-microbe interaction **only in the last decade**
- The total leaf area is **twice as large as the earth surface area** (approx. 10^9 km²) in which 10^{26} microbes inhabit
- New insights have been put into the practical application as **biostimulant** for crop yield promotion, **plant protection** from pathogens, and **mitigation of GHG**.
- Necessity to understand the **physiology of strong friendship with host plant in phyllosphere** (e.g., community formation, stress response, LD- circadian cycle, dynamic nutrient change) for best utilization of their potential in food production.
- Rhizosphere microbes have been investigated **for many years**
- Various fundamental evidences and practical applications have been achieved, e.g. support with the plant's nutrient uptake from soil and nitrogen fixation

Policy dialogue around plant-microbe interaction



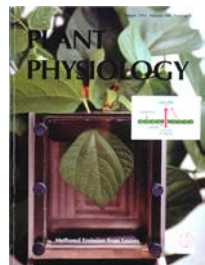
← FAO's microbiome working group

↓ Microbiome working group of the International Bioeconomy Forum (IBF)



Policy discussions around plant-microbe interaction are limited to the underground part.

Plant methanol emission and its diurnal change



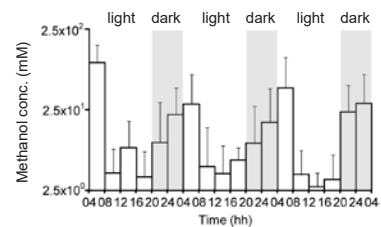
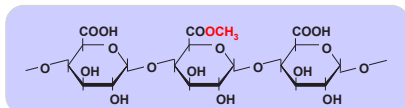
(Nemecek-Marshall *et al.*, *Plant Physiol.*, 1995)

Major plant VOCs

Isoprene	500 million tons / year
Monoterpene	Hundreds of million tons / year
Methanol	100 million tons / year

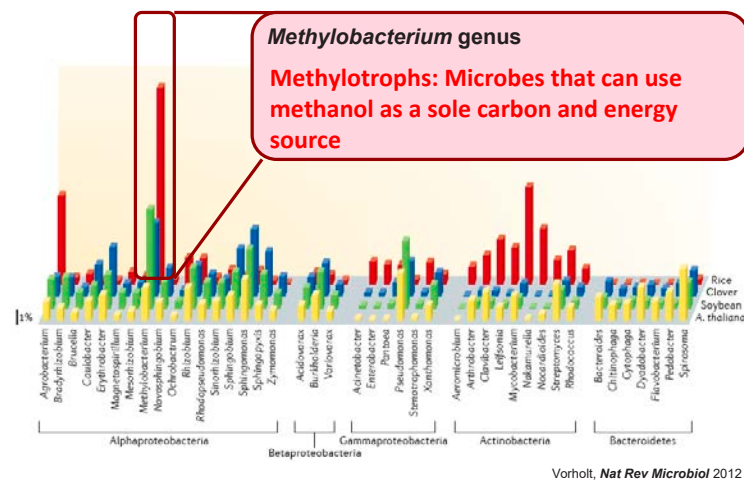
(Laothawornkitkul, *et al.*, *New Phytologist*, 2009)

Pectin : $-\text{CO}-\text{OCH}_3 \rightarrow -\text{COOH} + \text{CH}_3\text{OH}$
Pectin methylsterase (PME)



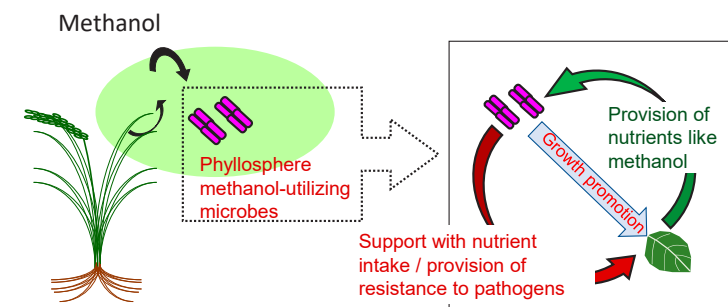
(Kawaguchi *et al.*, *PLoS ONE* 2011)

Distribution of phyllospheric bacteria



Vorholt, *Nat Rev Microbiol* 2012

Symbiotic effects of methanol-utilizing microbes on plant



10

How human species will be, can be, should be

Dr. ISOBE Masanori L-INSIGHT fellow / Kyoto University Hospital / Assistant Professor
Kelly Amal Dhru, LL.M. Faculty of Law, Universität Hamburg
Dr. Jerome Foo Department of Genetic Epidemiology in Psychiatry, Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University
Konrad Waschkies Department of Psychiatry and Psychotherapy, University of Göttingen

Enhancement: Genetic and Genomic Engineering/Editing:

Possible Examples	Questions, consequences?
Embryo Germline Editing: resistance to disease, k/o disease genes	Long term effects (lifetime, next generation)
Enhance "Smart" Genes: smarter humans	Many genes, protein determine function
Engineer synthetic blood, enhance oxygen levels	Susceptibility to something new?

