



Annual Report 2018

Annual Report 2018

International Research Organization for Advanced Science and Technology
Kumamoto University

*Science is built of facts the way a house is built of bricks;
but an accumulation of facts is no more a science than a pile of bricks is a house.*
- Henri POINCARÉ, *La Science et l'Hypothèse*

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Preface



The International Research Organization for Advanced Science and Technology (IROAST), which opened in April of 2016, is one of the Centers of Excellence in Kumamoto University and promotes world class, cutting-edge research in science and technology. It features a standardized international research environment with several established global collaborations and utilizes a tenure track based personnel system.

We have been vigorously promoting our partnership with the International Collaborative Research Group for Science and Technology, which opened in Kumamoto University in 2013 and closed at the end of March 2018. All of the group members are still working as IROAST's adjunct researchers and are collaborating on international research projects with IROAST faculty and our visiting professors.

The aims of IROAST are the further promotion of international collaborations to establish international research networks in the following four advanced areas of science and technology: Nano Material Science, Green Energy, Environmental Science and Advanced Green Bio, in parallel with the development of young excellent researchers, promotion of ongoing cutting-edge research projects, and initiation of innovative interdisciplinary research projects.

To achieve these goals, we will promote the international partnership with overseas universities and institutions. The ultimate goal of IROAST is to be fully and globally recognized as a hub of world-class, cutting-edge research networks through the international brain circulations.

A handwritten signature in black ink that reads "Takashi HiYama" with a long horizontal flourish extending to the right.

Dr. Takashi HIYAMA, Professor Emeritus
Distinguished Professor
Director of International Research Organization for
Advanced Science and Technology (IROAST)
Kumamoto University

E-mail: hiyama@cs.kumamoto-u.ac.jp
URL: <http://www.cs.kumamoto-u.ac.jp/hiyama/>

IROAST Members

Director / Vice-Director



Takashi Hiyama



Jun Otani

Project Professor / Distinguished Professors



Toshiyuki Tosha



László Pusztai



Yufeng Zheng



Konstantinos
Kontis
(November 1,
2018-)

Tenure-track Professor / Associate Professors / Assistant Professor



Mitsuhiro Aida



Takumi Higaki



Ruda Lee



Atsushi Sainoki



Takashi Ishida

Postdoctoral Researchers



Akiko Nakamasu



Adam Karl
Schwartzkopff



Minwoo Kim



Sri Imriani
Pulungan

Young Faculty Members for International Joint Research



Satoshi Hinokuma
FAST



Yasuko Matsubara
FAST



Makoto Kumon
FAST

Visiting Professors



José E. Andrade
California Institute
of Technology
USA



Josep-Lluís
Barona-Vilar
University of
Valencia
Spain



Jorge Norberto
Beltramini
The University of
Queensland
Australia



Paul Bowen
University of
Birmingham
UK



Maria Jose Cocero
The University of
Valladolid
Spain



Marc de Boissieu
SIMaP, CNRS,
Université Grenoble
Alpes
France



Patrice Delmas
The University of
Auckland,
New Zealand



Martin Dienwiebel
Karlsruhe Institute
for Technology
Germany



Martino Di Serio
University of Naples
Federico II
Italy



Derek Elsworth
The Pennsylvania
State University
USA



Carolina Escobar
University of
Castilla La Mancha
Spain



Amir A. Farajian
Wright State
University
USA



Etsuko Fujita
Brookhaven
National Laboratory
USA



**Tomonari
Furukawa**
Virginia Polytechnic
Institute and State
University
USA



Hamid Ghandehari
University of Utah
USA



Olivier Hamant
INRA, RDP, ENS
Lyon
France



Christian Hardtke
University of
Lausanne
Switzerland



Jens Hartmann
Universität
Hamburg
Germany



Yang Kim
Kosin University
Republic of Korea



Tsutomu Kiuchi
Shimizu
Corporation
Japan



Alexei Kuzmin
Institute of Solid
State Physics,
University of Latvia,
Latvia



Ick Chan Kwon
Dana Farber Cancer
Institute, Harvard
Medical School
USA
and
Korea Institute of
Science and
Technology
Republic of Korea



Pavel Lejček
Academy of
Sciences of the
Czech Republic
and
University of
Chemistry and
Technology, Prague,
Czech Republic



Viren Ivor Menezes
Indian Institute of
Technology Bombay
India



**Matthieu
Micoulaut**
Sorbonne
University, France



**Dmitri Aleks
Molodov**
RWTH Aachen
University
Germany



**Rahul Raveendran
Nair**
The University of
Manchester
UK



Reiko Oda
CNRS, University
of Bordeaux
France



Ramesh S. Pillai
University of
Geneva
Switzerland



Zoran Ren
University of
Maribor
Slovenia



**Christian
Rentenberger**
University of Vienna
Austria



Supri Soengkono
GNS Science
New Zealand



**Gioacchino
Viggiani**
Université Grenoble
Alpes
France



Thomas Waitz
University of Vienna
Austria



Zhenghe Xu
Southern University
of Science and
Technology
China
and
University of
Alberta
Canada



Firuz Zare
The University of
Queensland
Australia

Project Professor

	Name	Period of Appointment	Former Affiliation
1	Dr. Toshiyuki Tosha	April 1, 2016- March 31, 2019	Qualified Project Researcher Priority Organization for innovation and Excellence, Kumamoto University

Distinguished Professors

	Name	Period of Appointment	Affiliation
1	Dr. László Pusztai Host Professor: Shinya Hosokawa (FAST)	April 1, 2017-	Wigner Research Centre for Physics, Hungarian Academy of Science, Hungary (Scientific Advisor)
2	Dr. Yufeng Zheng Host Professor: Kazuki Takashima (FAST)	May 1, 2017-	Department of Materials and Engineering, College of Engineering, Peking University, China (Professor)
3	Dr. Konstantinos Kontis Host Professor: Hamid Hosano (IPPS)	November 1, 2018 -	Head of the Aerospace Sciences Division, Sir Henry Mechan Chair of Engineering, School of Engineering, University of Glasgow, UK (Professor)

Tenure-Track Professor/Associate Professors

	Name	Period of Appointment	Former Affiliation
1	Dr. Mitsuhiro Aida Professor	July 1, 2017-	Postdoctoral Researcher Department of Applied Biological Science, Tokyo University of Science PhD: Kyoto University (1999)
2	Dr. Takumi Higaki Associate Professor	August 1, 2017-	Research Associate Professor Graduate School of Frontier Sciences, The University of Tokyo PhD: The University of Tokyo (2009)
3	Dr. Ruda Lee Associate Professor	January 1, 2017-	Postdoctoral Researcher Department of Drug Discovery and Development, Instituto Italiano Di Tecnologia, Italy PhD: Korea University, Korea (2013)

4	Dr. Atsushi Sainoki Associate Professor	January 1, 2017-	Postdoctoral Researcher Mine Design Laboratory, McGill University, Canada PhD: McGill University, Canada (2014)
5	Dr. Takashi Ishida Assistant professor	June 1, 2016-	Postdoctoral Researcher Graduate School of Science and Technology, Kumamoto University PhD: Nara Institute of Science and Technology (2007)

Postdoctoral Researchers

	Name	Period of Appointment	Former Affiliation
1	Dr. Adam Karl Schwartzkopff Atsushi Sainoki Laboratory	July 1, 2017-	PhD: The University of Adelaide, Australia (2016)
2	Dr. Akiko Nakamasu Takumi Higaki Laboratory	December 1, 2017-	PhD: Ochanomizu University (2010)
3	Dr. Minwoo Kim Ruda Lee Laboratory	June 1, 2018-	PhD: Yonsei University, Korea (2018)
4	Dr. Sri Imriani Pulungan Mitsuhiro Aida Laboratory	November 1, 2018- March 31, 2019	PhD: University of Tsukuba (2018)

Young Faculty Members for International Joint Research

	Name	Period of Appointment	Partner University
1	Dr. Satoshi Hinokuma Assistant Professor, FAST	April 1, 2017- March 31, 2019	The Barcelona Institute of Science and Technology, Institute of Chemical Research Catalonia (ICIQ), Spain
2	Dr. Yasuko Matsubara Assistant Professor, FAST	April 1, 2017- April 30, 2019	Department of Computer Science, Carnegie Mellon University, USA
3	Dr. Makoto Kumon Associate Professor, FAST	April 1, 2018- March 31, 2021	Department of Mechanical Engineering, Virginia Polytechnic Institute and State University, USA

Visiting Professors

	Name	Affiliation	Host Professor
1	Dr. José E. Andrade	California Institute of Technology, USA (Professor)	Jun Otani (FAST)
2	Dr. Josep-Lluís Barona-Vilar	University of Valencia, Spain (Professor)	Hiroataka Ihara (FAST)
3	Dr. Jorge Norberto Beltramini	The University of Queensland, Australia (Associate Professor)	Shinya Hayami (FAST)
4	Dr. Paul Bowen	University of Birmingham, UK (Deputy Pro-Vice-Chancellor and Feeney Professor of Metallurgy)	Kazuki Takashima (FAST)
5	Dr. Maria Jose Cocero	The University of Valladolid, Spain (Professor)	Tetsuya Kida (FAST)
6	Dr. Marc de Bossieu	SIMaP, CNRS, Université Grenoble Alpes, France (Director)	Shinya Hosokawa (FAST)
7	Dr. Patrice Delmas	The University of Auckland, New Zealand (Associate Professor)	Toshifumi Mukunoki (FAST)
8	Dr. Martin Dienwiebel	Karlsruhe Institute for Technology, Germany (Professor)	Kazuki Takashima (FAST)
9	Dr. Martino Di Serio	University of Naples Federico II, Italy (Professor)	Shinya Hayami (FAST)
10	Dr. Derek Elsworth	The Pennsylvania State University, USA (Professor)	Atsushi Sainoki (IROAST)
11	Dr. Carolina Escobar	University of Castilla La Mancha, Spain (Assistant Professor)	Shinichiro Sawa (FAST)
12	Dr. Amir A. Farajian	Wright State University, USA (Associate Professor)	Hamid Hosano (Hosseini) (IPPS)
13	Dr. Etsuko Fujita	Brookhaven National Laboratory, USA (Senior Chemist)	Yutaka Kuwahara (FAST)
14	Dr. Tomonari Furukawa	Virginia Polytechnic Institute and State University, USA (Professor)	Makoto Kumon (FAST)
15	Dr. Hamid Ghandehari	University of Utah, USA (Professor)	Hamid Hosano (Hosseini) (IPPS)
16	Dr. Olivier Hamant	INRA in the Plant Reproduction and Development Laboratory, ENS Lyon, France (Research Director)	Shinichiro Sawa (FAST)
17	Dr. Christian Hardtke	University of Lausanne, Switzerland (Professor)	Shinichiro Sawa (FAST)

18	Dr. Jens Hartmann	Universität Hamburg, Germany (Professor)	Takahiro Hosono (POIE)
19	Dr. Yang Kim	Kosin University, Republic of Korea (Professor Emeritus)	Shinya Hayami (FAST)
20	Dr. Tsutomu Kiuchi	Shimizu Corporation, Japan (Technical Adviser)	Toshiyuki Tosha (IROAST)
21	Dr. Alexei Kuzmin	Institute of Solid State Physics, University of Latvia, Latvia (Leading Researcher, Full Member of the Latvian Academy of Science)	László Pusztai (IROAST)
22	Dr. Ick Chan Kwon	Dana Farber Cancer Institute, Harvard Medical School, USA (Presidential Scholar)/ Korea Institute of Science and Technology, Republic of Korea (Principal Research Scientist)	Takuro Niidome (FAST)
23	Dr. Pavel Lejček	Academy of Sciences of the Czech Republic, Czech Republic/ University of Chemistry and Technology, Prague, Czech Republic (Professor)	Sadahiro Tsurekawa (FAST)
24	Dr. Viren Ivor Menezes	Indian Institute of Technology Bombay, India (Professor)	Hamid Hosano (Hosseini) (IPPS)
25	Dr. Matthieu Micoulaut	Sorbonne University, France (Professor)	Shinya Hosokawa (FAST)
26	Dr. Dmitri Aleks Molodov	RWTH Aachen University, Germany (Professor)	Sadahiro Tsurekawa (FAST)
27	Dr. Rahul Raveendran Nair	The University of Manchester, UK (Professor)	Shinya Hayami (FAST)
28	Dr. Reiko Oda	CNRS, University of Bordeaux, France (Senior Principal Investigator)	Hiroataka Ihara (FAST)
29	Dr. Ramesh S. Pillai	University of Geneva, Switzerland (Professor)	Tokio Tani (FAST)
30	Dr. Zoran Ren	University of Maribor, Slovenia (Professor)	Kazuyuki Hokamoto (IPPS)
31	Dr. Christian Rentenberger	University of Vienna, Austria (Associate Professor)	Mitsuhiro Matsuda (FAST)
32	Dr. Supri Soengkono	GNS Science, New Zealand (Senior Principal Investigator)	Toshiyuki Tosha (IROAST)

33	Dr. Gioacchino Viggiani	Université Grenoble Alpes, France (Professor)	Jun Otani (FAST)
34	Dr. Thomas Waitz	University of Vienna, Austria (Associate Professor)	Mitsuhiro Matsuda (FAST)
35	Dr. Zhenghe Xu	Southern University of Science and Technology, China (Professor)/ University of Alberta, Canada (Professor)	Makoto Takafuji (FAST)
36	Dr. Firus Zare	The University of Queensland, Australia (Professor)	Hamid Hosano (Hosseini) (IPPS)

FAST: Faculty of Advanced Science and Technology, Kumamoto University

IPPS: Institute of Pulsed Power Science, Kumamoto University

POIE: Priority Organization of Innovation and Excellence, Kumamoto University

Operation and Management of IROAST

1. IROAST Steering Committee Activities

We opened the Steering Committee meetings 11 times in the academic year of 2018 to discuss and determine varieties of regulations required for successful operation and management of the IROAST. In addition, a good number of research supporting programs has been running under the fully understanding by the committee members. All the following regulations are attached in the annual report.

R1: Regulations of IROAST

R2: Internal Rules for Selection of Tenure-track Professors and Associate Professors

R3: Agreement on Procedures for Selection of Tenure-track Professors and Associate Professors

R4: Guidelines for Interim Evaluation of Tenure-track Professors and Associate Professors

R5: Guidelines for Tenure Review of Tenure-track Professors and Associate Professors

R6: Agreement of the IROAST for Visiting Professors

R7: Handling of Granting the Title of “Visiting Professor” for the IROAST

R8: Agreement of the IROAST for Distinguished Professors

R9: Selecting Distinguished Professors for the IROAST

R10: Outline of International Advisory Board of IROAST

R11: Guidelines for Implementing the Internship Researchers Acceptance Program of IROAST

2. IROAST Research Support Programs

We have several research supporting programs running in parallel in order to promote internationally collaborated research works towards the configuration of international joint research networks and also to bring brains circulation around the world.

IROAST Young Faculty Members for International Joint Research

We select young excellent faculty members from the Faculty of Advanced Science and Technology, the Institute of Pulsed Power Science, the Magnesium Research Center and the Center for Water Cycle, Marine Environment and Disaster Management and invite them to IROAST for three years to give them the opportunity to promote their joint research works at overseas universities and institutions totally at least for one year.

IROAST International Joint Research Travel Support

We select excellent faculty members from the Faculty of Advanced Science and Technology, the Institute of Pulsed Power Science, the Magnesium Research Center and the Center for Water Cycle, Marine Environment and Disaster Management and send them to overseas universities and institutions in order to conclude MOUs to promote internationally collaborated research works and/or to perform their joint research there.

IROAST Visiting Professor and Visiting Professor Candidate Invitation

We invite Visiting Professors and candidates of Visiting Professors to IROAST in order to promote the joint research with their host researchers toward the configuration of international joint research networks and also to open international seminars to attract young researchers including graduate students into the cutting-age research activities.

Research Award from IROAST (for IROAST faculty members only)

We select excellent and powerful IROAST faculty members at the end of every fiscal year to appreciate their research activities and give them the Research Award from IROAST.

IROAST Proofreading/Publication Support

We give the financial support for the proofreading/publication to the researchers mainly belonging to the Graduate School of Science and Technology to increase the number of publications from the area of science and technology.

IROAST Research Internship Program

We provide hands-on research opportunities for highly motivated undergraduate/graduate students and young postdoctoral researchers who have an interest in advanced scientific research.

IROAST Symposiums

We invite key-note speakers from overseas universities and also universities in Japan to open international symposia with specific titles two to three times a year.

IROAST Seminars

We invite excellent and powerful researchers from overseas universities and institutions to open international seminars and also to start new internationally collaborated research works.

3. International Advisory Board Meeting

On March 18th and 19th, 2019, IROAST held its international advisory board meeting at Kumamoto University. The advisory board consists of overseas university faculty and administration members who provide valuable perspectives on joint international research, the identification and fostering of leading research personnel, and institutional management. The purpose of the meeting was to discuss the board's advice on the development of young researchers participating in IROAST research support programs, the establishment of international collaborative research, and to reflect on the management of IROAST and its ability to achieve its goals: to strengthen leading international research in science and technology, to promote and expand international joint research, and to discover and foster leading researchers at Kumamoto University.

On the morning of the first day, IROAST Director Takashi Hiyama reported on the research activities IROAST has been engaged in since its establishment to the three advisory board members, Professor Kwan Yun Lee, Dr. Anne Gellert, and Professor Jorge Beltramini.*¹ The

board members asked questions on a wide range of topics, such as research achievement evaluation, international joint research progress, and educational approach, and exchanged views with IROAST's director and vice-director. In the afternoon, five IROAST researchers, Professor Mitsuhiro Aida, Associate Professor Atsushi Sainoki, Assistant Professor Takashi Ishida, Professor Armand T. Quitain, and Associate Professor Kumon, presented their research and fielded questions from the board members. The board then provided useful suggestions for future research.