Considerations

Public health implications

- Citizen science and consumer genetics
- Determinism, discrimination, attitudes, beliefs and policy
- Non-medical, non-therapeutic uses (appearance, intellectual, athletic ability... eugenics)
- Inclusion of diverse populations

Background

Currently, various state-of-art technics to enhance intellectual ability, such as decoded neurofeedback, have been developed and are now close to be implemented in the clinical field. Careful discussion in advance would be desirable from multiple perspectives as follows; how far the expansion of physical and cognitive functions should go, how far it should be allowed to go, and what kind of common understanding and restrictions are necessary when this expansion proceeds. For example, restrictions have been placed on human cloning, but what extent do such restrictions need to be extended to enhancement of our physical/mental activities? What remains as our individuality? I would like to discuss these issues with people from various fields including those who specialize in bioethics, law, and those who are researching the improvement of cognitive function and recovery of physical function.

Summary

The theme of our group is very big, which is titled; "how human species will be, can be, should be." It is very hard to summarize all the topics we discussed, but here we summarize four topics raised by the speakers: medication and technology for cognitive enhancement; enhancement by genetic and genomic engineering and editing; human identity through the lens of "One Health"; ethical and legal issues for enhancement technologies. We share the awareness that there is an important difference between the treatment and enhancement. This is a point on the background of all the discussions.

First, on the topic of medication and technology for cognitive enhancement, we discussed the importance of taking care about accessibility to the technology as treatment and values in society because the technology might induce inequality in the situation.

Second, about genetic and genomic engineering and editing, our conclusion is that risks and benefits are important to be shared with the researchers, the developer and the general public.

Third, we discussed human identity through the lens of human health. Human identity is connected and reliant on other systems, especially the environment and animals; that is "One Health." This stresses the need to carefully consider humanity's impact on all other relevant systems. Thus funding and allocation of resources should be critically assessed, and one way for that is to prioritize by urgency of the problem that is being worked on.

At last, ethical and legal issues related to the enhancement technology were discussed. Technologies leading to neuroenhancement may change the way we understand the obligation to others in society. The question of striving for "unrealistic perfection" reaches a new level with the questions of neuroenhancements. There are also risks of data protection and behavior manipulation.

We should care and keep dialogues with the researchers and with other professionals from various perspectives and various backgrounds.



Dialogue 5:

“How human species Will be, Can be, Should be”

Masanori Isobe
Department of Psychiatry, Kyoto University

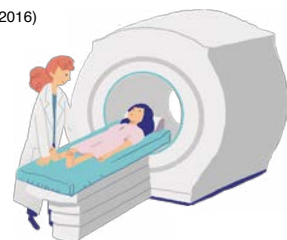
12/02/2022

For social implementation of new technology

- Careful discussion in advance would be desirable from multiple perspectives as follows;
 - “How far the expansion of cognitive functions should go”
 - “How far it should be allowed to go”
 - “What common understanding and/or restrictions are necessary in dissemination”
- Related matters;
 - Who can use the technics? Restrict to the sick? All who needs enhancement?
 - Who needs understanding and/or restrictions? Researcher? Developer? The public?
 - What remains as our individuality?

Examples (cognitive enhancement)

- Psychostimulant for ADHD (Methylphenidate) can enhance working memory in human (Mehta et al. 2000)
- rTMS improves memory function of mild cognitive impairment (MCI) (Zhang et al. 2021)
- Decoded functional MRI neurofeedback reduces fear (Koizumi et al. 2016)
- Decoded neurofeedback on PTSD patients reduced severity of symptoms (Chiba et al. 2019)



MAIN TOPIC

Boundary among Research, Treatment and Enhancement

- Caution when innovations based on research of psychiatry and neuroscience are implemented in society
- 4 examples will be raised from each speaker

□ Cognitive enhancement	Masanori Isobe
□ Genetics technology for public health	Dr Jerome Clifford Foo
□ Human identity (“One Health”)	Dr Konrad Waschkies
□ Legal and ethical perspective	Ms Kelly Amal Dhru

Time Course

Time	Containt	Presenter
0930-0940	Opening	
0940 (-1055)	Start dialogue	
0940-0942	Introduction of the topic	Masanori Isobe
0942-0945	Self/Research introduction	Masanori Isobe
0945-0950	Self/Research introduction	Dr Jerome Clifford Foo
0950-0955	Self/Research introduction	Dr Konrad Waschkies
0955-1000	Self/Research introduction	Ms Kelly Amal Dhru
1000-1045	Dialogue (Deeper the 4 examples)	All
1045-1055	Summary for general discussion	All
1055-1125	General discussion & Wrap-ups from each group	Masanori Isobe (5min)
1125-1145	Comments from guests	
	Closing	

Topic 1

Medication and Technology for Cognitive Enhancement

Do we need restriction for use?

Treatment or Enhancement

“Neuroethics”

Summary for General Discussion

- We discussed 4 topics, which are
 - “medication and technology for cognitive enhancement”
 - “enhancement: genetic and genomic engineering/editing”
 - “human identity through the lens of one health”
 - “ethical and legal issues for enhancement technology”

Summary for General Discussion

For upcoming future with advanced technologies that extend human ability,

- It is important to take care about accessibility to the technology and values in society.
- Aware risk and benefits are also important to be shared with general public.
- Humanity is connected and reliant on other systems, especially the environment and animals. This stresses the need to carefully consider humanity's impact on all other relevant systems.
- Funding and allocation of resources should be critically assessed. One way of doing that is to prioritize by urgency of the problem that is being worked on.
- The technologies leading to neuroenhancements may change the way we understand obligations to one-another in society.
- The questions of striving for an unrealistic perfection reach a new level with the questions of neuroenhancements.
- There are also risks of data protection and behaviour manipulation.

Dialogue — 6

How healthcare technology should overcome the digital literacy gap in the aged society?

Dr. EGUCHI Kana

L-INSIGHT fellow / Graduate School of Medicine, Kyoto University /
Program-Specific Assistant Professor

Dr. Sebastian Herberger

Interdisciplinary Center of Sleep Medicine, Charité – Universitätsmedizin, Berlin

Dr. Nicolai Spicher

Department of Medical Informatics, University Medical Center Göttingen, University of Göttingen

• [Present situation]

- How do you see the current healthcare technology?
 - What is the influence of current healthcare technology on the digital literacy gap? (e.g., pros and cons)
 - Are there any issues induced by the digital literacy gap?

• [Future situation]

- What are your thoughts on possible future issues induced by the digital literacy gap?
- What are our next challenges/targets for overcoming the digital literacy gap? Does it root in technology, human, or a combination of each?
- How can we better understand possible future end-users at the time of R&D? Are there any effective methods or frameworks we can use?

All participants can join the dialogue via *Slido*
If anyone wants to speak, please use the “raise hand” reaction in zoom!

Background

Aging and health now become a worldwide problem. On the basis of WHO's fact sheets^[ref.1], the proportion of the world's population over 60 years will become 22%, while 80% of them will be living in low- or middle-income countries. These situations may cause an ever-greater digital literacy gap, which may even affect access to healthcare or medical service.

At this moment, our study has already faced the digital literacy gap-induced problems in collecting side-effect reports from patients undergoing cancer pharmacotherapy: we confirmed that the use of smartphone applications may become a big hurdle for aged Japanese people. In this dialogue, I would like to first exchange the current situation in Germany and Japan related to the issues surrounding healthcare induced by the digital literacy gap. Then discuss possible issues induced by the digital literacy gap in the future and how we can/should overcome the vicious circle of technology development and the digital literacy gap.

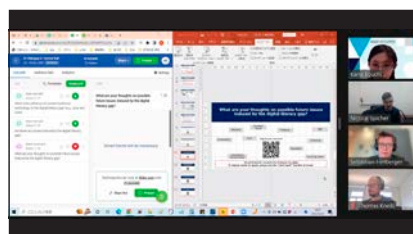
[ref.1] — <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>

In Dialogue 6, we discussed how healthcare technology should overcome the digital literacy gap in the aged society. In a brief sense, we talked about three topics.

We first confirmed the situation that Germany and Japan are facing. Actually, before starting the dialogue, we considered that there might be a difference between these two countries. But in fact, we found that the situation is quite similar to each other. The median age by country is 48.6 in Japan, whereas 47.8 in Germany.

As the second topic, we then focused on the issue surrounding healthcare technology. We confirmed that “medicine” has a lot of stakeholders such as the economy, reimbursement, and regulation. In addition, limited resource is a very important issue. I mean there are a lot of patients but limited medical providers, so things easily become a zero-sum game. For this reason, the current evolution in healthcare technology may have pros and cons. The pros are potential, which allow us to record vital information every day. Meanwhile, the cons are accessibility. In this sense, its main target user including the aged people cannot get confident results unless they use it appropriately.

As the last topic, we then move on to discuss what are our next challenges and targets for overcoming the digital literacy gap. Our result is innovation in the production process. To our opinion, currently, there are two processes. One is the step-by-step process, in which doing a workshop, making a prototype, and asking the target group to use it, but takes a lot of time. The other is a quick and dirty process, in which we first release the product and pile up evidence, but has the risk of discontinuation in a few years. In our results, the innovation in the production process should find “the third way.” One example in our dialogue raised by Dr. Herberger is the Stanford Biodesign that first focuses on the problem itself.



Dialogue topics [in total 50 min]

- **[Present situation]**
 - How do you see the current healthcare technology?
 - What is the influence of current healthcare technology on the digital literacy gap? (e.g., pros and cons)
 - Are there any issues induced by the digital literacy gap?
- **[Future situation]**
 - What are your thoughts on possible future issues induced by the digital literacy gap?
 - What are our next challenges/targets for overcoming the digital literacy gap? Does it root in technology, human, or a combination of each?
 - How can we better understand possible future end-users at the time of R&D? Are there any effective methods or frameworks we can use?

All participants can join the dialogue via *Slido*
If anyone wants to speak, please use the “raise hand” reaction in zoom!

[Dialogue 6] How healthcare technology should overcome the digital literacy gap in the aged society?