On the second day, the board gave detailed suggestions and comments based on the previous day's findings about the future management and organization of IROAST, and exchanged ideas with Director Hiyama and Vice-Director Otani. The meeting is expected to greatly contribute to the future operation of IROAST.*²

The three board members also met with President Shinji Harada and the university trustee in charge of research and social-academic collaboration, Dr. Yasumichi Matsumoto. They had a meaningful discussion on several matters, particularly the globalization of Kumamoto University and the strengthening of research capabilities.

IROAST will reflect on the advisory board's helpful feedback and endeavor to make the organization more attractive and open to the world by focusing on its unique strengths.

*¹ Participants

IROAST International Advisory Board Members

Dr. Anne Gellert, Director, International Office, Heinrich-Heine-University Düsseldorf, Germany

Dr. Kwan Yun Lee, Chair of Electrical and Computer Engineering, Baylor University, USA

Dr. Jorge Beltramini, A/Professor-Senior Research Fellow, The Nanomaterials Centre–NANOMAC–AIBN, University of Queensland, Australia; IROAST Visiting Professor

IROAST Director and Vice-Director

Takashi Hiyama, Director, IROAST; Distinguished Professor, Priority Organization for Innovation and Excellence

Jun Otani, Vice-Director, IROAST; Professor, Faculty of Advanced Science and Technology

*² IROAST received comments from the IROAST advisory board on the following six topics:

1. Tenure-track based development of young excellent researchers
2. Promotion of international "brain circulation"
3. Configuration of international joint research networks
4. Publications
5. Acquisition of external funds
6. Operation and management of IROAST



Director Hiyama reporting on IROAST activities



IROAST researcher introducing his research



Prof. Beltrami



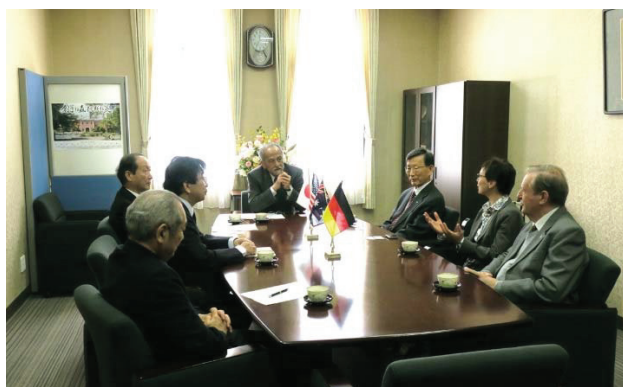
Prof. Lee



Dr. Gellert



Board members giving comments



Courtesy visit to President Harada and Trustee Matsumoto



Statistics for IROAST Research Activities (Reference for the Advisory Board Meeting)

◆ Indices for Self-evaluation of IROAST Research Activities

Indices for Self-Evaluation (Numerical Target)	2016	2017	2018*
Number of Papers (30 papers per year)	13	26	46
Rate of Internationally Collaborated Papers (~80%~)	84.6%	88.5%	80.0%
Rate of Top 10% Papers (~20%~)	0%	15.4%	NA
Field Weighted Citation Index (>1.1)	0.85	1.33	NA
Number of Concluded MOU (>20 for the first term)	3	8	13
Number of Visiting Professors (~40~)	18	26	37
Number of Distinguished Professors (4)	0	2	3
Number of International Symposia including KU-KAIST Joint Symposium (>1)	1	1	5 (3+2)
Number of International Seminars including IROAST&IRCMS Joint Seminars (~20~)	8	20 (19+1)	23 (22+1)
Number of Invited Researchers (~25~)	9	25	28
Number of Researchers Visiting Overseas Universities and Institutions (~20~)	5	21	18
Number of Internship Students	—	—	3

*As of February 12, 2018

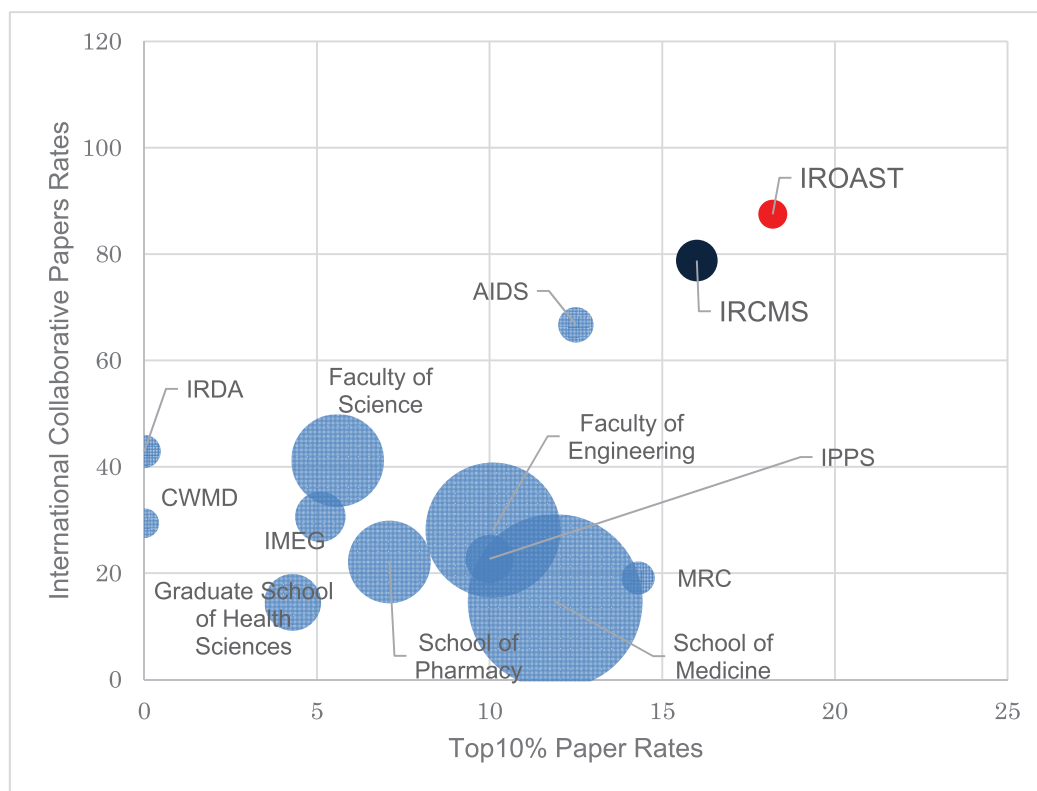
◆ Number of Published Journal Papers by Category of Researchers: Scopus

Category of Researchers	2016 (2016.1.1- 2016.12.31)	2017 (2017.1.1- 2017.12.31)	2018 (2018.1.1- 2018.12.31)	2019 (2019.1.1- 2019.2.12)
Tenure-track Researcher (5)	2	10	13	7*
Distinguished Professor (2) (Papers with the affiliation of IROAST)	—	2	6	3*
Postdoctoral Researcher (4)			(2**)	(2**)
International Joint Researcher (2) (Papers with the affiliation of IROAST)	—	4	16	Not checked
Collaborated with Visiting Professor	11	10	11	Not checked
Total	13	26	46	10

*: including papers in press

**: collaborated papers with the tenure-track researchers not included when counting the papers

◆ Published Papers included in Scopus (up to December 1, 2017)



- IRDA
(Institute of Resource Development and Analysis)
- CWMD
(Center for Water Cycle, Marine Environment and Disaster Mitigation)
- IPPS
(Institute of Pulsed Power Science)
- MRC (Magnesium Research Center)
- AIDS (Center for AIDS Research)
- IMEG (Institute of Molecular Embryology and Genetics)
- IRCMS (International Research Center for Medical Sciences)

Notes:

- Papers by professors registered in the personnel data of each department as of December 1, 2017
- IROAST and IRCMS include distinguished professors, specially-invited professors and special project researchers, not including visiting professors.
- Top 10% paper rates are corrected in specific research fields.

◆ Summary of Research Fund

FY2018

Categories	Number of Grants	Amount (x 1000 Yen)
JSPS Grant-in-Aid	6	22,000
Commissioned Research	1	6,862
Private Research Grant	2	8,000
Donated Grant	5	3,600
Total	14	40,462

FY2017

Categories	Number of Grants	Amount (x 1000 Yen)
JSPS Grant-in-Aid	3	6,340
Commissioned Research	0	0
Private Research Grant	2	8,150
Donated Grant	4	2,450
Total	9	16,940

FY2016

Categories	Number of Grants	Amount (x 1000 Yen)
JSPS Grant-in Aid	1	1,330
Commissioned Research	1	439
Private Grant	0	0
Donated Grant	2	1,200
Total	3	2,969

Comments from International Advisory Board Member 1

1. Tenure-track based development of young excellent researchers
 - It is good that tenure-track faculty knows what is expected for tenure and that once tenured, they have regular tenured position either in GSST or MRC.
 - Mid-term evaluation is critical to make mid-term correction and re-enforce weak areas for the final tenure evaluation.
 - Specific recommendation needs to be written for the candidate for successful tenure evaluation.
 - Publication and external funding should be checked annually.
2. Promotion of International Brain Circulation
 - It is good for the tenure-track faculty to visit other places overseas for international collaboration.
 - However, the length of visit overseas seems to be too often or too long for some tenure-track faculty, because it is important for them to establish their research base and train/mentor students on campus.
 - Training of undergraduate students is missing. They will be future brains!
3. Configuration of International Joint Research Networks
 - It is good to involve other faculty (FAST, IPPS, POIE) to expand international joint research networks.
 - Contribution of IROAST faculty is reasonable. This is expected to grow as tenure-track faculty visit overseas and develop collaborative research.
 - Promote alumni network of former students.
4. Publications
 - Targets for self-evaluation seem to be reasonable.
 - It is very encouraging that these targets are exceeded.
 - Papers with visiting professors seem to be low (11) compared to the number of visiting professors (37).
 - Include patents as another category.
5. Acquisition of External Funds
 - It is encouraging to see that Grant-in-Aid for Scientific Research is acquired by most tenure-track faculty.
 - It is very encouraging that total external funds has jumped in FY2018, especially in JSPS Grant-in-Aid has jumped in FY 2018, especially in JSPS Grant-in-Aid.
 - Funding is the key component in tenure evaluation in America.

6. Operation and Management of IROAST

- Management of IROAST seems to be excellent!
- With only two faculty members (Prof. Hiayama and Prof. Otani), the management of the organization is done efficiently.
- Regular Steering Committee Meeting, Faculty-Staff Meeting, and Staff Meeting held once a month seem reasonable.
- Small number of administrative staff is doing a very (good) job for operation of IROAST.
- Should celebrate!
- Develop good website!

Additional Comments:

1. Participation of undergraduate students in research projects is encouraged. They will be encouraged to pursue research career and go abroad for graduate studies.
2. Basic, fundamental research should be balanced with applied research.

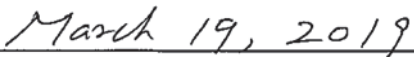
Name of International Advisory Board Member:

Prof. Kuwan Yun Lee

Affiliation:

Baylor University, USA

Signature: 

Date: 

Comments from International Advisory Board Member 2

1. Tenure-track based development of young excellent researchers

It is very positive that you offer tenure-track based employment. IROAST researchers should do some teaching during their affiliation with IROAST and they should get some teaching training. Maybe this could also help to strengthen their contact with GSST. For the teaching training, you should use the central office for Kumadai professors. In Germany this section is named “Hochschuldidaktik.” They should teach in English or Japanese.

2. Promotion of International Brain Circulation

If possible, get high-school students and bachelor students involved in research (e.g. via Kumadai central administration activities). Address the ‘emotional’ side of consideration to become a researcher by putting testimonials on top of the IROAST homepage. Invite, if possible, high-school students and bachelor students to specifically designed summer schools. Mix foreign and Japanese people as participants in your summer schools. Already now think about future alumni programs and make use of your alumni as ambassadors. If possible, use the common alumni program of Kumadai.

3. Configuration of International Joint Research Networks

Do you already ‘use’ your visiting fellows for promotion of IROAST in foreign countries? You should make all people aware that there are lots of possibilities to come to IROAST. This should not be left to the personal insight of each person. It should be part of meetings to talk about the possibilities everyone should help to build up and strengthen the international joint research network. Therefore, it would be good to have a clear vision of the joint research network you want to install.

4. Publications

It is very good that you provide support/proofreading for English texts. Do you also provide intercultural training for staff and researchers? Presenting and writing in English also needs cultural skills.

5. Acquisition of External Funds

It is impressive how you extended the JSPS-funding. Keep on looking for suitable funding. This is time-consuming. Therefore, you should make sure that there is enough staff that can identify suitable funding and support academics in applying for it.

Do you know that Erasmus funds are available for the cooperation with Japan? Your partners in Erasmus countries (Germany, France...) could apply for it under Erasmus key action 107. There will be funding for mobility of students, professors and staff. But it will increase the third-party-money of your partners, only.

Make use of the contacts of your professors to companies. Invite the professor plus his/her partner from the company to 'IROAST open day,' present the achievements of IROAST and outline future possibilities of cooperation, or just celebrate together.

6. Operation and Management of IROAST

How do you celebrate your achievements? Celebrating together is a good opportunity to strengthen a team. Administrative staff and professors should celebrate together.

You should rethink the structure of your homepage and put more stress on the positive personal experience you offer, the satisfaction of being a researcher and the enrichment of your life by international contacts and, of course, the good job opportunities for your alumni.

You should be present on Facebook, twitter, Instagram. Maybe you can use Kumadai official 'pages' of Facebook, twitters and Instagram. Find out if there is someone at IROAST who likes to do Facebook, twitter and Instagram. This is really time-consuming, but if you can provide good photos on Instagram, this can have a great impact for the promotion of the knowledge that IROAST exists.

To get more known by Kumadai students, e.g. distribute post cards on the first day of semesters to freshmen with the announcement of 'IROAST open day' for example in May/ June. Part of this 'open day' should be the possibility to win something or to gain in another way. Produce and distribute magnets (for putting on the refrigerator) with the IROAST butterfly. Your logo is really beautiful!

Name of International Advisory Board Member:

Dr. Anne Gellert

Affiliation:

Heinrich-Heine-University Düsseldorf, Germany

Signature: 

Date: 19.03.2019

Comments from International Advisory Board Member 3

1. Tenure-track based development of young excellent researchers

- Tenure track positions are an excellent system that offers a career path by which young researchers can accumulate experience through fixed-term employment in research environment.
- It is important for their future academic career that they also participate from time to time in teaching programs through relevant departments.
- They should also conduct seminars and short course in English to graduate students (Bachelors, Masters and PhD).
- A mentor system should be established to provide continuing individual support according to tenure-track faculty members' needs.

2. Promotion of International Brain Circulation

This is an important idea and task of the organization. Especially young researchers at graduate level should have experience at high level that will able them to challenge issues prevailing in the global arena, while forming networks with visiting professors at IROAST and visiting overseas universities and research institutes will potentially create the global researchers of the future that can solve innovative society challenges.

3. Configuration of International Joint Research Networks

It is important that the role of IROAST to be the top university international window to communicate and to conduct the interdisciplinary research innovative cutting-edge related work. As such a consultative member group with involvement of academic and research staff from university departments should work together to coordinate, establish and recommend the formation of joint research networks.

4. Publications

It is with satisfaction to see that the number of IROAST research publications continue to increase since its inception. I will encourage the researchers to work cooperatively with the different university professors and researchers to produce joint publications in high IF scientific journals. Apart from publications, dissemination of work in high level reputed International conferences is very important for the recognition of the organization and important for creation of new research networks.

5. Acquisition of External Funds

- It is important to obtain external funds to secure the long-term liability of the organization. As such it is important to get to know the outside community by presenting and disseminating information and looking for potential philanthropic funders and university donors.
- Reach regional, national and international companies for sponsorship.

- Create a commercialization office as part of IROAST to manage IPs, create business plan, and identify potential sources of funding to match existing ideas.

6. Operation and Management of IROAST

IROAST has an excellent operation and management sources team that impact in the day to day activities. As such it is recommended due to personal experience that:

- Look on possibility to nominate a day in a year as celebration for IROAST achievements where faculty members can attend, hold a BBQ party and give prizes for best researcher, best publication, etc. Improve public relations within Univ.
- Do an Open Day, where IROAST opens its door for anybody interested to visit facilities.
- Hold a day meeting every semester international new arrived student to inform them of IROAST activities.
- For seminars and workshops, send individual invitations by email to every staff and encourage to attend. Place posters of the seminar announcement around the university departments. It is very important to communicate and open a communication channel with all professors asking research achievements from time to time have a celebration of those milestones.
- Attend international research exhibitions to promote activities.
- Produce an IROAST Promotional kit that researchers and Professors attending conferences worldwide can use to contribute and inform of activities done at Kumamoto University.

Name of International Advisory Board Member:

Prof. Jorge Beltramini

Affiliation:

Queensland University of Technology (QUT)

Signature: 

Date: 19-3-2019

Research Activities

1. IROAST Researchers

No.	Name	Project Title
1-1	Toshiyuki Tosha	Geothermal energy
1-2	Mitsuhiro Aida	Shoot meristem formation during Arabidopsis embryogenesis
	Sri Imriani Pulungan	
1-3	Ruda Lee	Multifunctional nanosystem for theragnosis (therapy + diagnosis)
1-4	Atsushi Sainoki	Sustainable energy development
1-5	Takumi Higaki	Quantitative Bioimaging
1-6	Takashi Ishida	Deciphering biological relevance of peptide hormone-mediated intercellular communications in plant by genome editing
1-7	Adam Karl Schwartzkopff	Prediction of induced seismicity from fluid injection into faults
1-8	Akiko Nakamasu	Theoretical modeling of plant morphogenesis
1-9	Minwoo Kim	Bio-inspired Lipid-based Drug Delivery Systems for Cancer Therapy

No. 1-1	Geothermal energy		
Name	Toshiyuki Tosha		
Affiliation	IROAST Email: tosha@kumamoto-u.ac.jp	Title	Project Professor
Research Field	Green Energy		

Green (renewable) energy refers to the resource that is recognised as being able to be used permanently as an energy source, such as solar power and heat, wind power, hydropower, geothermal, heat in the atmosphere and other natural heat source, and biomass. They are regulated by a Japanese law. Renewable energy is also one of green energies and an excellent energy that scarcely exhausts carbon dioxide during power generation and heat utilisation, which is regarded as the major cause of the global warming. The global warming is an international issue and one of the biggest challenge of this century.