• Moderator

- **Dr. Kana EGUCHI**
 - L-INSIGHT fellow
 - Program-Specific Assistant Professor, Graduate School of Medicine, Kyoto University

• Panelists

- **Dr. Nicolai SPICHER**
 - Department of Medical Informatics, Göttingen University
- **Dr. Sebastian HERBERGER**
 - Interdisciplinary Center of Sleep Medicine, Charité-Universitätsmedizin, Berlin
 - Mentalab GmbH

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Time schedule

Schedule of this parallel dialogue session

Time	Speaker	Topic
5min (17:40-17:45 JST/09:40-09:45 CET)	Dr. Kana EGUCHI	Introduction of dialogue topic
10 min (17:45-17:55 JST/09:45-09:55 CET)	Dr. Kana EGUCHI Dr. Nicolai SPICHER Dr. Sebastian HERBERGER	Self-introduction of speakers (around 3 min per each)
50 min (17:55-18:45 JST/09:55-10:45 CET)	All participants incl. speakers (Moderator: Dr. Kana EGUCHI)	Discussion on dialogue topics
10 min (18:45-18:55 JST/10:45-10:55 CET)	All participants incl. speakers (Moderator: Dr. Kana EGUCHI)	Wrap-up of discussion

Schedule after ending parallel dialogue session

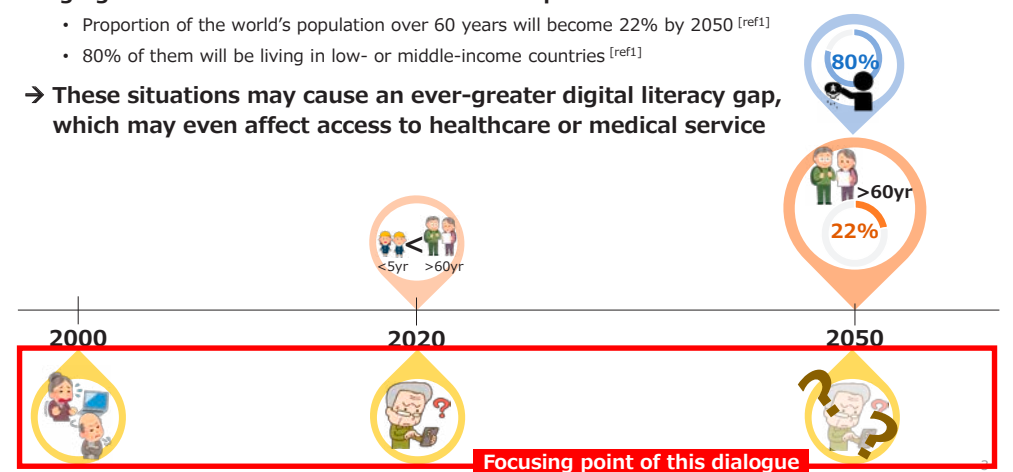
Time	Speaker	Topic
30 min (4min X 7 dialogues) (18:55-19:25 JST/10:55-11:25 CET)	Moderator of each dialogue	Wrap-up of each dialogue
15 min (19:25-19:40 JST/11:25-11:40 CET)	Prof. Dr. Motomu TANAKA Prof. Dr. Thomas Kneib Prof. Dr. Yasuyuki KONO	Comments from guests
		Ending remarks

Motivation [Social background]

• Aging and health now become a worldwide problem

- Proportion of the world’s population over 60 years will become 22% by 2050 ^[ref1]
- 80% of them will be living in low- or middle-income countries ^[ref1]

→ These situations may cause an ever-greater digital literacy gap, which may even affect access to healthcare or medical service



1. <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>

Motivation [Example Episode]

- Digital literacy gap induced problem in collecting side-effect reports from patients (i.e., electric patient-reported outcome, ePRO) undergoing cancer pharmacotherapy
 - Developed a smartphone application to gather ePRO

- Our thoughts before starting project**
- ePRO can be used easier than paper-based PRO
 - We can gather a lot of ePRO from many patients

- What we have experienced**
- Installing application was one of the big hurdles
 - Not all enrolled patients input ePRO daily

→[Concern] digital literacy gap may become a *surface* separating two clusters

- Patients with digital literacy
- Patients who are digitally vulnerable/illiterate



Speakers

Moderator



Dr. Kana EGUCHI
Department of Real World Data R&D,
Graduate School of Medicine,
Kyoto University

Medical engineering (ME),
Biosignal processing,
Wearable sensing,
Medical Informatics (MI),
Human-computer interaction (HCI)

- Wearable device design (EMG)
- Biosignal processing method design (ECG/HRV)
- Medical information analysis

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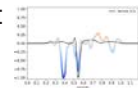
Panelist



Dr. Nicolai SPICHER
Department of Medical Informatics,
University Medical Center,
Göttingen University

Biosignal processing,
Medical engineering (ME),
Medical Informatics (MI)

- Biosignal processing
- Explainable AI in biosignal processing
- Multidimensional biosignal analysis (physiological networks in polysomnography/ICU data)



Panelist



Dr. Sebastian HERBERGER
Interdisciplinary Center of Sleep Medicine,
Charité-Universitätsmedizin Berlin/
Mentalab GmbH

Internal Medicine,
Cardiology,
Sleep Medicine,
Biosignal Research,
Biosensor Engineering

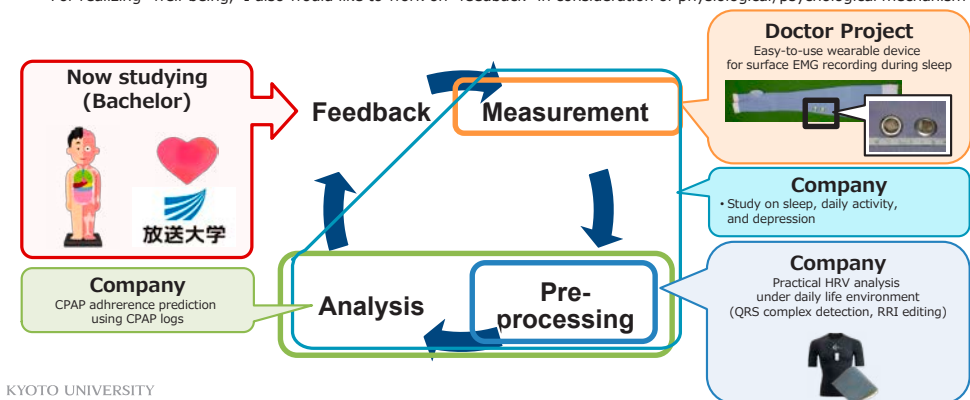
- Sleep / Cardiology
- Research / Patient Care
- Biomed. Software / Hardware

5

Self-introduction [Dr. Kana EGUCHI]

Recent 5 years of PIC work mainly focused on the former steps of data analysis for non-communicable diseases (NCDs) detection/treatment

- Measurement, pre-processing, and analysis
- For realizing "well-being," I also would like to work on "feedback" in consideration of physiological/psychological mechanism



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Dialogue topics [in total 50 min]

• [Present situation]

- How do you see the current healthcare technology?
 - What is the influence of current healthcare technology on the digital literacy gap? (e.g., pros and cons)
 - Are there any issues induced by the digital literacy gap?

• [Future situation]

- What are your thoughts on possible future issues induced by the digital literacy gap?
- What are our next challenges/targets for overcoming the digital literacy gap? Does it root in technology, human, or a combination of each?
- How can we better understand possible future end-users at the time of R&D? Are there any effective methods or frameworks we can use?

All participants can join the dialogue via *Slido*
If anyone wants to speak, please use the "raise hand" reaction in zoom!

How do you see the current healthcare technology?

What is the influence of current healthcare technology on the digital literacy gap? (e.g., pros and cons)



All participants can join the dialogue via *Slido*
If anyone wants to speak, please use the "raise hand" reaction in zoom!

How do you see the current healthcare technology?

Are there any issues induced by the digital literacy gap?



All participants can join the dialogue via *Slido*
If anyone wants to speak, please use the "raise hand" reaction in zoom!

What are your thoughts on possible future issues induced by the digital literacy gap?



All participants can join the dialogue via *Slido*
 If anyone wants to speak, please use the "raise hand" reaction in zoom! 10

What are our next challenges/targets for overcoming the digital literacy gap?

Does it root in technology, human, or a combination of each?

Sorry, QR code is changed!
Input your answer!



All participants can join the dialogue via *Slido*
 If anyone wants to speak, please use the "raise hand" reaction in zoom!

How can we better understand possible future end-users at the time of R&D?

Input your answer!



All participants can join the dialogue via *Slido*
 If anyone wants to speak, please use the "raise hand" reaction in zoom!

Are there any effective methods or frameworks we can use?

Input your answer!



All participants can join the dialogue via *Slido*
 If anyone wants to speak, please use the "raise hand" reaction in zoom!

Bridging the gap between macro and micro scale in tumor imaging

Dr. IIMA Mami

L-INSIGHT fellow / Kyoto University Hospital / Assistant Professor

PD Dr. Sebastian Bickelhaupt

Institute for Radiology, University Hospital Erlangen

A/Prof. Dr. Dimitrios Karampinos

Experimental Magnetic Resonance Imaging, School of Medicine & Munich Institute of Biomedical Engineering, Technical University of Munich

Dr. Felix Kurz

Division of Radiology, German Cancer Research Center (DKFZ)

Dr. Van Anh Tu

Experimental Magnetic Resonance Imaging, School of Medicine & Munich Institute of Biomedical Engineering, Technical University of Munich



Background Karampinos

We will aim to establish a trans-scale imaging method that connects a whole body, tissue, and cellular scales using MRI etc, especially diffusion MRI, which can evaluate the movement of water molecules *in vivo*. In the diagnosis of cancer, it is important to understand the phenomenon and elucidate the mechanism by traversing various scales, such as the tumor microenvironment and micrometastases that may exist throughout the body. However, the understanding of the principles that will lead to the elucidation of new pathological conditions at the microscopic level involving elemental interactions in biomolecules and cells, and at the meso- and macro-level involving tissues and organs, has not yet been fully developed.