Geothermal energy is recognised as the stable energy which is not affected by the weather condition and can supply electricity for 24 hours in a day. However, the energy has not been advanced in Japan due to risks arising during their developments of an underground resource. We have been engaged in activities to contribute to geothermal development not only domestically but overseas.

The Oguni town located in the north of Kumamoto Prefecture has many resources. There are many forests in Oguni and are rich in woody resources. In addition, geothermal resources are abundant. They are creating a plan for the town in future combining geothermal and woody resources. Regarding the geothermal resources at Oguni, we has conducted geothermal fluid flow analysis using TOUGH2, a geothermal flow simulator. From the analysis of the areal gravity gradient data, geothermal water is predicted to originate under Mt. Waita and to flow to Sugawara directly though it was considered to flow along the Takenoyu Fault (Fig. 1). The simulation based on this new findings was conducted and the results represented the geothermal flows around the Oguni field as well as the shallow, hot water flows.

MT (Magneto-telluric) survey was also conducted to obtain resistivity structure.

The first survey was conducted in 2017 with two observation stations and in 2018 we expanded the survey area with three other stations. The survey stations are plotted in Fig. 2.

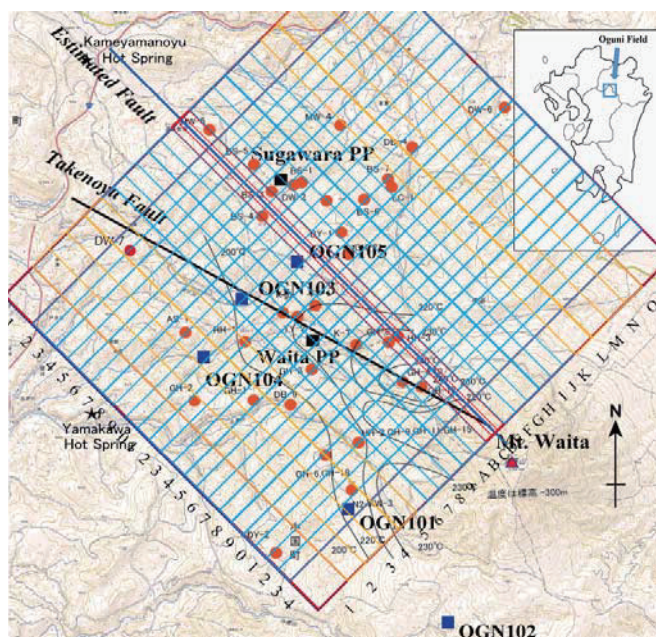


Fig. 1 Grid for the simulation study in Oguni. Open red circles, black squares indicate locations of wells and power plants, respectively. Takenou Fault, which is believed as a major fault and a main pass of the geothermal fluid, is also shown. The fault is oblique to the main axis of the simulation model.

For overseas cooperation, micro earthquake lectures and observation helps in the geothermal areas in Indonesia and Kenya were carried out in a program supported by JICA.

The government of Kenya has set a high target to increase geothermal energy production up to 5,530 MW by 2030. For this target, the government made a new 100% state-owned company, Geothermal Development Company Ltd. (GDC), independent from Electric Power Corporation in 2009. However, the technical levels of GDC for the geothermal development is not sufficient, and business risks in terms of technology is so high. The technical cooperation program (capacity improvement project) supported by JICA is intended to improve the technical level in GDC. In JICA technical cooperation, stuff teams in geology, geochemistry, drilling, geophysical exploration and modelling have been promoting cooperation projects in Menengai. The exploration technology using microearthquake, which is the target technology conducted by Kumamoto University, is organised to analysis micrieqrthquakes happened in Paka and Korosi areas, because of insufficient data in Menengai. Microearthquakes suggest us the deep geothermal structure but the analysis carried out in GDC is not sufficient to derive useful information. This project will be continued in 2019.

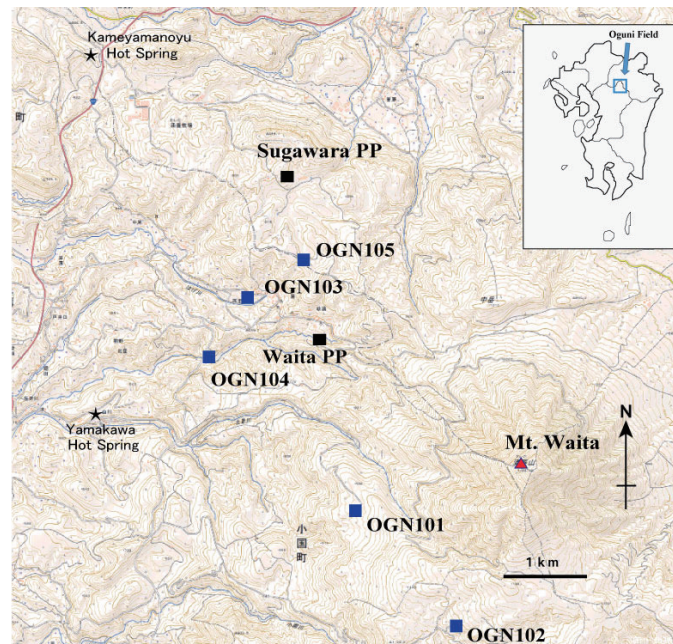


Fig. 2 MT Survey station map in Oguni. OGN101 and OGN102 are the stations where survey was conducted in 2017 and others (OGN103, OGN104, and OGN105) are those in 2018.

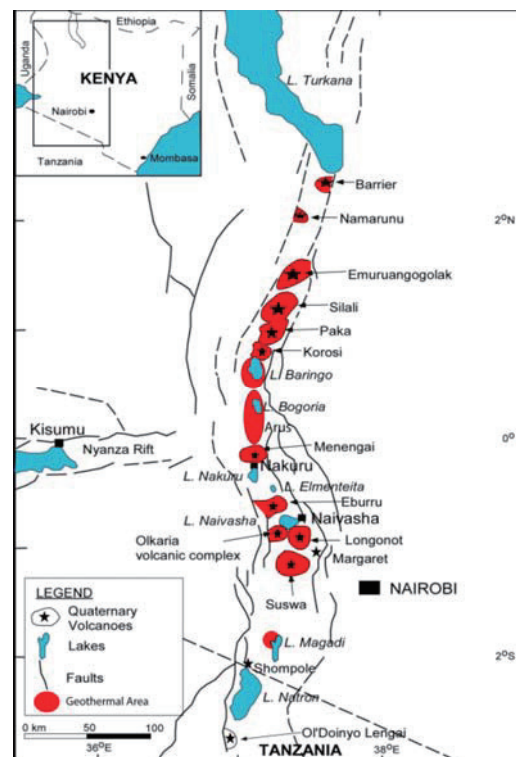


Fig.3 Geothermal field in Kenya Menengai geothermal field is located near Nakuru. Paka and Korosi are in the north of Menengai.

No. 1-2	Shoot meristem formation during <i>Arabidopsis</i> embryogenesis		
Name	Mitsuhiro Aida		
Affiliation	IROAST Email: m-aida@kumamoto-u.ac.jp	Title	Professor
Name	Sri Imriani Pulungan		
Affiliation	IROAST Email: sri-pulungan@kumamoto-u.ac.jp	Title	Postdoctoral Researcher
Research Field	Advanced Green Bio		

The main goal of our group is to elucidate the molecular mechanisms of shoot meristem formation, which is a critical process for plant growth and development. The shoot meristem consists of actively dividing undifferentiated cells that can generate all types of shoot organs, such as leaves, stems and flowers. We have been focusing on the functions of *CUP-SHAPED COTYLEDON* genes *CUC1*, *CUC2* and *CUC3*, which encode transcription factors expressed in shoot organ boundaries. We have identified a number of downstream genes that are activated by CUC proteins, and one of these is *SHOOT MERISTEMLESS (STM)*, whose activity is essential for postembryonic shoot meristem maintenance. We have uncovered that the activity of *STM* is mainly responsible for embryonic shoot meristem initiation downstream of CUC proteins. We have also identified genes related to the plant hormone auxin as candidate target genes of the CUC proteins. These candidate genes include genes involved in auxin biosynthesis and response. Using molecular markers and mutants, interactions of these genes with the *CUC* and *STM* is under investigation.

International and multidisciplinary research collaborations with overseas research groups of Heinrich-Heine University (Germany), Max Planck Institute for Plant Breeding Research (Germany), University of Silesia (Poland), Palacky University (Czech Republic), INRA CNRS (France) and Cardiff University (UK) as well as several domestic research groups of Tokyo Science University, Tohoku University and Nara Institute of Science and Technology is going on to understand molecular mechanisms regulating fruit development, flower development, shoot meristem maintenance, mechanical regulation and shoot regeneration in tissue culture. These collaborative activities include young researchers and those with various discipline, facilitates me to conduct highly advanced, international, multidisciplinary research including new field. One of these collaborations lead to a publication reporting functional analysis of a novel epigenetic regulator for shoot regenerative competency (Ishihara et al. 2019, Nat Commun).

We will further continue to investigate interaction among *CUC*, *STM* and auxin related genes with focusing on their effect on growth pattern during embryonic shoot meristem formation and its maintenance. This analysis will lead to understanding of how shoot meristem activity is initiated and how growth patterns of the apical region is regulated during plant embryogenesis.

Publication

Ishihara H, Sugimoto K, Tarr PT, Temman H, Kadokura S, Inui Y, Sakamoto T, Sasaki T, Aida M, Suzuki T, Inagaki S, Morohashi K, Seki M, Kakutani T, Meyerowitz E, Matsunaga S (2019). Primed histone demethylation regulates shoot regenerative competency. Nat Commun 10, 1786, doi.org/10.1038/s41467-019-09386-5.

No. 1-3	Multifunctional nanosystem for theragnosis (therapy+diagnosis)		
Name	Ruda Lee		
Affiliation	IROAST Email: aeju-lee@kumamoto-u.ac.jp	Title	Associate Professor
Research Field	Advanced Green Bio		

1. Research achievements

In FY2018, I performed various project. First main topic was cancer diagnosis and therapy. During past decades, the focus of cancer research has shifted from malignant tissue to the tumor microenvironment (TME). Tumor cells can control TMEs by secreting of various modulators such as growth factors, chemokines, and cytokines. In previous reports, the TME showed low pH compared to normal region, so that I designed 1) pH-triggered prodrug loaded Hyaluronic acid-Glycol chitosan nanoparticles, and 2) folic acid targeted pH-sensitive liposome as one strategy of cure. I proved that pH-triggered nanomaterials have less toxicity because it can specifically deliver the drugs to target area. Also, these nanocarriers showed highly effective on inhibition of cancer growth. As well as, I designed tumor surface receptor target delivery system. The multi-drug resistance cancer cell expressed epithermal growth factor (EGF) and showed poor prognosis. I modified EGF receptor target peptide on the surface of nanomaterials and examined the therapeutic effect using micro RNA. I demonstrated that the EGFR target small peptide is efficient to deliver drug.

Second main topic was developed iron detection system in Parkinson's disease (PD). This research get support from IROAST research Unit since October 2018. We made Parkinson's disease animal model and analyze the whole brain level of iron. Compared to normal mice, PD mice brain showed high expression level of iron. We extracted dopamine cell region for ICP-MS analysis, however, the amount of dopamine cell region is too small to perform statistical analysis. So that, we change our strategy to use mass imaging technique. It will be performed in FY 2019 and *in vivo* administered upconversion nanoparticles for iron chelating.

2. International research collaboration

October 2018, IROAST, Kumamoto university-Department of Biomedical engineering, Yonsei University made MOU. I organized with Prof. Key (Yonsei Univ.) since April 2018 for expanding collaboration between Japan and Korea.

March 2019, four young researchers applied HSFP young researcher grant. I organized Japan-Korea-Australia-USA connection. All researchers get Ph.D. within 10 years and become a PI within 5 years. We start to keep closely working on deep brain imaging using upconversion nanoparticles.

For Post.doc research, we worked with Korea Institute of Science and Technology (KIST). We worked on High-Intensity Focused Ultrasound (HIFU) mediated drug-controlled release system. In vitro characterization was finalized, and we've got promising results. In FY 2019, we will perform animal experiment and publish papers.

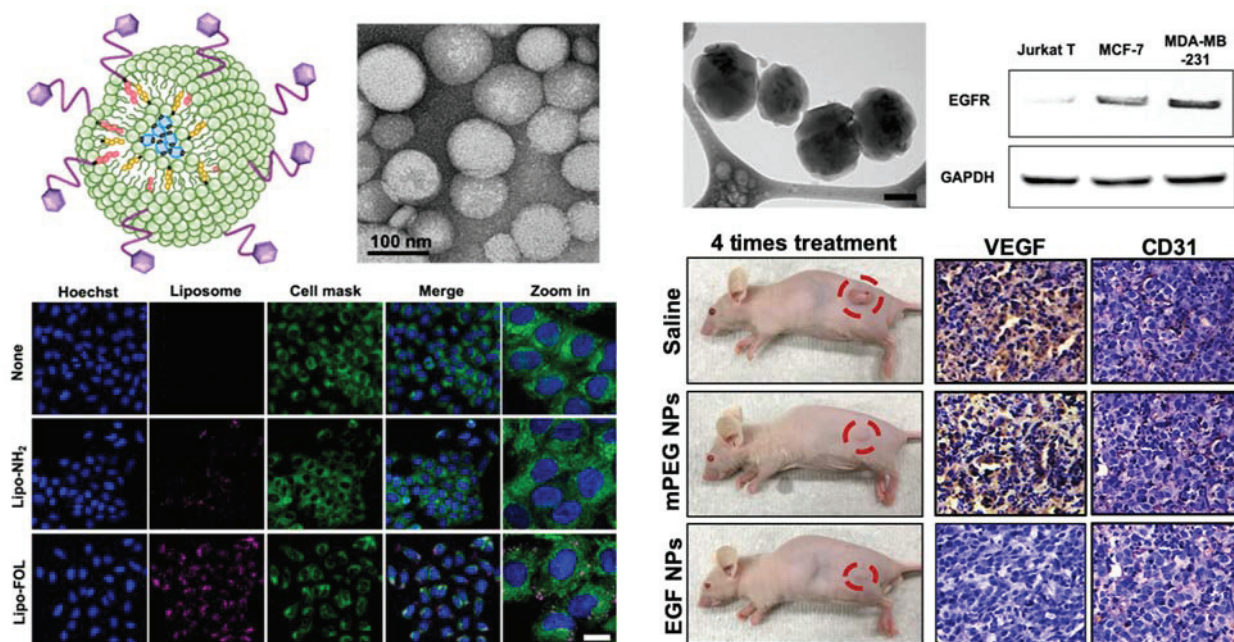
3. Prospect for further research collaboration

In FY2019, I have plan to apply eASIA grant with Japan (IROAST, AIDS center)-United States (Dana Faber Cancer Institute, Harvard)-Australia (Univiversity of Sidney). We start to make new strategy for detecting latent HIV infected CD4 T cells and latency-reactivating agent delivery to reduce toxicity and cure HIV. This team consists of many early career researchers who get Ph.D. within 10 years and Professor. Kwon who is famous researcher in imaging and drug delivery. We will focus on overcome clinical huddle for treating HIV.

To develop useful tool in clinic, I start to make collaboration with surgeon. We prepared IRB

documents and got approval from Yonsei University medical school. We start to get patients-derived samples and will apply on imaging sensor to diagnosis disease severity. All of my researches final goal is clinical application for diagnosis, treatment and monitoring disease. So that, I decide to work more closely with clinician. It will be a starting point and I will expand cancer research collaborator near future.

[Cancer research]



[MOU with Kumamoto Univ.- Yonsei Univ. in Yonsei Univ. Wonju campus]



[Friendship of Kumamoto Univ.-KIST researchers]



No. 1-4	Sustainable energy development		
Name	Atsushi Sainoki		
Affiliation	IROAST Email: atsushi_sainoki@kumamoto-u.ac.jp	Title	Associate Professor
Research Field	Green Energy		

Research Achievement

During fiscal year 2018, I conducted various studies in the fields related to rock mechanics, mineral resource development, and civil engineering. I have published one journal paper in Construction and building materials (IF=3.485) and four conference papers in international conferences, as below. One of the conference papers has been awarded and recommended as a journal paper. In terms of research grant, I have obtained grants from two associations, namely **Japan Anchor Association** and **Limestone Association of Japan**. Also, I have obtained **JSPS postdoctoral fellowship** for research in Japan, although I had to decline the grant because the complex circumstance of the candidate made it impossible for him to come to Japan.

Tanikura, I., Shintani, R., Sainoki, A., Watanabe, S. and Obara, Y., 2018. Quantitative comparison of chipping-and hydrodemolition-induced microscopic damage evolution in concrete substrates. *Construction and Building Materials*, 164, pp.193-205.

Nakamura, K., Obara, Y., Kasai, A., Yoshinaga, T. and Sainoki, A., 2018, January. Crack Front Geometry and Stress Intensity Factor on Cracked Chevron Notched Semi-Circular Bend Test. In *ISRM International Symposium-10th Asian Rock Mechanics Symposium*. International Society for Rock Mechanics and Rock Engineering.

Sainoki, A., Obara, Y. and Mitri, H.S., 2018. Numerical simulation of stress distribution within a rock discontinuity asperity. In *Geomechanics and Geodynamics of Rock Masses* (pp. 673-679). CRC Press.

Jiang, L., Chen, L., Sainoki, A. and Mitri, H.S., 2018, January. Numerical Approach for Yield Pillar Design Under Fractured Ground Conditions in Longwall Coal Mining. In *ISRM International Symposium-10th Asian Rock Mechanics Symposium*. International Society for Rock Mechanics and Rock Engineering.

Schwartzkopff, A., Sainoki, A., 2018. Numerical simulation of an in-situ fluid injection experiment with a coupled X-FEM analysis. International Symposium on Mine Safety Science and Engineering, Beijing, China

International research collaboration

I have invited two professors specialized for sustainable energy development focusing on geothermal energy development from **University of British Columbia** and **McGill University**. The two professors held a seminar at Kumamoto University to provide cutting-edge information on mineral resource development using sustainable energy, including ground freezing and geothermal energy utilization. After the seminar, we made a visit to an experimental geothermal site located in Beppu, Oita prefecture. Based on a discussion made there, we agree to conduct research together while collaborating with Japanese private company performing the in-situ experiment with a co-axial heat exchanger. Also, I visited **Central Mining Institute in Poland**, which focuses on coal mining technology as well as clean coal technology, such as underground coal gasification and coal liquefaction. I have concluded MOU with the institution. Now, I've been

contacting one researcher of the institution to start collaborative research, focusing on the induced seismicity taking place in a deep coal mine.

Prospect for further research collaboration

During fiscal year 2018, I visited **Adelaide University**, and I have discussed research collaboration with Prof. Murat Karakus. We have agreed to collaborate concerning two topics: microbial-aided carbon precipitation for improving the efficiency of carbon sequestration, and elucidation of stress concentration on rock surface asperities. I'm planning to send my postdoctoral fellow to Adelaide University to perform some experiments. In addition to the collaboration with Adelaide University, I attended a meeting for 111 project, which is a research project led by Shandong University of Science and Technology. Distinguished professors participate into the project from recognized universities around the world, and fortunately I've been selected as one of the members. In the meeting, I got acquainted with a professor of **Colorado School of Mine**. She is working on a similar topic that I'm interested in, and we talked about possible research collaboration.



MOU with The Central Mining Institute



Meeting of 111 project

No. 1-5	Quantitative Bioimaging		
Name	Takumi Higaki		
Affiliation	IROAST Email: thigaki@kumamoto-u.ac.jp	Title	Associate Professor
Research Field	Advanced Green Bio		

Recent advances in bioimaging equipment have enabled biological scientists to easily acquire large amounts of bioimage data within a short period of time. Following this influx of information, biologists are now engaging in bioimage informatics, an emerging area of bioinformatics. I am working on this interdisciplinary research area through development of bioimage analysis tools and its application to biological problems. As great opportunities in FY2018, I gave presentations about quantitative evaluation and classification in the 2nd IROAST&IRCMS Joint Seminar held in this university (August 21, 2018) and 2018 KAIST-KU Joint Symposium held in Daejeon, Korea (October 22, 2018) and discussed with biomedical researches in the International Research Center for Medical Sciences (IRCMS) and KAIST-GSMSE (Graduate School of Medical Science and Engineering, Korea Advanced Institute of Science and Technology) (see the right image). Thanks to these meetings, I had started a collaboration with Dr. Hidenobu Mizuno (IRCMS) and Dr. Yuji Takihara (National University of Singapore) on stem cell dynamics in living animals, with a support from IRCMS-IROAST Budget (acceptance date: January 11, 2019). In this collaborative works, I performed semi-automatic tracking the moving hematopoietic stem cells and quantification of the movement speed and orientation from time-lapse multiphoton confocal images.



I am also working on image analysis of cytoskeleton, which tightly relates to various cell activities including cell division, expansion, and differentiation. In FY2018, I had developed and upgraded a high-versatility and high-throughput image analysis framework for quantification of multidimensional cytoskeletal organizations. To examine versatility of my technique, I performed some collaborative researches. My technique succeeded to quantitatively evaluate the cytoskeletal organizations in various types of cells, and we published four original papers concerning quantification of cytoskeletons in various materials including plant root cells (Takatsuka et al. 2018 *Plant Physiology*; collaboration with NAIST), plant root hairs (Hirano et al. 2018 *Nature Plants*; collaboration with Kyoto Prefectural University, Kyushu University, and University of Oxford), plant zygotes (Kimata et al. 2019 *Proc Natl Acad Sci U S A*; collaboration with Nagoya University), and growth cones in animal cultures cells (Tanaka et al. 2019 *Genes to Cells*; collaboration with AIST and Tsukuba University). Related to the



cytoskeleton project, I organized a symposium focused on bioimage analysis technology in the 82nd annual meeting of the Botanical Society of Japan (September 14, 2018) with my collaborator Dr. Emiko Okubo-Kurihara of RIKEN, and gave an oral presentation about my work on cytoskeletal quantification (see the right image). Following this symposium, we had co-worked on edition of the e-book that will be published in *BSJ review* (<http://bsj.or.jp/jpn/general/bsj-review/>).

Under the support from IROAST Research Unit, I had started to perform international collaborations concerning development of an image analysis system to quantify multi-dimensional cytoskeletal organization with Dr. Masaki Shimono and Prof. Brad Day (Michigan State University), Mr. Fei Du and Prof. Yuling Jiao (Chinese Academy of Science), and Dr. Kae Akita (The University of Tokyo). Related to the project, I published three papers as a corresponding author (Hirakawa et al. 2018 *Cytologia*; Akita et al. 2018 *Plant Sig Behav*; Akita and Higaki 2019 *Journal of Visualized Experiments*).

In addition, I published two original papers on plant-animal interactions. We reported plant seed-derived attractants for root-knot nematodes (Tsai et al. 2018 *Molecular Plant*; collaboration with Prof. Sawa in this University and INRA). In this collaborative work, I quantified nematode movements by time-series image analysis. We also reported molecular basis of plant's detection of a class of odor molecules known as volatile organic compounds, which are essential for many plant survival strategies, including attracting birds and bees, and deterring pests (Nagashima et al. 2019 *Journal of Biological Chemistry*; collaboration with The University of Tokyo). Our work made the cover of the journal (see the right image). In this collaborative work, I performed live imaging analysis on odor molecule detection in plant cells.



No. 1-6	Deciphering biological relevance of peptide hormone-mediated intercellular communications in plant by genome editing		
Name	Takashi Ishida		
Affiliation	IROAST Email: ishida-takashi@kumamoto-u.ac.jp	Title	Assistant Professor
Research Field	Advanced Green Bio		

1. Research achievements

Coordinated behavior of various types of cells is crucial in multicellular organisms. In order to control the cells precisely, organisms have developed scrupulously designed molecules, called as “hormones” over the course of evolution. One class of the hormones are encoded by specialized genes. These genome-encoded peptide hormones are known to be involved in a wide variety of physiological processes in plants including developmental regulations, environmental responses, nutrient responses, regulation of reproductive cells, plant-microorganism interactions. Although the indispensable function of the peptide hormones has been recognized, most hormone-encoding genes have been left unstudied.

Genetic analysis with loss-of gene function mutant is a powerful approach to elucidate the gene functions. However, targeted gene disruption method has not been established in most organisms. In this context, recently invented genome editing system, namely CRISPR/Cas9, is a meaningful technique for next-generation biological studies. Once the effectiveness of CRISPR/Cas9 in animals was recognized, the method was also applied to plant science field. I have been working on the genome editing in *Arabidopsis thaliana*, a model organism of plant science research. In FY2017, I have reported the establishment of a highly efficient genome editing pipeline and generation of a collection of loss-of-function mutants for the peptide hormones in *Arabidopsis* as a publicly available bioresource.

In this FY, I have conducted several interdisciplinary and international collaborative research using the genome editing pipeline and the peptide hormone mutants. These achievements were published from high-profile journals. We discovered that IDL1 peptide controls turnover of root tip columella cells that are protecting dividing cells (**I**). We also found that CLE9 and CLE10 peptides are responsible for the regulation of the number and movement of gas-exchanging stomata in leaves (**II**, **III**). In addition to the publications with authorship, my contributions were acknowledged in the following reports, biological relevance of CLE25 in environmental responses (**IV**), functional analysis of CLE16, CLE17 and CLE27 (**V**). I also provided seeds for research on evolutionary biology (**VI**) and sex and reproductive science (**VII**). These achievements demonstrated that I could contribute for better understandings of basic plant science as well as these findings will pave the way for advanced green biology.

In addition, I have developed improved plant genome editing method, a manuscript describing the results is in preparation for resubmit (Yamamoto et al., *Plant Cell Physiol*, in preparation). Further, I have started new collaborative research focusing on the characterization of genes that are important in stress biology, sex and reproductive science, epigenetics, inter-organism interactions, agricultural science, ecological science and evolutionary biology as well as stem cell and developmental biology which is my specialty.

Publications

· Authorship

I. The dynamics of root cap sloughing in *Arabidopsis* is regulated by peptide signalling. Shi CL,

von Wangenheim D, Herrmann U, Wildhagen M, Kulik I, Kopf A, **Ishida T**, Olsson V, Anker MK, Albert M, Butenko MA, Felix G, Sawa S, Claassen M, Friml J, Aalen RB, *Nature Plants*, 2018 Aug;4(8):596-604. doi: 10.1038/s41477-018-0212-z (Impact Factor: 11.471)

II. CLE9 peptide-induced stomatal closure is mediated by abscisic acid, hydrogen peroxide, and nitric oxide in *Arabidopsis thaliana*. Zhang L, Shi X, Zhang Y, Wang J, Yang J, **Ishida T**, Jiang W, Han X, Kang J, Wang X, Pan L, Lv S, Cao B, Zhang Y, Wu J, Han H, Hu Z, Cui L, Sawa S, He J, Wang G, *Plant Cell Environ.*, doi:10.1111/pce.13475 (Impact Factor: 5.415)

III. The CLE9/10 secretory peptide regulates stomatal and vascular development through distinct receptors. Qian P, Song W, Yokoo T, Minobe A, Wang G, **Ishida T**, Sawa S, Chai J, Kakimoto T, *Nature Plants*, 2018 Dec;4(12):1071-1081. doi: 10.1038/s41477-018-0317-4 (Impact Factor: 11.471)

· Acknowledgement

IV. A small peptide modulates stomatal control via abscisic acid in long-distance signalling. Takahashi F et al., *Nature*, 2018 Apr;556(7700):235-238. doi: 10.1038/s41586-018-0009-2.

V. The signaling peptide-encoding genes CLE16, CLE17 and CLE27 are dispensable for *Arabidopsis* shoot apical meristem activity. Gregory EF et al., *PLoS One*, 2018 Aug 16;13(8):e0202595. doi: 10.1371/journal.pone.0202595.

VI. CLAVATA Was a Genetic Novelty for the Morphological Innovation of 3D Growth in Land Plants. Whitewoods CD et al., *Curr Biol*, 2018 Aug 6;28(15):2365-2376.e5. doi: 10.1016/j.cub.2018.05.068

VII. Live cell imaging of meiosis in *Arabidopsis thaliana* - a landmark system. Prusicki MA et al., *bioRxiv*, October 18, 2018, doi: <https://doi.org/10.1101/446922>.

In FY2018, I have applied a patent on a discovery and development of novel bio-active compounds as a joint inventor (with three domestic researchers). Based on the invention, we have started a collaborative research project to improve the usability and efficiency of the compounds with a private company. For the research project, we got a fund (¥1,000,000) from the company. The project will be extended to FY2019 and spin-off project is also under discussion.

2. International research collaboration

The published projects listed in the section 1 were done as international collaboration.

IDL1 project (**I**) was accomplished by a collaboration with research groups in University of Oslo (Norway), IST Austria (Austria), ETH Zurich (Switzerland) and University of Tübingen (Germany).

CLE9 project (**II**) was performed with research groups in Shaanxi Normal University (China), Hubei University of Medicine (China), Wageningen University (The Netherlands), IST Austria (Austria) and Henan University (China).

CLE9/10-stomata/vascular project (**III**) was performed with research groups in Osaka University, Tsinghua University (China), MPIPZ (Germany), University of Cologne (Germany) and Shaanxi Normal University (China)

3. Prospect for further research collaboration

In FY2018, I have started some international collaboration on the genome editing in plants. Our pipeline for rapid generation of *Arabidopsis* mutant will provide us further collaborations. In addition, a research project that is aiming to understand molecular insights into the nematode-induced root-knot formation is in progress as an international collaboration.

No. 1-7	Prediction of induced seismicity from fluid injection into faults		
Name	Adam Schwartzkopff		
Affiliation	IROAST Email: aschwartzkopff@kumamoto-u.ac.jp	Title	Postdoctoral research fellow
Research Field	Green Energy		

1. Research achievements

During this fiscal year, I have been concentrating on the development of a cutting-edge numerical simulation program for replicating induced seismicity occurring due to fluid injection into faults. This (quasi-static and dynamic) code has been completed and the quasi-static version has been validated against an in-situ experiment. The associated manuscript has been written and is about to be submitted to 'Numerical and analytical methods in geomechanics' international journal. I presented the preliminary results at an international conference held in Beijing in October 2018. My work was awarded a certificate of appreciation for an outstanding paper.

In addition, I have been able to link this novel numerical simulation code with a (powerful) parameter estimation software (PEST). I have used it to estimate the rock and fault parameters and compare four different relationships, linking the dilation to hydraulic aperture and hence permeability of the fault. From this work, I have written an accepted peer reviewed conference paper and will present it at the International Society of Rock Mechanics congress in September 2019.

In May and June 2018, I undertook an exchange in China, hosted by Prof. Qi Li at the Institute of Rock and Soil Mechanics, Chinese Academy of Sciences. During this visit I worked on characterizing the material properties of tight sandstone found in the Sichuan basin for use in predicting the hydraulic fracturing parameters. A manuscript has also been developed from this work and I am planning to submit it to an international journal later this year.

2. International research collaboration

I am currently collaborating with the Institute of Rock and Soil Mechanics, Chinese Academy of Sciences, to finalize the manuscript on the hydraulic fracturing experiments I conducted during my exchange.

3. Prospect for further research collaboration

There is a prospect for further research collaboration with the Institute of Rock and Soil Mechanics, Chinese Academy of Sciences.

I am also under the supervision of Associate Prof. Atsushi Sainoki; for further research collaborations planned see his section.

No. 1-8	Theoretical modeling of plant morphogenesis		
Name	Akiko Nakamasu		
Affiliation	IROAST Email: nakamasu@kumamoto-u.ac.jp	Title	Postdoctoral research fellow
Research Field	Advanced Green Bio		

1. Research achievements

I and Dr. Takumi Higaki published a paper titled “Developmental analyses of divarications in leaves of an aquatic fern *Microsorium pteropus* and its varieties” in PLoS one 14(1) e0210141 on Jan. 2019. *Microsorium pteropus* and its varieties are popular aquarium plants for their leaf variation. Especially different branch patterns, bifurcation and monopodial branches, among the varieties are characteristic. In this present paper, these plants were revealed as closely related species by molecular phylogenetic analysis. All of the leaf variation were found to be generated by apical growths, which were analyzed by time-laps imaging, shape observations of epidermal cell, and cell-division labelling by EdU. These results will lead to understandings of the biological mechanism that generates shape diversity. This is a research collaborated by Kyoto Sangyo University (Ms. Saori Miyoshi and Dr. Seisuke Kimura), Komazawa University (Dr. Ryo Ootsuki), and Kumamoto University.

Then we had a poster presentation titled “Modeling of a moving net observed in a plant endoplasmic reticulum” at Annual meeting of SMB and JSMB in Sydney on Jul. 2018. An endoplasmic reticulum (ER) is a tubular organelle observed in cells of eukaryote including the plants and animals. Interacting with flow of actin cytoskeleton, the net-like pattern organized by ER in plant cells is continuously moving. The network is frequently remodeled, though they keep the structure called Steiner-minimum-trees. For the understanding of this system, we combined spatially distributed two structures, an arbitral periodic pattern and an actin mesh. In this model, we successfully obtained the dynamics of the system, then it was found that the static perturbations were sufficient to move the pattern. These results will lead to the new strategies to design dynamical systems and networks.

2. International research collaboration

NA

3. Prospect for further research collaboration

Different from the research field “Advanced Green Bio”, I schedule a research collaboration with Masafumi Inaba in South California University and Masakatsu Watanabe in Osaka University. They are biological researchers in the field of color-pattern formations in avian and fish. We plan to construct a theoretical model on a molecular level, then we will integrate the mechanism of pigment-pattern formations observed in avian and fish. Then we’d like to apply the knowledge to pattern formation in plant.

Then I’m now planning to a work-shop titled “Hidden dimension of pattern formation” in Annual Meeting of Japan Society of Molecular Biology with M. Watanabe on 3 Dec. 2019.

No. 1-9	Bio-inspired Lipid-based Drug Delivery Systems for Cancer Therapy		
Name	Minwoo Kim		
Affiliation	IROAST Email: minwoo-kim@kumamoto-u.ac.jp	Title	Postdoctoral research fellow
Research Field	Nanomaterial Science		

* Publication information

Accepted → *Theranostics*, 9(3), 837-852, Jan 2019

1. Research achievements

The research themes that have been conducted at former affiliation (Yonsei University) were the development of a variety of nanoparticles which can transmit anti-cancer drugs. It is less than one year after I started my research at IROAST and I've mainly focused on how to strengthen my previous research and progress new projects. I've also deeply concerned about adjusting to a new research environment in Japan. In this situation, the topic which started in Korea could have been completed with a better paper by sharing ideas, setting a new direction, and conducting further experiments with various research teams at Kumamoto University.

In this fiscal year, the research paper was accepted for publication in a Q1-ranked international journal (*Theranostics*, 2019). Research dealt with development of new therapies to treat breast cancer type which is unresponsiveness to conventional therapies and has high recurrence risk. The genetic differences of breast cancers make them exhibit aggressive progression, a higher rate of metastasis, and poorer prognosis. So I've considered genetic approach and developed lipid-based nanoparticles that can specifically deliver therapeutic genes (siRNA) and quantum dots which enable fluorescence imaging in breast cancer. The delivered siRNAs effectively reduced target oncogenic gene expression, resulting in inhibition of both tumor growth and lung metastasis.