The current MRI has difficulty in measuring and evaluating the micro level, especially in terms of resolution, and thus we will aim to develop this method further to establish trans-scale imaging to visualize cancer characteristics on a longitudinal scale and exploit them for cancer diagnosis and prognosis prediction.

Summary

We have discussed bridging the gap between the macro and micro scale in tumor imaging. Because the majority of us are researchers, majors in MRI, we have mainly discussed the MR imaging techniques to assess tumor biology and micro-environment. Even in the current state, we can evaluate a lot of information from MRI; for instance, microstructure, heterogeneity, apoptosis, or hypoxia. First, Dr. Dimitrios Karampinos introduced the cutting-edge MRI research they are working on right now. What's interesting for us was that he introduced us the method to evaluate the micro-calcification in the lesion with MRI, which is very challenging in the clinical setting. This kind of technique is only available with x-ray or CT, and with MR, there is a lot of potentials to evaluate and make a definite prognosis and even further provide guidance for the treatment. Dr. Sebastian Bickelhaupt kindly introduced his research on using artificial intelligence to MR imaging. In clinical setting, we need to use a contrast agent for the diagnosis of cancers, in general. He has used the AI technique to generate contrast-enhanced images from non-contrast images, including diffusion-weighted imaging. What's the beauty of his research is that contrast agent has some kind of side effects that might be very safe for all people or patients, and this is a very safe technique for many patients as well.

Dr. Felix Kurz kindly introduced, also categorized in the manner of various scales and what imaging method could be applicable for what kind of tumor microstructure. He has intensively worked on the association between brain tumors in mice models with microstructure using NMR, photon microscopy, ultra-high field MRI, fluorescent Immunohistochemistry and so on. We have discussed especially the potential of imaging of microperfusion in tumors, which might be a bit challenging in the current MR technique. But the emerging new techniques, such as advanced DWI, with which we can evaluate the behavior of water molecules *in vivo* might solve to evaluate some kind of microperfusion as well. All of the things have been measured in MR so far, but we have found that there is more space and work to be done in the various imaging techniques, and we need to discuss this again from now on. Thank you.



Dialogue 7

We have discussed bridging the gap between the macro and micro scale in tumor imaging. Even in the current state, we can evaluate a lot of information from MRI; for instance, microstructure, heterogeneity, apoptosis or hypoxia. Various new MR imaging techniques, such as the method to evaluate the micro-calcification in the lesion with MRI, the AI technique to generate contrast-enhanced images from non-contrast images, including diffusion-weighted imaging, or the association between brain tumors in mice models with microstructure using photon microscopy and MRI have been introduced. We further discussed the possible future imaging techniques optimal for trans-scale imaging.

Good morning and good evening, everyone. My name is Motomu Tanaka. I'm a Kyoto University graduate but moved to Germany 25 years ago. I have been a professor at the Institute of Physical Chemistry at Heidelberg University since 2005 and heavily involved in this HeKKSaGOn alliance even before we held the first meeting in 2010. Also, in 2013, I began leading my second lab at the Institute for Advanced Studies of Kyoto University, called the Center for Integrated Physics and Medicine.

I really enjoyed today. Like last year, I could join only one discussion, but I was fascinated. I joined Dialogue 7, which was chaired by Dr. Iima. As someone who has worked with pathologists, I was interested in the state-of-the-art MRI technology based on a multi-disciplinary combination of physics, applied mathematics, and informatics. Unfortunately, since the discussion moved quickly and was very specialized, the audience had no chance to join in, which was a bit sad, but still, it was enjoyable.

The use of synthetically generated training data discussed by Dr. Bickelhaupt from Erlangen was very elegant and attractive. This would be a major breakthrough in radiology if such an approach or technology were established and standardized while working across multiple institutions independently from machine vendors. It would help patients quite a lot.

I enjoyed the very deep discussion. At the next event, we probably should, for example, encourage session chairs to conclude by turning to more general contexts. With that said, I was happy to join this kind of event again and learned a lot. I took many notes. Thank you all so much for holding it. I look forward to hopefully joining you all next year.

Prof. Dr. TANAKA Motomu
 —
 Institute for Physical Chemistry,
 Heidelberg University



My name is Thomas Kneib. I'm a professor of statistics at the University of Göttingen, and also part of its Campus Institute Data Science. It is really nice to have this opportunity to join as a session commentator today. Given that we are all here, I presume we all agree that networking is an important component of science, especially for early career researchers and fostering interdisciplinary exchange. This was very well reflected in the topics that were chosen for the dialogues.

On the other hand, starting interdisciplinary exchange is always challenging, especially on a transcontinental scale involving universities from Japan and Germany. While it is not so easy to get together, this format provided an excellent opportunity to see what is happening and to get such exchange started. It was especially nice to witness the enthusiasm and drive of participating early career researchers! I attended two dialogues closest to my own research: The role of epidemiology and statistics in healthcare science in 2030 and how healthcare technology should overcome the digital literacy gap in an aging society.