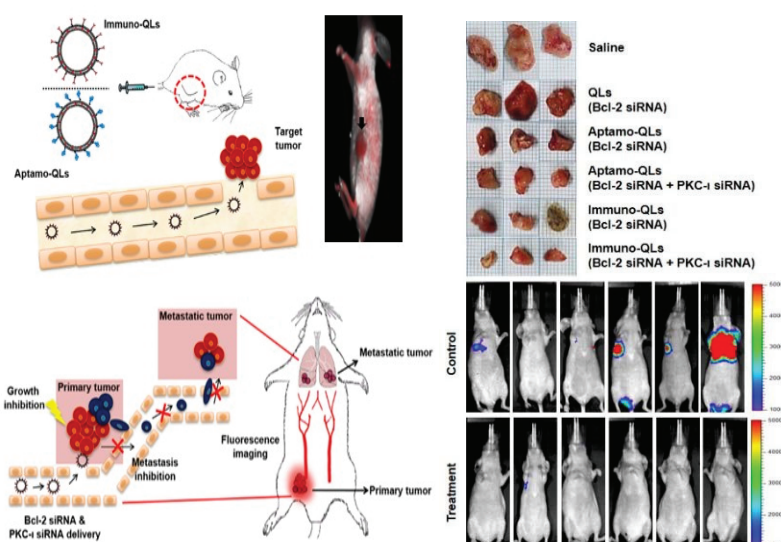


Fig 1. Fluorescence imaging and evaluation of therapeutic effects in breast cancer mouse model

Another paper is about recent studies about lipid-based drug delivery systems. Topics about the development of lipid-based nanoparticles are subject that I have been continuing throughout my research career and I am still highly interested. Recently, it is becoming more popular to scientists around the world due to its safety and biocompatibility. I've tried to know a recent trend and written the review paper not simply repeat the research in a similar way, but to make novel

and innovative attempts. The review paper was accepted in the international journal (Int J Mol Sci, 2018). In this review, I described various lipid-based nanoparticles such as liposomes, micelles, emulsions, lipid-polymer hybrids, red blood cell nanoparticles, and exosomes that can be utilized as drug delivery systems.

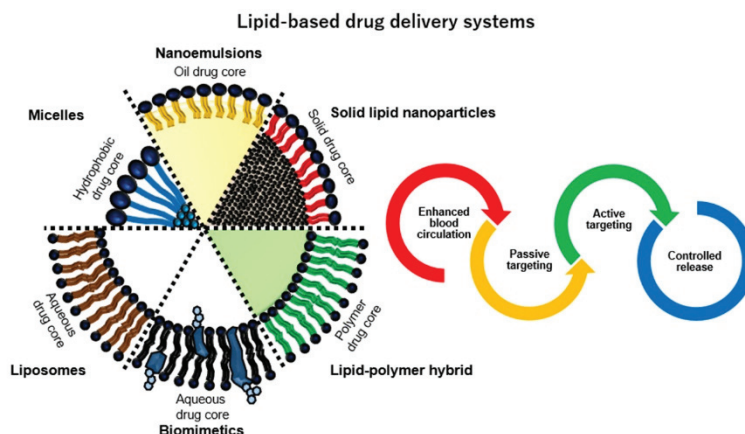


Fig 2. A variety of lipid-based nanoparticles

2. International research collaboration

While I worked at IROAST, I had a chance to do collaborative activities and exchange knowledge with the help of my host professor, Ruda Lee. It is not only limited to IROAST, but also includes collaboration with professors in various research fields such as material sciences (FAST), pharmaceutical sciences (KU, school of pharmacy), and medicine (KU, school of medicine). Furthermore, it includes international collaboration with top scientific institutes in Korea (KIST, KBSi, and Yonsei University). These great opportunities have helped me to get ideas about advanced research and actually proceed with the research.

3. Prospect for further research collaboration

In fact, the contents suggested in the review paper are like as ongoing research proposals to me. I explained about a number of techniques that enable lipid-based nanoparticles to be more effective in the tumor environment and suggested future perspectives. I am aiming to develop new lipid-based drug delivery systems such as ultrasound-responsive liposomes, red blood cell nanoparticles, and exosomes. Using these delivery systems, I've been evaluating diverse types of chemotherapeutics and trying to increase drug delivery efficiency with the help of various research collaborator. Our research team has already got many meaningful results and we will continue to expand our cooperation. We are expecting to get more and better performance in the next year.

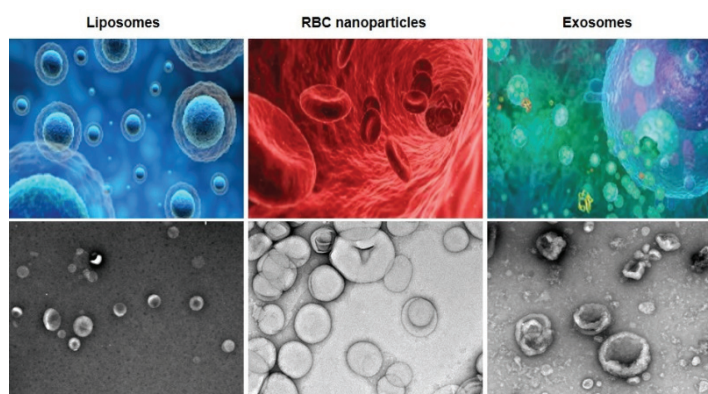


Fig 3. Images of lipid-based nanoparticles observed by TEM

2. Distinguished Professors

No.	Name	Project Title
2-1	László Pusztai	Study of microscopic and mesoscopic structures of liquids and amorphous materials
2-2	Yufeng Zheng	Development and evaluation of biomaterials
2-3	Konstantinos Kontis	New Applications of Pulsed Power Plasma Technologies in Aerospace and Automobile Engineering

No. 2-1	Study of microscopic and mesoscopic structures of liquids and amorphous materials		
Name	László Pusztai		
Affiliation (home)	Wigner Research Centre for Physics, Hungarian Academy of Sciences, Hungary Email: pusztai.laszlo@wigner.mta.hu lpusztai@kumamoto-u.ac.jp	Title	Scientific Advisor
Research Field	Nanomaterial Science		
Period of appointment	04/01/2018-03/31/2019 (80 working days)		
Host Professor	Shinya Hosokawa		
Affiliation	Department of Physics, Faculty of Advanced Science and Technology Email: shhosokawa@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

My primary research goal in general may be described in short as ‘**understanding disordered structures**’. Accordingly, my main activity (still, in general) is the investigation of the microscopic structure of liquids, amorphous materials and disordered crystals. We combine experimental data, such as total scattering structure factors (TSSF) from X-ray and neutron diffraction (XRD and ND, respectively) and EXAFS spectra, with computer modeling tools, such as Reverse Monte Carlo (RMC) and molecular dynamics (MD) simulations. As a result of such an approach, large sets (containing tens of thousands) of atomic coordinates (‘particle configurations’) in simulation boxes are provided that are consistent (within errors) with experimental data. These configurations are then subjected to various geometrical analyses, so that specific questions concerning the structure of a material may be answered. Below I describe some selected results from the year of 2018 that are specific to my stays at IROAST of KU: these works, in one way or another, are all related to the search for hydrogen-bonded supramolecular assemblies in various molecular liquids.

(i) *Temperature dependent structure of ethanol-water mixtures at low alcohol contents.* By making use of literature X-ray diffraction data, extensive molecular dynamics computer simulations have been conducted for ethanol-water liquid mixtures in the water-rich side of the composition range, with 10, 20 and 30 mol % of the alcohol, at temperatures between room temperature and the experimental freezing point of the given mixture. All-atom type (OPLS) interatomic potentials have been assumed for ethanol, in combination with two kinds of rigid water models (SPC/E and TIP4P/2005). Both combinations have provided excellent reproductions of the experimental X-ray total structure factors at each temperature; this provided a strong basis for further structural analyses. Beyond partial radial distribution functions, various descriptors of hydrogen bonded assemblies, as well as of the hydrogen bonded network have been determined from the simulated particle configurations. A clear tendency was observed towards that an increasing proportion of water molecules participate in hydrogen bonding with exactly 2 donor- and 2 acceptor sites as temperature decreases. Concerning larger assemblies held together by hydrogen bonding, the main focus was put on the properties of cyclic entities: it was found that, similarly to methanol-water mixtures, the number of hydrogen bonded rings has increased with lowering temperature. However, for ethanol-water mixtures the dominance of not the six-, but of the five-fold rings could be observed.

Following on with the detailed analyses of the hydrogen bonded network in water, methanol, ethanol and ethanol-water mixtures (also as a function of temperature), we have introduced a

novel tool for characterizing the stability of such network. Calculating the Laplace-spectra for hydrogen bonded systems was also shown to be effective for detecting percolating networks.

Related publications:

(a) Pothoczki Sz; **Pusztai L**; Bakó I; Variations of the Hydrogen Bonding and Hydrogen-Bonded Network in Ethanol–Water Mixtures on Cooling; *J. Phys Chem. B*; **122**, 6790–6800 (2018).

(b) Bakó I; Pethes I; Pothoczki Sz; **Pusztai L**; Temperature dependent network stability in simple alcohols and pure water: The evolution of Laplace spectra; *J. Mol. Liq.*; **273**, 670–675 (2019).

(iii) *The structure of liquid aldehydes.* Synchrotron X-ray diffraction experiments and molecular dynamics simulations have been performed on simple aliphatic aldehydes, from propanal to nonanal. The performance of the OPLS all-atom interaction potential model for aldehydes has been assessed via direct comparison of simulated and experimental total scattering structure factors. In general, MD results reproduce the experimental data at least semi-quantitatively. However, a slight mismatch can be observed between the two datasets in terms of the position of the main diffraction maxima. Partial radial distribution functions (PRDF) have also been calculated from the simulation results. Clear differences could be detected between the various O-H partial radial distribution functions, depending on whether the H atom is attached to the carbon atom that is doubly bonded to the oxygen atom of the aldehyde group or not. Based on the 3 different O-H PRDF-s, as well as on the various H-H PRDF-s, it may be suggested that neighboring molecules turn toward each other (somewhat) preferentially by their aldehyde ends. From $g_{OO}(r)$ and $g_{CC}(r)$, and from intermolecular angular correlations presented in Figure 5, it may be discerned that no (or at most, extremely weak) orientational correlations are present between neighboring aldehyde groups.

As a follow-up of the above series of experiments, the total scattering structure factors of pure liquid *n*-pentanol, pentanal, and 5 of their mixtures have been determined by high energy synchrotron X-ray diffraction experiments. For the interpretation of measured data, molecular dynamics computer simulations were performed, utilizing ‘all-atom’ type force fields. The diffraction signals in general resemble each other over most of the monitored scattering variable, Q , range above 1 \AA^{-1} , but the absolute values of the intensities of the small-angle scattering maximum (‘pre-peak’, ‘first sharp diffraction peak’), around 0.6 \AA^{-1} , change in an unexpected fashion, non-linearly with the composition. MD simulations are not able to reproduce this low- Q behavior; on the other hand, they do reproduce the experimental diffraction data above 1 \AA^{-1} rather accurately. Partial radial distribution functions are calculated based on the atomic coordinates in the simulated configurations. Inspection of the various O-O and O-H partial radial distribution functions clearly shows that both the alcoholic and the aldehydic oxygens form hydrogen bonds with the hydrogen atoms of the alcoholic OH-group.

Related publications (both are related to the ISKSR-5 symposium, held at KU):

(a) Pethes I; Temleitner L; Tomsic M; Jamnik A; **Pusztai L**; Unexpected Composition Dependence of the First Sharp Diffraction Peak in an Alcohol–Aldehyde Liquid Mixture: *n*-Pentanol and Pentanal; *phys. stat. sol (b)*; **255**, 1800130/1-7 (2018).

(b) Pethes I; Temleitner L; Tomsic M; Jamnik A; **Pusztai L**; X-Ray Diffraction and Computer Simulation Studies of the Structure of Liquid Aliphatic Aldehydes: From Propanal to Nonanal; *phys. stat. sol (b)*; **255**, 1800127/1-7 (2018).

(iv) *The structure of 1-propanol/water and 2-propanol/water liquid mixtures.* The structure

factors of pure 1-propanol, 2-propanol and mixtures of 1-propanol/water and 2-propanol/water, as a function of composition, have been determined experimentally, by synchrotron X-ray scattering, and by molecular dynamics simulations. The primary aim was to find interatomic potentials that reproduce measured structural data at the highest possible level. For this reason, various alcohol potential models have been employed, including united atom (UA) and all atom (AA) types, in combination with a TIP4P-based model for water. In order to improve agreement with experimental values of the dielectric constant and mass density, a new UA force field for the alcohols has also been constructed.

It has been shown that the X-ray weighted structure factors may be represented by the UA force field (both the original and the new UA) satisfactorily for the pure alcohols; agreement for the aqueous mixtures may be termed ‘qualitative’ in the best cases. That is, for calculating structural properties, the UA-type potentials are not applicable for 1-propanol/water and 2-propanol/water mixtures. On the other hand, the OPLS/AA force field has proven to be consistently better in comparison with the X-ray diffraction data; also, for the reproduction of neutron diffraction data, only the all atom type potential is applicable.

Related publication: Mendes-Bermudes JG; Dominguez H; Temleitner L; **Pusztai L**; On the Structure Factors of Aqueous Mixtures of 1-Propanol and 2-Propanol: X-Ray Diffraction Experiments and Molecular Dynamics Simulations; *phys. stat. sol (b)*; **255**, 1800215/1-8 (2018).

Talks at meetings, seminars:

During my second year at IROAST, I have been invited to deliver talks at the following meetings:

(1) *Special Session of the Annual Meeting of the Japanese Ceramic Society (15 and 16 March, 2018; Tohoku University, Sendai)*

Title: „RMC_POT - a Reverse Monte Carlo software tool aiming at structural studies of amorphous materials and molecular liquids”

(2) *ISMMDoF2018: International Symposium on Advanced Materials Having Multi-Degrees-of-Freedom – Informatics in Advanced Measurements and Material Science (1 and 2 November 2018; Kumamoto University)*

Title: “Understanding the structure of disordered materials via combinations of Molecular Dynamics Simulations and Reverse Monte Carlo modeling: handling information deficiency”

2. Overview and significance of the research collaboration and lecture(s) to the students

During my stays at IROAST, I’ve collaborated mostly with my host professor, Dr. Hosokawa, and his co-workers at the Department of Physics (Dr. Jens Stellhorn, a JSPS post-doctor, and Dr. Yoichi Nakajima, a young tenured-track fellow).

Research proposals submitted:

(1) JSPS ‘KAKENHI’, type ‘B’; with Dr. Nakajima (under review).

(2) Various beamtime applications to world class large scale facilities in Japan: SPring-8 synchrotron source (two with Dr. Temleitner of the Wigner RCP, Hungary; and another one with Dr. Nakajima); and J-PARC pulsed neutron source (with Dr. Nakajima). The latest item mentioned is still under review, whereas all the previous ones have been approved.

The joint research work with Dr. Nakajima, on high pressure diffraction measurements of alcohol-water liquid mixtures, has been extended: two experiments have already been completed,

two more are in the design stage. We very much hope that the first publications would appear during the next fiscal year.

On one occasion, I was asked to deliver a lecture to undergraduate students, in the framework of Prof. Hosokawa's course.

3. Prospect for further research collaboration with Kumamoto University

See point 2.: the high pressure work, for which I obtain vital help and assistance from Dr. Nakajima is expected to expand, by involving his students, as well – provided that we obtain a sufficient amount of (possibly, external) funding.

4. Impressions of Kumamoto University/Kumamoto

I can only repeat my words from my last report: life is convenient here for me, particularly as nowadays I'm staying in Kusunoki Kaikan. (If only a public washing machine was there, somewhere in Kusunoki Kaikan...)

No. 2-2	Development and evaluation of biomaterials		
Name	Zheng Yufeng		
Affiliation (home)	Department of Materials Science and Engineering, College of Engineering, Peking University, China Email: yfzheng@pku.edu.cn yfzheng@kumamoto-u.ac.jp	Title	Professor
Research Field	Nanomaterial Science		
Period of appointment	04/01/2018-03/31/2019 (40 working days)		
Host Professor	Kazuki Takashima		
Affiliation	Department of Materials Science and Engineering, Faculty of Advanced Science and Technology Email: takashik@gpo.kumamoto-u.ac.jp	Title	Professor

1. Research achievements

I attended “Biomaterials International 2018” conference, held at Tokyo from July.21-27, 2018, and gave a 30 min invited talk entitled “Fundamentals of the theory of biodegradable metals”.



I attended Autumn Meeting of The Japan Institute of Metals and Materials, held at Sendai from Sept.19-21, 2018, and gave an oral presentation entitled “Degradation of pure zinc stent in the rabbit abdominal aorta model”.



I attended 40th annual meeting of Japanese Society for Biomaterials, held at Kobe from Nov.12-13, 2018, and gave an oral presentation entitled “Studies on zinc-hydroxyapatite composites as novel biodegradable metal matrix composite”.



I attended “The1st KU - KAIST Joint Symposium”, held at Kobe from Oct.21-23, 2018, and gave an oral presentation entitled “Study on biological response of biodegradable metals with stem cell model and animal testing”.

In this financial year, I applied for Grants-in-Aid for Scientific Research -KAKENHI-(B), with the project title “骨治癒するためのZn-Liベースの生分解性材料における合金設計と生分解挙動の制御”, together with Prof. Kazuki Takashima, Jun Otani and Liqun Ruan as co-investigators.

In this financial year, I published 3 papers with the affiliation of IROAST:

In vitro and in vivo studies on zinc-hydroxyapatite composites as novel biodegradable metal matrix composite for orthopedic applications
Acta Biomaterialia 71 (2018) 200–214

Formation Mechanism, Corrosion Behavior, and Cytocompatibility of Microarc Oxidation Coating on Absorbable High-Purity Zinc
<https://pubs.acs.org/doi/10.1021/acsbiomaterials.8b01131>

Enhanced Osseointegration of Zn-Mg Composites by Tuning the Release of Zn Ions with Sacrificial Mg-Rich Anode Design
<https://pubs.acs.org/doi/10.1021/acsbiomaterials.8b01137>

2. Overview and significance of the research collaboration and lecture(s) to the students

I conducted research collaboration with Prof. Jun Otani and Prof. Toshifumi Mukunoki by a joint experimental work on biodegradable zinc, and we are going to conduct the micro-CT observation on the corroded bulk samples at different timepoints after static immersion in simulated body fluid or under dynamic flow impact pressure chamber pumped with simulated body fluid by rotary pump. The significance of this work is to reveal the corrosion mechanism of biodegradable zinc under different corrosion environment.

On July. 20, 2018, I gave a lecture, entitled “Metallic Biomaterials: New Directions and

Technologies” to undergraduate student at Engineering Building, with the host of Prof. Kazuki Takashima. The significance of this lecture is to let the students to understand the most important aspects of newly-emerging metallic biomaterials, on the one hand how to endow new biofunctions, antibacterial function, promoted osteogenesis, reduced in-stent restenosis and inhibition of inflammatory cells for the traditional metallic biomaterials such as 316L stainless steel and Ti alloys; on the other hand the feasibility studies on the newly-developed biodegradable metals (Mg and its alloys, Fe and its alloys, Zn and its alloys) and amorphous bulk metallic glasses.

3. Comments/suggestions for IROAST/Kumamoto University

In the past 2 years, for each trip I took to and from Kumamoto, I needed to spend two whole daytime (12 hours one way) during the trip by connecting flights between Beijing-Tokyo-Kumamoto, with no payment. For example, in the year 2018, I spent 10 days in total. So I wish that there will be some modification on payment for my case.

4. Prospect for further research collaboration with Kumamoto University

In the 2019 financial year, I would like to explore research collaboration with Prof. Guojun Sheng@IRCMS, on the stimulation of new bone formation with magnesium ions. And future collaboration with other professors in medicine campus of KU will be considered.

5. Impressions of Kumamoto University/Kumamoto



(Photoed on Sept. 10, 2018)

This is my favorite gate of Kumamoto University.

No. 2-3	New Applications of Pulsed Power Plasma Technologies in Aerospace and Automobile Engineering		
Name	Konstantinos Kontis		
Affiliation (home)	Aerospace Sciences Division, School of Engineering, University of Glasgow, UK Email: Kostas.Kontis@glasgow.ac.uk	Title	Professor
Research Field	Green Energy/ Environmental Science		
Period of appointment	11/01/2018-03/31/2019 (22 working days)		
Host Professor	Hamid Hosano		
Affiliation	Institute of Pulsed Power Science Email: hosseini@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

a. Seminars:

a1) Dec. 4, 2018 (Tue.) 14:30-16:00: The 6th IROAST Faculty-Staff Meeting: The presentation provided an overview of University of Glasgow including key strengths, research generation with impact, innovation, international reach and internationalization strategy. The second part discussed the research excellence framework and its importance in generating originality, significance and rigor. Target audience was members of staff.

a2) Dec. 11, 2018 (Tue.) 14:30-16:00: The 45th IROAST Seminar – IPPS Lecture & Seminar No. 42; Title: Flow Control Techniques in S-shaped Ducts; The presentation gave an overview of the University of Glasgow Aerospace research activities. It discussed the complex flow physics in diffusive, s-shaped airplane engine intake ducts, and flow control methods employed to counteract the onset of separation, swirl formation, and non-uniformity of pressure at the aerodynamic interface plane. Passive, active, and hybrid flow control techniques were presented. The target audience was students.

b. Collaborative discussions:

b1) Dec 10, 2018 (Mon.) 13:00-13:30: Professor Konstantinos Kontis paid a courtesy visit to President Shinji Harada. In a discussion with President Harada, Prof. Kontis, Prof. Hosano and IROAST Director Hiyama exchanged opinions on expanding the current academic exchanges between the two universities. As a result of this visit, further exchanges are expected.

<http://iroast.kumamoto-u.ac.jp/news/iroast-distinguished-professor-kontis-pays-a-courtesy-visit-to-president-harada/>



b2) Dec 19, 2018 (Wed.) 11:30-12:00: Professor Konstantinos Kontis paid a courtesy visit to Dr Yasumichi Matsumoto, the university trustee in charge of research. Dr Matsumoto is also the director of the Institute of Pulsed Power Science (IPPS) to which Prof. Hamid Hosano, the host professor of Prof. Kontis's home institute, the School of Engineering of the University of Glasgow has an academic agreement with IPPS. In meeting with Dr Matsumoto, Prof. Kontis exchanged opinions on expanding the current academic exchanges between their institutes and Kumamoto University.



b3) Professor Kontis had almost daily research discussions and exchange of ideas with Professor Hosano.

2. Overview and significance of the research collaboration and lecture(s) to the students

The research collaboration discussions have enabled expansion of the current academic

exchanges between the two universities in other areas of mutual interest such as social sciences and medicine and have set the foundations of the renewal of the current MoU and the possibility of staff and student exchanges in the near future.

The ensuing discussions under items a1) and b1) reinforced the significance of criteria in the assessment and quantification of research excellence. It provided the best practices currently in UK.

The lecture to the students enabled fruitful discussions about the potential of plasma systems and energy deposition in applications outside the traditional areas of IROAST, which opens up vast opportunities for multidisciplinary collaboration, knowledge transfer activities and impact generation.

3. Comments/suggestions for IROAST/Kumamoto University

IROAST/Kumamoto University has vast potential to make a difference regionally, nationally and internationally. Interdisciplinary and multidisciplinary approaches and, where relevant, use of stakeholder knowledge and gender dimension in research and innovation content are critical. IROAST has the opportunity to expand and open up their core expertise and create bridges with aerospace engineering, quantum technologies, nanofabrication etc.

4. Prospect for further research collaboration with Kumamoto University

As it has been discussed in item 3), there are vast opportunities for further research collaborations. The unique technologies of IROAST can be married with a range of engineering applications opening up multidisciplinary opportunities. The current stay has set the foundations for future research activities. The following actions are planned with Professor Hosano: a) JSPS Kakenhi International collaboration; b) ERASMUS+ application between IROAST and University of Glasgow (Aerospace Sciences) for PHD students and staff exchanges; c) EPSRC research application on energy deposition systems; d) Joint research activities to enable publications in high impact factor journals; e) Expansion of current MOU between Glasgow and Kumamoto U covering areas across the two universities.

5. Impressions of Kumamoto University/Kumamoto

I am really impressed by the passion and dedication of students and staff to expand the frontiers of science and engineering. The hospitality and friendliness of Kumamoto University and Kumamoto City are unforgettable and I am really grateful of the opportunity.

3. Young Faculty Members for International Joint Research

No.	Name	Project Title
3	Makoto Kumon	Autonomous Control of Drones for Environment Monitoring

No. 3	Autonomous Control of Drones for Environment Monitoring		
Name	Makoto Kumon		
Affiliation	Faculty of Advanced Science and Technology Email: kumon@gpo.kumamoto-u.ac.jp	Title	Associate Professor
Research Field	Advanced Green Bio		
Period of Travel	August 14, 2018-August 26, 2018		
Host Researcher	Tomonari Furukawa		
Affiliation	Virginia Polytechnic Institute and State University	Title	Professor

1. Summary of the results of the joint research trip

This visit was mainly organized to prepare for the visiting researcher's visit in 2019 so he will be able to smoothly join the research project (autonomous drone). Since the project includes the development of autonomous drones for field-tests, which is normally the most time-consuming part, the visiting researcher clarified the existing equipment, such as drone platforms and drone cage (flight test field). The researcher also discussed on the project with the host researcher and his students to share information. He also talked with a member of Non-line of sight sound source localization project that is intended to provide the technology for visually-impaired person to obtain the perception skill of the daily environment.

During the visit, the visiting researcher also visited International Support Service (ISS) VT to prepare his visit.

2. Future plans

Based on the collaborative activities during the researcher's visit, and the visit of the host researcher to Kumamoto University, a novel study on the search and localization technique using drones has progressed, and it will be further studied for the publication. This method has a potential to be utilized in order to realize an autonomous drone that is initially planned. According to the initial plan, the researcher is going to visit host institute in 2019.

3. Others

The researcher is now preparing to apply for KAKANHI grant starting from 2020, and he is planning to include the collaborative research project in it. He will finalize the application during his visit to VT. Stable and continuous support from the IROAST program is greatly helpful for research activities.

4. Visiting Professors & Invited Researchers

No.	Name	Project Title
4-1	Richard Dronskowski HP: Akira Yoshiasa	Performance and achievement of international collaborative research with France and Germany: Research on extreme conditions experiments
4-2	Kenneth T. Koga Rose Koga Esther HP: Akira Yoshiasa	Volatile elements (H ₂ O, CO ₂ , F, Cl, S) cycle through the plate subduction
4-3	Massimo Nespolo HP: Akira Yoshiasa	Performance and achievement of international collaborative research with France and Germany: Research on extreme conditions experiments and mass extinction records left in sediments.
4-4	Gioacchino Viggiani HP: Jun Otani	Application of X-ray CT
4-5	Patrice Delmas HP: Toshifumi Mukunoki	Advantages of Multi-Region Kriging over Bilevel Techniques for Soil CT Scan Segmentation
4-6	Jens Hartmann HP: Takahiro Hosono	Water quality in the Aso Caldera and Kirishima area
4-7	Marc de Boissieu HP: Shinya Hosokawa	Structural investigation in functional materials using synchrotron radiation
4-8	Alexey Vinogradov HP: Yoshihito Kawamura	Advances in Novel Nanocrystalline Magnesium Alloys with the LPSO Structure
4-9	Maria Jose Cocero HP: Tetsuya Kida	Biomass to Green Energy Conversion Technologies
4-10	Tomonari Furukawa HP: Makoto Kumon	Sound Source Localizatin in Non-Field of Sight
4-11	Youn-Woo Lee Oliver Boutin HP: Mitsuru Sasaki	Development of functional materials production using supercritical fluids and pulsed discharge atmosphere
4-12	Josep-Lluís Barona-Vilar HP: Hiroataka Ihara	International collaboration research for design and application of organic/inorganic hybrid gel
4-13	Dimitri A. Molodov HP: Sadahiro Tsurekawa	Local mechanical properties in the vicinity of grain boundary in Al and Mg bicrystals
4-14	Pavel Lejček HP: Sadahiro Tsurekawa	Grain boundary segregation of W in Mo
4-15	Matthieu Micoulaut HP: Shinya Hosokawa	Cooperative studies of theory and experiment on non-crystalline functional materials

4-16	Christian Rentenberger HP: Mitsuhiro Matsuda	Structure and functional property of nanocrystalline-amorphous alloy by severe plastic deformation
4-17	Ramesh Shanmughom Pillai HP: Tokio Tani	Studies on roles of nuage in piRNA biogenesis and functions
4-18	Hamid Ghandehari HP: Hamid Hosano	Safety assessment of inorganic and dendritic nanoparticles
4-19	Martino Di Serio HP: Shinya Hayami	Sol-Gel Ru / SiO ₂ catalysts for Green Chemistry
4-20	Andrew J. Whittle HP: Jun Otani	Potential research collaboration with Prof. Otani at Kumamoto University
4-21	Reiko Oda HP: Hiroataka Ihara	Joint research for fabrication and functionalization of chiral molecular assemblies
4-22	Etsuko Fujita HP: Yutaka Kuwahara	Development of catalytic system for CO ₂ reduction by supramolecular system

HP: Host Professor

The visits were supported by the IROAST research support programs.

No. 4-1	Performance and achievement of international collaborative research with France and Germany: Research on extreme conditions experiments		
Name	Richard Dronskowski		
Affiliation	RWTH Aachen University, Germany Email: drons@HAL9000.ac.rwth-aachen.de	Title	Professor
Research Field	Nanomaterial Science		
Period of Visit	March 2-9, 2019		
Host Professor	Akira Yoshiasa		
Affiliation	Faculty of Advanced Science and Technology Email: yoshiasa@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

The recent years have seen considerable progress in the discovery of next-generation materials based on main-group elements, either from experiment or theory or a combination of both. For example, a third elemental polymorph of arsenic, dubbed *pararsenolamprite*, was discovered as a natural mineral occurring in Japan in the early 21st century. This polymorph, crystallizing in space group $Pnm2_1$, combines structural motifs known from grey arsenic ($R\bar{3}m$) and the arsenolamprite ($Bmab$), and its structural characterization by means of X-ray diffraction and XANES data (and also computation) is due to Professor Yoshiasa from Kumamoto University and associated colleagues from Japan. This result of paramount importance as regards our understanding of structure and bonding in materials calls for further studies as regards total energies, orbital mixing, van-der-Waals bonding, charge analysis, covalent bonding, and many more issues.

2. Overview and significance of the research collaboration with Kumamoto University

During his visit, Professor Dronskowski has been most grateful for learning about the research conducted at Kumamoto University. In particular, he was quite fascinated by the discovery of pararsenolamprite which was unknown to him until 2019. Because the Dronskowski group has been working, for many years, on first-principles methods to project out chemical-bonding data from plane-wave first-principles calculations by means of the LOBSTER computer program, the groups of Professor Yoshiasa and Dronskowski have agreed to share their interest in pararsenolamprite and related materials and to collaborate on such matter. In more detail, they have started to exchange atomistic data in order to develop an in-depth understanding and holistic theoretical picture as regards pararsenolamprite and the two other allotropes of arsenic, also including finite-temperature thermochemical properties. Research of that kind is particularly interesting and timely because such main-group V elements are considered perfect candidates for superior phase-change materials in modern electronic-data storage.

3. Comments or suggestions for IROAST/Kumamoto University

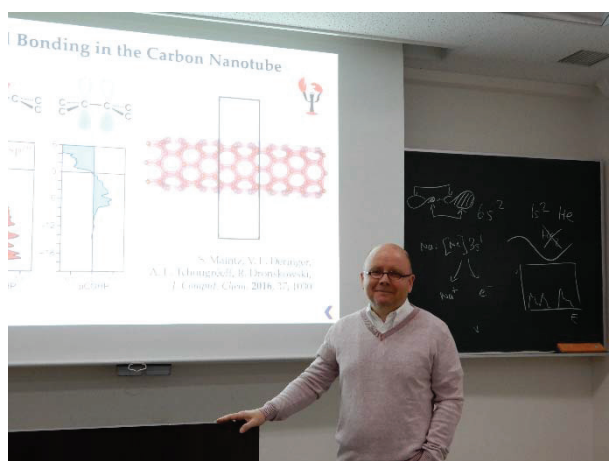
Before coming to Kumamoto University, Professor Dronskowski did not know about the IROAST program in much detail. From what he could learn during his Kumamoto visit, IROAST is a fine world-class approach targeted at international cooperations, in particular by inviting foreign experts to Kumamoto and by recruiting distinguished research professors. Also, IROAST is clearly focusing on young tenure-track and postdoc researchers from all around the globe, which is certainly a good and timely idea. It is difficult to understand, from outside, why only one research area is targeted at fundamental science such as “Nano Material Science” but three more (and very similar ones) at “Green Energy”, “Environmental Science”, and “Advanced Green Bio”. To attract foreign experts, a little more emphasis on fundamental science might be another option.

4. Prospect for further research collaboration with Kumamoto University

It is highly probable that joining forces between selected, eminent professors from Kumamoto University with other experts from abroad will turn out fruitful in the long run. As regards Kumamoto University, there is a strong tradition as regards (nano) inorganic materials, in particular because there is an extremely strong link between solid-state chemistry and mineralogy, a perfect combination needed to carry out (planetary) earth-science studies. At the same time, such center of excellence focusing at next-generation materials by means of extreme condition is likely to attract international collaborators who can provide additional expertise, for example, from theoretical chemistry, from computational materials science, from diffraction research utilizing (neutron-based) sources etc.

5. Impressions of Kumamoto University/Kumamoto

This being Professor Dronskowski's first visit to Kumamoto and Kumamoto University, he was pleasantly surprised by the place and by the openness of its people. He has been traveling to Japan since 1991, almost regularly, but never had the chance to come here. Given its (relatively small) size, Kumamoto University ranks favorably in the world, and it is also visible from Germany. Kumamoto itself is an extremely attractive city to visit, not only due to the pleasant (from a German perspective) climate conditions but also because of the enormously rich cultural treasury. Likewise, the island of Kyushu is a great place to visit, not only because of nature's richness (in terms of mineralogy) but also because of many historical landmarks as regards early (hidden) Christianity. Professor Dronskowski is especially grateful to Professor Yoshiasa for making him aware of these highly interesting places.



No. 4-2	Volatile elements (H ₂ O, CO ₂ , F, Cl, S) cycle through the plate subduction		
Name	Kenneth T. Koga		
Affiliation	Université Clermont Auvergne, OPGC Email: Ken.Koga@uca.fr	Title	Associate Professor
Research Field	Earth and Environmental Science		
Period of Visit	October 27, 2018-November 6, 2018		
Name	Rose Koga Esther		
Affiliation	Laboratoire Magmas et Volcans, CNRS UMR 6524, UCA, Email: estelle.koga@uca.fr	Title	CNRS CR1 (CNRS Researcher, equivalent to Associate Professor)
Research Field	Earth and Environmental Science		
Period of Visit	October 27, 2018 – November 6, 2018		
Host Professor	Prof. Akira Yoshiasa		
Affiliation	Email: yoshiasa@kumamoto-u.ac.jp	Title	Professor

1. Overview of the project and research achievements

This project is aimed to build a research program of multi-colleague collaborations with people in both institutes. The main theme of the research is an investigation the cycle of volatile elements (H₂O, CO₂, F, Cl, S) from the plate subduction and to the volcanic eruption releasing these gases in an arc system, using high precision geochemical analysis and material characterization on material derived from extreme condition found in nature as well as recreated in laboratories. We are especially interested in the unique nature of Japan arc where active volcanoes are present in close proximity of the fossil oceanic crust transported once deep into



A speaker at the symposium on 11/02/2018.

the earth and found at the surface today. Fossil oceanic crust is a key ingredient of magmatism in an arc. It should also be stress that the volcanic gas is the main natural source of halogen in the atmosphere. Quantitative understanding of halogen cycle has a significant implication to the chemistry of atmosphere.