I was, of course, only able to attend the beginning of one and the end of the other, so I can't comment on all aspects of the dialogues. The two dialogues adopted different methods to get the discussion going. In the first one, more time was spent on introducing the scientific backgrounds of the larger group of participants. This was very helpful in identifying common themes that could then be discussed in the group, but of course, limited the time a little bit that was left for discussion. Two overarching questions were discussed: whether statistics and machine learning will change healthcare, and what kind of skillsets or international collaboration will be needed to produce novel evidence.

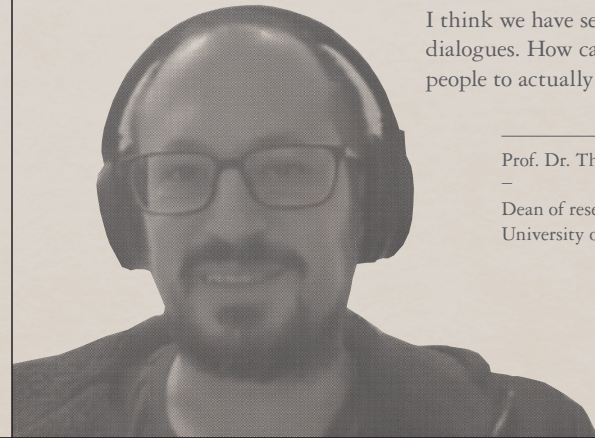
For me, there were two main takeaways. First, acknowledging and utilizing patient population heterogeneity under personalized medicine and developing statistical or machine learning data science procedures that reflect this heterogeneity. Second, evidence synthesis: the combination of information sources, data types, and applications, as well as meta-analysis, to make the most of the available information.

In the second discussion I joined, the group was a little smaller, so there was more time for discussion, also because the introductory part was shorter. The comparisons between countries were particularly interesting because they identified many similarities in the challenges and obstacles faced. I think this is one major point where these dialogues could provide a real benefit.

As an overarching theme, data scientification or digitalization is really relevant also for interdisciplinary research. It certainly impacts all areas of life, in particular research. For early career researchers, it appears that data science is an essential skill and perhaps an aspect that can help launch collaboration between the HeKKSaGOn partners. In the past, a data science summer school was already organized with HeKKSaGOn's help in Göttingen, but it has not been held for two years due to the pandemic. I think such a summer school would really be a nice opportunity to get some more collaborations going, to meet with each other and to have common discussion topics.

I think we have seen that there is a need to continue the discussions from today's dialogues. How can we move from this initial format to something that really gets people to actually collaborate? This is the main point we need to think about.

Prof. Dr. Thomas Kneib
 —
 Dean of research at the Faculty of Business and Economic Sciences,
 University of Göttingen



First, I want to thank all the groups' chairs and discussants. I partly attended groups four and two. In both, I found their discussions very productive and stimulating, and all the participants seemed to enjoy them. Every chair said they want to continue these discussions, which is quite important. Interdisciplinary discussions need time—they're not so easy. I was also invited here last year, which may be related to my background. Let me talk about my experience with interdisciplinary studies.

I'm an irrigation engineer in education. I received a Ph.D. in irrigation engineering, but then found a job at Kyoto University's Center for Southeast Asian Studies. This was about 30 years ago. Interdisciplinary research takes place here. Before I joined, my colleagues and friends were mostly agriculture or irrigation engineers. But since joining, I have been surrounded by anthropologists, economists, political scientists, and medical doctors. A very diverse group.

In the beginning, I could not find the words to talk with them and could not understand what they were saying. Every researcher used their own terminology and talked based on their field's theories and frameworks. We could not communicate. But of course, I had opportunities to interact with them, and more importantly, we went to the field together. We discussed topics such as the basic societal structure, emerging changes, and the relationship between the government and the people. The subject of our research was sometimes countries and sometimes villages.

Sharing the same questions, everybody contributed answers based on their knowledge. Political scientists said something about politics, and economists talked about the economy. And then, I gradually understood their terminology, logic, ways of thinking, and viewpoints. Through this kind of experience, I started to understand interdisciplinary research. I have organized an interdisciplinary research project focusing on just one village in Thailand. It is now at the preparatory stage. We have to discuss topics like what are families, what are households, what is landholding, what is nature, what is artificial, and how can we distinguish between nature and the artificial.

These are basic concepts of field-based research, but such concepts are not shared beyond disciplines. Each discipline has its ideas. But when we discuss and understand the logic of different disciplines, we can find out how to bridge the gap. And this kind of experience is quite important, I think, in terms of making interdisciplinary research more fruitful.

Interdisciplinary research, it's sometimes said, is a kind of fighting without any rules. It's like a boxer and a sumo wrestler fighting. They don't share the rules but try to fight. Nobody can say who has won. We are doing something like that. My point is that interdisciplinary research is very difficult but still worth doing. It can accomplish what disciplinary study cannot. Also, importantly, the real world is interdisciplinary. I want to encourage all the participants to continue talking. Even though it may not be so fruitful at the beginning, I'm sure it will be in the future. Thank you very much.