In the year 2018, we have launched three studies including 3 scientists in Kumamoto University and 5 scientists in Université Clermont Auvergne (UCA). The activity was supported through both Kumamoto University and the regional grant to UCA (3 years). With such support, we have achieved following activities. The footage of the joint sampling and symposium is introduced to French public (esp. to high-school students) by a blog (<https://japongeologie.wordpress.com>).

- A symposium (The Kumamoto International Symposium on Recent Advancements of Mineralogy and Petrology XI And The Eighth Meeting of Research Consortium on High-pressure Research) on November 4, 2018, exchanging recent research results presented by 3 scientists from each institute.

- Sampling of volcanic material in Aso volcano. Mt. Aso is an active volcano, which is continuously monitored for many years. We plan to quantify the rate of magma ascent and the quantity of gas release, using melt inclusions and volatile analysis techniques, which Clermont-Ferrand teams, are specialized in. We have obtained preliminary data and a PhD student from Kumamoto Univ. (Mr. Kawaguchi) is currently working to complete the data. Furthermore, with new samples corrected this year, we will expand the data to understand time-transient variation of gas flux. With the collaboration found, Mr. Kawaguchi will stay in Clermont-Ferrand for several months in 2019 to conduct the analyses.

- Sampling of Sanbagawa and Nagasaki complex. Sampling of a fossil oceanic crust, which was exposed to the depth of the earth (thus high pressure), provides precious material, which recorded the processes of chemical segregation, associated with mineral reactions at the conditions. Here, our particular focus is to understand the behavior of magmatic volatile elements and molecules (H₂O, CO₂, F, Cl, and S) before the magma production. We

have conducted such sampling in two localities in Japan this time,



Discussion of sampling strategy

2. Significance of the research collaboration with Kumamoto University

The complementarity of the two institutions is the main reason why we have engaged in the current project. Kumamoto University provides the expert knowledge of local geology as well as mineralogical studies, while UCA provides geochemical analysis and high-pressure experiments. We expect to report new discoveries in this collaboration projects, via exchange of researchers and students.



Assessing high-pressure rocks

3. Comments or suggestions for IROAST/Kumamoto University

The lodging facility and the staff member in the hosting department received us smoothly without any difficulty. I believe the university has an excellent organization to host visiting researchers. If I would make a suggestion, although this is just a minor issue, I think a laundry facility in the guest housing would have been very useful. This time, we have arrived at the university after several days of a sampling trip, and in such circumstances a facility to wash clothes is certainly quite useful.

4. Prospect for further research collaboration with Kumamoto University

In the year 2019, a PhD student is planned to visit Clermont-Ferrand to complete the analysis of the as samples and we hope to present the result in an international conference. Depending on the progress, we would plan a second sampling trip either in 2019 or 2020. Finally, in 18-24 month

time, we would like to organize a workshop to assess the achievement of the project.



No. 4-3	Performance and achievement of international collaborative research with France and Germany: Research on extreme conditions experiments and mass extinction records left in sediments.		
Name	Massimo Nespolo		
Affiliation	Université de Lorraine, France Email: massimo.nespolo@univ-lorraine.fr	Title	Distinguished Professor
Research Field	Nanomaterial Science		
Period of Visit	December 17, 2018-December 21, 2018		
Host Professor	Akira Yoshiasa		
Affiliation	FAST Email: yoshiasa@kumamoto-u.ac.jp	Title	Full Professor

During my visit I have given a seminar under the title “Chirality in crystallography”, which was the occasion to point out common misunderstanding the nomenclature errors in the literature, as well as to give some guidelines to correctly report experimental crystal structures when they are chiral. The seminar was attended by staff and students with background in Earth Sciences, Chemistry and Physics.

My visit of was motivated by the PhD Defense of Mr. Tsubasa TOBASE, candidate for double degree program between Kumamoto University and University of Lorraine. The defense was successfully hold on Wednesday, December 19, in front of a jury composed by the two supervisors (Prof. Yoshiasa and myself) and two external members: Prof. Takeshi Ikeda (Kyushu University) and Prof. Mitsua Machida (Sojo University).

Mr. Tsubasa Tobase visited UL when he was master student in summer 2014 and from October 2015 he started a double PhD degree program. He has spent about one year in Nancy (October 2015 – August 2016), the rest of the PhD program was realized in Kumamoto.

The University of Lorraine (UL below) and the Kumamoto University (KU below) have an active cooperation in both education and research. With the arrival of Professor Yoshiasa in this time, we got the result of submitting international collaborative research paper with us. The title of the research paper is “Single crystal structure analysis of petzite, Ag_3AuTe_2 .” and it was submitted to Acta Crystallographyca. This crystal has chiral and belongs to the Sonke croup.





No. 4-4	Application of X-ray CT		
Name	Prof. Gioacchino (Cino) Viggiani		
Affiliation	Laboratoire 3SR, UGA, Grenoble, France Email: cino.viggiani@3sr-grenoble.fr	Title	Professor
Research Field	Advanced Green Bio		
Period of Visit	June 9, 2018-June15, 2018		
Host Professor	Jun Otani		
Affiliation	Faculty of Advanced Science and Technology Email: junotani@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

As an active researcher in the field of X-ray CT and micromechanics of geomaterials, I organized a workshop as a visiting professor. During my stay in Kumamoto, I performed the following activities:

- 1) Organization of a workshop on June 10 (please check HP)
- 2) Signature of a MOU between IROAST and 3SR, Grenoble
- 3) Lecture to graduate students
- 4) Research meeting with the members of X-Earth Center (about X-ray CT applications)

2. Overview and significance of the research collaboration with Kumamoto University

These activities will be able to contribute:

- 1) Enhancement of worldwide activities with X-Earth center,
- 2) Enhancement of international collaboration, and
- 3) Development of human resources which are not only faculty members but also graduate students

3. Comments or suggestions for IROAST/Kumamoto University

It was very nice to live this experience under the visiting professorship. I would like to suggest enhancing the students exchange for the collaborative research. We are ready to welcome in Grenoble students from Kumamoto University. I would also ask Kumamoto University to accept our students and younger researchers from 3SR/Grenoble-Alpes University.

4. Prospect for further research collaboration with Kumamoto University

In fact, we have discussed about research collaboration with Kumamoto University and Caltech in the United States, of which Prof. Andrade is now also visiting professor at IROAST. All three institutions are very active for the research on micro mechanics and the use of X-ray CT in geomaterials. I hope we will have some further steps for these joint activities next year.

5. Impressions of Kumamoto University/Kumamoto

It is very nice to be a visiting professor for me. I realized that the IROAST is very interesting and international research organization at Kumamoto University. I really wish to continue the collaboration with Prof. Otani and IROAST.

No. 4-5	Advantages of Multi-Region Kriging over Bilevel Techniques for Soil CT Scan Segmentation		
Name	Patrice Delmas		
Affiliation	The University of Auckland Email: p.delmas@auckland.ac.nz	Title	Associate Professor
Research Field	Environmental Science/Image processing		
Period of Visit	June 23, 2018-July 22, 2018		
Host Professor	Toshifumi Mukunoki		
Affiliation	Faculty of Advanced Science and Technology Email: mukunoki@kumamoto-u.ac.jp	Title	Associate Professor

1. Research achievements

The stay was short but quite intense in terms of research exchange. The list of activities is below:

1. Access to the CT-scan facilities to complete NZ-soils sampling;
2. Research exchanges over the development of Multi-region Kriging algorithms for CT-scan Image Segmentation (a publication draft from this work is currently under revision-see below);
3. Delivery of a series of lectures in Image Processing for Engineering students using ImageJ as part of the 30th IROAST workshop;



Photo.1 Group photo after 9 series lectures of Image Processing

4. Completion of a publication manuscript (listed below) with the help of Associate Professor Mukunoki;
5. Organization of the 31st IROAST Mini International Workshop for Advancing Imaging, Image Processing and Data Visualization in the BRAIN/MINDS and MBIE Catalyst Projects with guests and presentations from The University of Auckland, RIKEN Saitama and Kumamoto University with about 35 academic and post-graduate students attendees.

T. Gee, J. Debes, P. Delmas, T. Mukunoki, C. Duwig: Anisotropic 3D Indicator Kriging Image Segmentation for CT-scan volume of soils. Currently under review in the special issue of Soil Research.

T. Gee and Patrice Delmas. Analysis of imagery from air passing through oily synthetic soil.



Photo.2 Group picture after the 31st IROAST seminar

Technical report Kumamoto University, July 2018.

2. Overview and significance of the research collaboration with Kumamoto University

The research collaboration with Kumamoto University and Professor Otani/Associate Professor Mukunoki is of great significance to my research strategy of intelligent advanced image processing systems for engineering problems. The wide knowledge of Associate Professor Mukunoki in CT-scan operation and applications combined with the availability of quality CT-scan imaging facilities and supporting team as well as a very motivated group of post-graduate students is a unique opportunity for quality research progress in relevant areas. Further to this, Associate Professor Mukunoki contacts with other academics and institutes via the X-earth center has provided invaluable linkage for further research endeavors which I intend to leverage via relevant funding through JSPS/EU-RISE/MBIE-NZ.



Photo.3 Assoc. Prof. Mukunoki in Nov. 2018

3. Comments or suggestions for IROAST/Kumamoto University

The status of IROAST visiting professor allowed me to benefit from the associated international exposure as well as financial support to stay in Kumamoto during the June 23, 2018-July 22, 2018 period. The planned IROAST events were popular with post-graduate students and

academics. From my perspective, the IROAST network works well in attracting international academics to visit Kumamoto University. Suggestions could include simplifying procedures for stipend reimbursement as well as providing in the future a residence on-campus for family and visiting academics including cooking facilities and study space to allow for longer stays. Additionally providing support for a small incubator to leverage quality research towards commercial applications within the Kumamoto area and/or Kyushu is of great interest to me.

4. Prospect for further research collaboration with Kumamoto University

I am currently working with Associate Professor Mukunoki to develop funding applications to JSPS (Visiting fellowship and research funding application) as well as with MBIE-New-Zealand (Research Programme: \$NZ5,000,000) to strengthen our research collaboration in Image Processing theoretical and applied development for geotechnical and CT-scan imaging solutions. Further to a series of classes I gave in July 2018, we have been discussing some book chapters or a book dedicated to Image processing for geotechnical post-graduate students.

5. Impressions of Kumamoto University/Kumamoto

Kumamoto University is a very welcoming place with great facilities for lodging visiting researchers and for undertaking quality research. The group of post-graduate students I interacted with in the Faculty of Advanced Science and Technology were extremely motivated to learn and progress their skills in Image processing. The use of CT-scan facilities was a prime focus of my stays as was the interaction with Professor Otani and Associate Professor Mukunoki and their teams. I am looking forward to my following visits and of quality research outputs. I would love an on-campus facility with European quality coffee and Japanese quality desserts associated with the excellent existing catering facilities.

No. 4-6	Water quality in the Aso Caldera and Kirishima area		
Name	Jens Hartmann		
Affiliation	Institute for Geology, Universität Hamburg, Germany Email: jens.hartmann@uni-hamburg.de	Title	Professor
Research Field	Environmental Science		
Period of Visit	September 27, 2018-October 06 2018 (extended sampling after till October 10 th)		
Host Professor	Takahiro Hosono		
Affiliation	POIE Email: hosono@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

- Finalizing a publication-proof about Aso Caldera and hydrothermal-seismotectonic controls on the river and groundwater.
- Conduct sampling of spring and river water in the Kirishima area to complete the set of samples taken the years before for later analysis in both laboratories. Two sampling trips were conducted during the stay.
- Preparation of a new manuscript and discussion (focus Selenium as a tracer for hydrothermal input to water resources).
- Discussion about future strategy for cooperation of both laboratories in the next years.

2. Overview and significance of the research collaboration with Kumamoto University

The study of controls on the water quality in tectonically active areas like Japan is of relevance as several under-researched processes control the water quality and the mobilization of matter and transport to the ocean. This includes seismotectonic processes causing deep water upwelling into the shallow groundwater and hydrothermal processes affecting the water quality directly at a local level. To be able to understand the regional controls on these fluxes a research area like Aso caldera or Kirishima represent unique opportunities due the given infrastructure. Specifically, the laboratory at Kumamoto University if of relevance as it is close to these highly active areas and samples can be handled directly in the laboratory at Kumamoto University. The laboratory of Prof. Hosono is perfectly equipped for the joint work. We have not conducted surveys for the four years due this infrastructure and have now a set of samples and data, which allows us to analyses in depth the diverse processes controlling the water quality, also using novel isotope approaches, which were not combined in the way as it is now down. The understanding that volcanic systems act also as a filter for deep carbon due weathering reactions, capturing CO₂ before it enters the atmosphere is only emerging now, and we have here the opportunity to work at the frontier in this field. The research plan has a multi-year long vision.

3. Comments or suggestions for IROAST/Kumamoto University

I would like to thank IROAST and Kumamoto University for hospitality. With out the logistics provided and the support this work would not be possible. I am very happy.

4. Prospect for further research collaboration with Kumamoto University

In the next years we plan to analyse the multiple isotope systems for the above given systems, to learn how fast the waters in the different compartments of the systems can change (Kinetics of water evolution). This is possible due the long-years of survey by Kumamoto University achieving a unique data set for water residence time and the new isotope data in combination.

The interpretation and writing publications based on these data is the plan for the next visits. Specifically we plan to work on the potential to use Selenium as a tracer for processes, work out the kinetics of rock dissolution to quantify why and where which water quality could be expected, determine the hydrothermal component using the combination of Li-B-S-D-O-isotopes, determine the contribution of deep carbon to the water chemistry, as this is largely unknown at the global scale.

5. Impressions of Kumamoto University/Kumamoto

Very good. Very friendly. I really like the Guest House. It is close to the laboratory, so not much time is wasted with travelling. I also thank for the opportunity to be able to use a room and store the equipment for our research.

No. 4-7	Structural investigation in functional materials using synchrotron radiation		
Name	Marc de Boissieu		
Affiliation	Email: Marc.de-boissieu@simap.grenoble-inp.fr	Title	Group Leader
Research Field	Nanomaterial Science		
Period of Visit	Oct. 27, 2018-Nov. 8, 2018		
Host Professor	Shinya Hosokawa		
Affiliation	Email: shhosokawa@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

Dr. Marc de Boissieu is a group leader at The Science and Engineering of Materials and Processing (SIMaP) laboratory in Grenoble, France, and hold a concurrent responsible at The European Integrated Center for the Development of New Metallic Alloys and Compounds (C-MAC), and thus he is one of the excellent scientists in France on functional metallic alloys.



Fig. 1. Dr. de Boissieu at Kumamoto University on 1st of November, 2018.

During the present visit, Dr. de Boissieu gave an invited talk titled “Icosahedral quasicrystals: atomic structure and lattice dynamics” in the IROAST Seminar/International Symposium on Advanced Materials Having Multi-Degrees-of-Freedom held at Faculty of Science, Kumamoto University on 1-2 November 2018. In his presentation, he introduced his recent works on the atomic structure and dynamics of quasi-crystals. In the poster presentation, Dr. de Boissieu

discussed with some students who investigate the structure and properties of functional materials.

2. Overview and significance of the research collaboration with Kumamoto University

Concerning the metallic materials, Faculty of Engineering, Kumamoto University has many laboratories, such as Magnesium Research Center (MRC), by which we have a strong basis of collaborative works between SIMaP, Grenoble, France and Kumamoto University. The Agreements of Academic and Student-Exchange is concluded between Kumamoto University and University of Grenoble Alpes, which partly join the SIMaP laboratory.

3. Comments or suggestions for IROAST/Kumamoto University

None.

4. Prospect for further research collaboration with Kumamoto University

Grenoble is not limited to be the center of winter sports in French Alps, but the largest scientific city in France, having large experimental facilities, such as an excellent neutron source, ILL, and a third-generation large synchrotron x-ray facility, ESRF.

From France, the host already accepted one undergraduate student for three months as an internship student from Polytech Clermont-Ferrand, and it is highly possible to accept again a French undergraduate or graduate student in Kumamoto University. Thus, it is highly possible to make further research collaborations between SIMaP and Kumamoto University.

5. Impressions of Kumamoto University/Kumamoto

He told me that he likes Kumamoto very much because it has both the famous large mountain, castle, and sea.

No. 4-8-1	Advances in Novel Nanocrystalline Magnesium Alloys with the LPSO Structure		
Name	Alexey Vinogradov		
Affiliation	Norwegian University of Science and Technology (NUST) Email: alexei.vinogradov@ntnu.no; alexei.vino@gmail.com	Title	Professor
Research Field	Nanomaterial Science		
Period of Visit	Dec. 2, 2018-Dec. 10, 2018		
Host Professor	Yoshihito Kawamura		
Affiliation	Magnesium Research Center (MRC) Email: rivervil@gpo.kumamoto-u.ac.jp	Title	Professor

1. Research achievements

Intensive interaction, discussions and exchange opinions with researchers from Kumamoto University and with international peers were among the main activities planned and accomplished during this short visit. Our most recent results of investigation of the effect of rotary swaging on the properties of several ingot cast and extruded Mg-Y-Zn and Mg-Zn-Ca alloys previously received from KU were discussed with researchers from MRC KU (Prof. Y.Kawamura, M. Yamasaki). Besides, new specimens of Mg-Y-Zn and Mg-Zn-Ca were manufactured at KU MRC by the unique rapid solidification/powder metallurgy technology upon my request for the investigation of their microstructure, mechanical and functional properties at NTNU. As an intermediate outcome of the discussions, we agreed agreement that it would be timely to publish a common review article, which would summarize the activity in the LPSO Mg field, in a highly recognized international journal such as Progress in Materials Science.