Prof. Dr. KONO Yasuyuki
 —
 Vice President,
 Director International Strategy Office,
 Kyoto University



If I understand correctly, I'm blocking everyone's way to dinner in Japan and to lunch in Germany, so I promise to be brief. Thank you for inviting me to your interesting and lively discussions today, and thank especially my colleagues in Japan for the fantastic preparation of this meeting. I have been working in the field of international relations and international cooperation for many years. When I started my job in the International Office at Heidelberg University, there were many reasons for optimism. We all felt that borders were becoming fewer or at least less of an obstacle. International communication, traveling, and meeting international partners had become easier than ever.

My colleagues and I all had the impression that the world had become more open, and nations had moved closer to each other. As you all know, this has changed; sadly there are not so many reasons for optimism these days. We are now facing a period when evolution seems to have gone backward. As a consequence, working in the field of international cooperation has become more difficult and complicated. But I am deeply convinced that it is now all the more important to put all our strength, efforts, and energy into promoting international cooperation, especially among young scientists like yourselves.

You are the ones that give us hope for the future. It is more important than ever that you meet, get to know each other, exchange views and opinions. This might not take place in your scientific or academic fields in a strict sense. Even if your specific projects are not a complete match or completely congruent, it can be extremely enriching and fruitful for both sides to meet, talk, discuss findings, and see things from a different perspective. Maybe not a better or worse perspective but just a different perspective. In my view, this kind of exchange is invaluable, vital, and, ultimately, irreplaceable in the academic world.

Therefore, I would like to thank all of you for dedicating yourself to this project. The name of this project is L-INSIGHT. Coming from a linguistic background, it is natural for me to look at words closely. If you look up the word "insight" in a thesaurus, you will find the following entries; knowledge, understanding, comprehension, recognition, and maybe surprisingly, sympathy. With these meanings in mind, I would like to encourage all of you to go ahead with this project, use the opportunities it provides, meet, and engage in discussions as often as possible.

Please, cross borders, not only national ones but also academic disciplines, cultures, and habits. Fill the project with life so you can realize the full potential of "insight" in finding knowledge, in mutual understanding, comprehension, recognition, and, last but definitely not least, sympathy. In this sense, my best wishes for the project and all of you—and also for the Japanese soccer team in the world championship, even though it's hard to say that today. Thank you.

Nicole Dorn

International Relations Division,
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First of all, let me express my sincere thanks to all of the today's speakers for their thought-provoking and excellent presentations. It was a great pleasure to join this event. I enjoyed listening to your talks and discussions a lot. And I would like to say congratulations to the L-INSIGHT Fellows who took on the role of session chairpersons, organizing and enlivening the discussions. Therefore, I would like to thank you all, the participants of this event. Without your input, ideas, and discussion, this forum would not have been the success. We welcome you to return next year as speakers and participants. I believe that the significance of this opportunity to transcend cultural spheres, academic disciplines, and generations, will become more and more evident.

It is my honor to acknowledge the following individuals. If it had not been for their involvement, this forum would not have been possible. Commentators, Professor Dr. Thomas Kneib, Spokesperson of the Centre for Statistics and Dean of research at the Faculty of Business and Economic Sciences, University of Göttingen, Dr. Michael Riemann, Botanical Institute, KIT (Karlsruher Institut für Technologie), Professor Dr. Motomu Tanaka, Institute for Physical Chemistry, Heidelberg University and Professor Dr. Yasuyuki Kono, Vice-President, Director of the International Strategy Office, Kyoto University, who have helped us since the memorable first event.

The organizers were the best team. Dr. Klaus Rümmele and Mr. Oliver Schmidt, KIT, Ms. Noline Dorn, Heidelberg University, Dr. Tanja Falkowski and Mr. Martin Jagonak, University of Göttingen, and Ms. Bernd Kirchner, Heidelberg University Office, Kyoto, thank you very much.

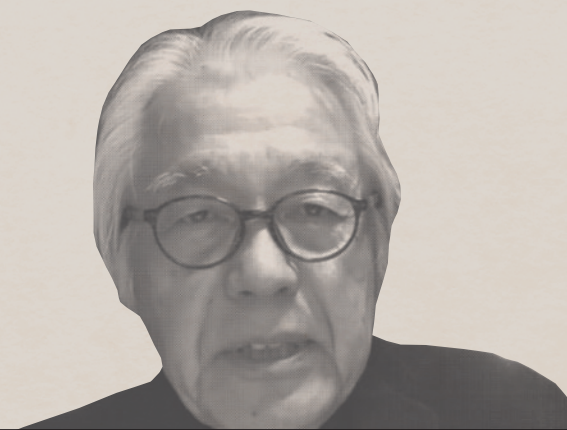
From the Kyoto University European Centre, I would like to thank Professor Mika Yokoyama, Ms. Sabine Schenk, today's MC, and Ms. Chiyoko Kanno for her great support from Germany. And finally but not the least, my team members from L-INSIGHT, thank you.

In our L-INSIGHT program, we encourage present and future young researchers to take on the world stage of their own volition. So far, several encounters in last year are moving toward new collaborations this autumn. I hope that today's initiative will lead to tomorrow's interactions in Japan and Germany.

In closing, I would like to wish you your good health and future success. Thank you very much.

Prof. Dr. AKAMATSU Akihiko

Director,
The Strategic Development Hub for Early Career Researchers,
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