2. Overview and significance of the research collaboration with Kumamoto University

Kumamoto University is recognized worldwide for its leadership in high performance Magnesium alloys with the LPSO structure. The competence accumulated at KU in both technology and fundamental science since 2001 is quite unique, which makes it attractive, if not to say essential, for foreign researches to co-operate with KU. On the other hand, the researchers and students at KU benefit from a wide mixture of competences existing in foreign partners laboratories.

3. Comments or suggestions for IROAST/Kumamoto University

I appreciate the IROAST/KU program as it provides an excellent opportunity for academic exchange between institutions and individuals. I think it is a well-organized program with a high potential to boost the international research at KU.

4. Prospect for further research collaboration with Kumamoto University

With ongoing common research planned during the last visit, I am confident that our collaboration with KU will unfold well in the future.

5. Impressions of Kumamoto University/Kumamoto

I have visited KU several times. Attracted primarily by the high level of the focused research in the field of Mg alloys, I am very delighted to see the progress in this field due to the efforts of the research team at MRC and the Department of Materials Science. During the last stay, I was able to see and assess the level of the student's Master theses, and I have to say that it is

internationally high. Kumamoto city is a nice place to be and enjoy a rare blend of excellent research, cultural and social life.

No. 4-8-2	Advances in Novel Nanocrystalline Magnesium Alloys with the LPSO Structure		
Name	Alexey Vinogradov		
Affiliation	Norwegian University of Science and Technology (NUST) Email: alexei.vinogradov@ntnu.no; alexei.vino@gmail.com	Title	Professor
Research Field	Nanomaterial Science		
Period of Visit	Feb. 17, 2019-Feb. 28, 2019		
Host Professor	Yoshihito Kawamura		
Affiliation	Magnesium Research Center (MRC) Email: rivervil@gpo.kumamoto-u.ac.jp	Title	Professor

1. Research achievements

During this stay, I was able to interact with teachers from the Department of Materials Science and Engineering and researchers from Magnesium Research Center of Kumamoto University on the following topics: 1) Instability of plastic flow of novel fine grained RS/PM Mg-Y-Zn alloys (D. Drozdenko, M.Yamasaki); the possible reasons for the instability are outlined, the measures to verify the proposed model views are decided and relevant experiments are planned in details; 2) Use of acoustic emission clustering algorithm ASK, which I have developed recently, for plastic deformation of Mg single crystals (experimental data were processed together with D. Drozdenko, the guidance for the algorithm and software use were provided in detail) and corrosion of Mg-alloys. A publication is planned after completing data analysis. 3) A plan for a new review paper on LPSO Mg alloys to be submitted in Progress in Materials Science has been finally made in cooperation with Prof. Y. Kawamura, M.Yamasaki and D.Shin.

2. Overview and significance of the research collaboration with Kumamoto University

See No. 4-8(1).

3. Comments or suggestions for IROAST/Kumamoto University

See No. 4-8(1).

4. Prospect for further research collaboration with Kumamoto University

The plans for three common publications, including one review, have been made to a different level of details, and I am confident that our collaboration with KU will unfold well in the future.

5. Impressions of Kumamoto University/Kumamoto

See No. 4-8(1).

No. 4-9	Biomass to Green Energy Conversion Technologies		
Name	Maria Jose Cocero		
Affiliation	High Pressure Research Group/Department of Chemical Engineering and Environmental Technology, Valladolid University (Spain) Email: mjcocero@iq.uva.es	Title	Professor
Research Field	Green Energy/ Advanced Green Bio		
Period of Visit	October 8, 2018-October 21, 2018		
Host Professor	Prof. Tetsuya Kida/Prof. Armando T. Quitain		
Affiliation	Faculty of Advanced Science and Technology/College of Cross-Cultural and Multidisciplinary Studies Email: tetsuya@kumamoto-u.ac.jp/ quitain@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

During my stay at Kumamoto University as an IROAST Visiting Professor, I followed up on the research collaboration carried out by Dr. Armando T. Quitain, during his stay in my laboratory in Valladolid University (Spain) as IROAST International Collaborative Researcher. The following research-related and academic activities were carried out during my stay:

- ①Research collaboration on biomass utilization using microwave and supercritical fluid technologies
- ②Consultation with PhD and MS students, exchange students from ASEAN universities, and about 10 Japanese graduate students, currently working on biomass-related researches in the laboratory.
- ③Discuss about joint publication related to the abovementioned research collaboration topic
- ④Giving the following seminars:
 1. “Understanding the Fundamentals of Biomass Fractionation in Sub/Supercritical Water”
 2. “Supercritical Water Oxidation for Clean Energy Production.”
- ⑤Give a Global Leader Course Seminar entitled "Global Women Leader in Science" participated by the Global Leader Course students at the College of Cross-Cultural and Multidisciplinary Studies.
- ⑥Joined in the Global Team Teaching subject on “Perspectives on Biomass Utilization”, offered at the College of Cross-Cultural and Multidisciplinary Studies.

2. Overview and significance of the research collaboration with Kumamoto University

The research collaboration on the use of green technologies (supercritical fluid and microwave) for biomass utilization with Kumamoto University started more than a decade ago with Prof. Motonobu Goto, and was renewed by Dr. Armando T. Quitain when he visited as an IROAST Young Researcher in 2017 for half a year. This collaboration will significantly broaden the perspective of the participating students to the science and technology of this promising environmental topic.

My consultation and discussion with the students significantly helped the students' capability and thinking about research. My expertise of the research topic will definitely guide the students to more promising research direction in the future. This gives an opportunity for them to have a discussion with prominent and leading scientists in this field, thereby improving their research

capability and thinking. .

3. Comments or suggestions for IROAST/Kumamoto University

IROAST is doing a good job in globalizing cutting-edge research of Kumamoto University.

4. Prospect for further research collaboration with Kumamoto University

I will continue the research collaboration with Kumamoto University by continuously accepting students to my laboratory, and also by sending our students to Kumamoto University. Valladolid University has applied for an Erasmus Mobility Grant with Kumamoto University to further support the students and staffs mobility between the two institutions.

With subsequent visits in the future, it is expected that a new set of students will benefit from it, and more research papers will be jointly published from this extended collaboration.

5. Impressions of Kumamoto University/Kumamoto

In my opinion, the consolidation of student mobility programs will be a strength of Kumamoto University. It could made a big difference to the students of Kumamoto University compared to those from other universities in Japan.

No. 4-10	Sound Source Localizatin in Non-Field of Sight		
Name	Tomonari Furukawa		
Affiliation	Department of Mechanical Engineering Virginia Polytechnic Institute and State University, USA Email: tomonari@vt.edu	Title	Professor
Research Field	Advanced Green Bio		
Period of Visit	Oct. 31, 2018-Nov. 7, 2018		
Host Professor	Makoto Kumon		
Affiliation	FAST/IROAST, Kumamoto University Email: kumon@gpo.kumamoto-u.ac.jp	Title	Assoc. Professor

1. Research achievements

The invitation was aimed at accomplishing two objectives. The first objective was to attend a demonstration in Fukushima to see the progress and accomplishments of Prof. Kumon in his project associated with drones and to jointly see the work of other robotics groups to extend the current collaborative work in the near future. The second objective was to see the work of Prof. Kumon and to present my work in return.

In the first, the most notable accomplishment was that I was able to see the Fukushima Robot Test Field. Disasters are one of the scenarios Prof. Kumon and I target, and the test field provides test environments for Prof. Kumon. As Virginia Tech has its own robot test field, this will facilitate our collaboration.

In the second, I could discuss with not only Prof. Kumon but also his students on the work we were collaborating. In addition, we could conduct tests together. This has strengthened our understanding and led to some new ideas and plans for our collaboration. My seminar talk also went well. There was a substantial number of participants, and I could interact with them and give advice to students who were interested in studying in USA.

2. Overview and significance of the research collaboration with Kumamoto University

Prof. Kumon and I have common research topics in two areas. One is the autonomous control of drones, and the other is the auditory localization. Collaboration on these topics began in 2007 when Prof. Kumon came to my university in Australia and worked together for half a year. Collaboration continued since then and has resulted in a number of joint publications. Such a long-term successful collaboration is a rare case, and it is thus considered as a significant research collaboration for Kumamoto University and Virginia Tech.

3. Comments or suggestions for IROAST/Kumamoto University

I thank IROAST for supporting the delegation of Prof. Kumon to Virginia Tech. I visited Kumamoto University for 1.5 months using a JSPS program, but Prof. Kumon has never had a chance for a long-term stay at Virginia Tech. The IROAST program is clearly enhancing our collaboration.

4. Prospect for further research collaboration with Kumamoto University

We will continue to work on the above two projects. In the drone research, I am participating in Mohamed Bin Zayed International Robotics Challenge (MBZIRC) 2020, which is one of the most prestigious international robotics challenges. Autonomous control of drones is one of the

important components in the competition. We plan to utilize the opportunity and enhance our collaboration. In the auditory robotics, I am collaborating with Daniel Kish, who is a blind and a pioneer of human echolocation. I plan to invite Prof. Kumon to this collaboration.

5. Impressions of Kumamoto University/Kumamoto

I have different impressions on Kumamoto University and Kumamoto from other visiting professors. Kumamoto is where I grew up, and Kumamoto University is where my father was working at. Because of this strong connection, I have more passion for Kumamoto and Kumamoto University. I am hoping to continuously contribute to both Kumamoto University and Kumamoto.

No. 4-11	Development of functional materials production using supercritical fluids and pulsed discharge atmosphere		
Name	[1] Prof. Youn-Woo Lee [2] Prof. Olivier Boutin		
Affiliation	[1] Seoul National University, Korea Email: ywlee@snu.ac.kr [2] Aix-Marseilles University, France Email: olivier.boutin@univ-amu.fr	Title	Professor
Research Field	Green Energy		
Period of Visit	[1] January 22, 2019 – January 27, 2019 [2] January 23, 2019 – January 30, 2019		
Host Professor	Mitsuru Sasaki		
Affiliation	Institute of Pulsed Power Science Kumamoto University Email: msasaki@kumamoto-u.ac.jp	Title	Associate Professor

Prof. Youn-Woo Lee

1. Research achievements

During the stay here in Kumamoto, we successfully discussed with Assoc. Prof. Sasaki about collaborative researches including student exchanges. Also, we decided to apply for the JSPS bilateral joint research program this year.

I gave a lecture entitled “Biorefinery of Plant Oil for Ethylene Metathesis with Supercritical Fluids” as a part of the 49th IROAST Seminar, in which I introduced several research project in my lab as a future prospect collaboration. In addition, I have discussed two students in Kumamoto University who want to visit my lab at Seoul National University. Since we already have an experience to exchange student each other in which a student from Kumamoto University visited my lab for 3 months for carrying out experiment and my student also visited for 3 months to Kumamoto University. If they want to come to my lab for joint research, I can support them partially during their staying.

2. Overview and significance of the research collaboration with Kumamoto University

Kumamoto University has cutting-edge research activities and research facilities in the field of supercritical fluid technology. Assoc. Prof. M. Sasaki is building international capabilities by interacting with researchers around the world. He plays a leading role in various studies in supercritical/ subcritical fluids. In particular, a leading role is expected in the field of integral technology that combines supercritical fluids with plasma. Professor Armando T. Quitain at the same research group is also active in the field of supercritical carbon dioxide. Professor Kida is an expert in materials/catalysts and expects to study reaction and fusion in supercritical fluids.

3. Comments to or suggestions for IROAST/Kumamoto University

As a small part of IROAST program, it is better to have an intensive course given in English by foreign professor.

4. Prospect for further research collaboration with Kumamoto University

Every year, I have sent a graduate student for not only research collaboration but also cultural exchange between students. My student always satisfied with amity provided by students of Kumamoto University. It will greatly help to maintain a good relationship between Korea and Japan. I would like to keep on opening collaborated research with Kumamoto University. These experiences in studying abroad for students have led to growth in intellectual capacity as well as to understand culture of other country.

5. Impressions of Kumamoto University/Kumamoto

My collaboration with Kumamoto University starts in 2010. I had visited Kumamoto University to have a collaborative research. At the beginning of sabbatical year of 2010, took a Japanese course at Kumamoto University for one semester. Thank to the opportunity, I now laid the foundation for reading Japanese literature. Since 2010, I had taught an intensive graduate course, 'Chemical Reactor Design', as a program of the Global Joint Education Center for Science and Technology. Every January (winter vacation in Korea), when I had come to Kumamoto, my family has always been with me, so Kumamoto is the same place as my second home. Since friendship of Kumamoto colleagues, my family member and I like Kumamoto more than ever. Even though they are working for companies in Japan, some of graduates of Kumamoto University are still contact me and recognized to me as teacher.

Prof. Olivier Boutin

1. Research achievements

During the stay here in Kumamoto, we successfully discussed with Assoc. Prof. Sasaki about collaborative researches including student exchanges. Also, we decided to apply for the JSPS bilateral joint research program this year. Two students came last year from Aix Marseille University to Kumamoto University for a three months internship. They were very enthusiastic about their stay at Kumamoto and work at Kumamoto University. For this year, we are currently preparing the application of two students from AMU to Kumamoto University, as well as two students from Kumamoto University to AMU. For both cases, the exchange is for several months and mainly for internship in our research laboratory.

2. Overview and significance of the research collaboration with Kumamoto University

During the stay, I was able to follow two series of experiments on plasma activities and microwaves activities with students from the laboratory. The explanations and tests were very interesting, and I was able to discuss with them about their research topics. Moreover, they present to me different posters on other research topics in the team. It confirms the interest to propose to my students to go to Kumamoto University. This is for me the first step before deeper research collaboration.

3. Comments to or suggestions for IROAST/Kumamoto University

The financial support and invitation from IROAST University was very much appreciated. It is the second time I come to Kumamoto University, and everything is well organized. I have to say that the collaboration between Dr Sasaki and myself began thanks to the fact Kumamoto and Aix en Provence are sister cities.

4. Prospect for further research collaboration with Kumamoto University

We will go on exchange students as well as propose projects to find financial supports. During this stay, we spent a day with Dr Sasaki to discussion deeply about the different research subject we can deal with our two research groups for further collaboration.

5. Impressions of Kumamoto University/Kumamoto

Very good impression, it is very easy to travel and visit.

No. 4-12	International collaboration research for design and application of organic/inorganic hybrid gel		
Name	Josep-Lluís Barona-Vilar		
Affiliation	Instituto de Historia de la Medicina y de la Ciencia López Piñero (IHMC), Universidad de Valencia, Spain Email: Jose.Luis.Barona@uv.es	Title	Professor
Research Field	Nanomaterial Science		
Period of Visit	November 14, 2017-November 24, 2017		
Host Professor	Hirotaka Ihara		
Affiliation	Faculty of Advanced Science and Technology Email: ihara@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

I was in frequent touch with the Prof. Ihara research group during 2017. A selected group made by Prof. Ihara, Prof. Takafuji and Dr. Kawahara visited Valencia, where we updated plans for the future. In November 2017 I visited Kumamoto University. During the period of my visit several aspects of the evolution of science and technology in modern and contemporary times have been discussed. One part of the visit was devoted to give intensive lecture-seminars to post-graduate students from different technological and scientific fields. Seven sessions were devoted to science and technology in the Antiquity, Middle Ages, Early modern colonial times, the Enlightenment and contemporary science. The role of science and technology in present times was also put into debate. Besides, I introduced the foundations of modern science and the history of science and medicine tradition in Spain and gave a seminar lecture on the origins of public health at the School of Health Sciences (University of Kumamoto).

2. Overview and significance of the research collaboration with Kumamoto University

The collaboration with Kumamoto University has contributed, on the one hand a humanistic, social and philosophical approach to present science and technology. In addition, it has started an interest on the several contributions of Japan to history of science and technology in the past. An example to this is the early development of research on physiology of nutrition in interwar years and the creation of a National/Imperial Institute of Nutrition in Tokyo. Similarly, the research projects developed by the Ihara Lab could find fruitful partnership in Valencia. In my opinion, the bilateral contribution can be reinforced in the future.

3. Comments or suggestions for IROAST/Kumamoto University

Nowadays scientific and technological research (technoscience) is closely linked to social and economic development.

Therefore, a sociological and historical approach to the main issues and problems faced by the present world can contribute to enrich and clarify the debates. As a complement of laboratory expertise, social sciences and history would give the researcher a more intelligent and thoughtful person. Master and PhD students should learn about social studies of science and technology. My intensive course on “The Origins of Modern Science and Technology” runs in this direction.

4. Prospect for further research collaboration with Kumamoto University

In addition to other possible collaborations in technical and scientific research, several collaborations could be started, such as the interchange of master and PhD students, as well as

the introduction of credits in humanities (philosophy of science and technology), history of health and medical sciences, and history.

For the next year 2019 I could teach the intensive course on “The Origins of Modern Science and Technology” for the Global Joint Education Center for Science and Technology, and eventually a second course on “Ethics and experimental research”, just in case this option could be interesting for the Kumamoto University.

5. Impressions of Kumamoto University/Kumamoto

Both Kumamoto University and IROAST are doing an excellent work and a hard effort in favor of internationalization. IROAST research projects, groups and topics have impact and good links with the international community. But also, internationalization means nowadays being fluent in foreign languages, with particular emphasis in English. Undergraduate and postgraduate students would make a step forward if a part of their courses were taught in English as well. Kumamoto is working step by step into this direction as I had the occasion to realize at the March Kickoff symposium. Establishing a wide and solid network of research groups and programs is essential to be present at the international sphere.

No. 4-13	Local mechanical properties in the vicinity of grain boundary in Al and Mg bicrystals		
Name	Dmitri A. Molodov		
Affiliation	Institute of Physical Metallurgy and Metal Physics (IMM), RWTH Aachen University, Germany Email: molodov@imm.rwth-aachen.de	Title	Professor
Research Field	Nanomaterial Science		
Period of Visit	February 25, 2019-March 8, 2019		
Host Professor	Sadahiro Tsurekawa		
Affiliation	Faculty of Advanced Science and Technology Email: turekawa@kumamoto-u.ac.jp	Title	Professor

During the one-year reference period from March 2018 to February 2019 the collaborative work by groups of Prof. S. Tsurekawa in Kumamoto and Prof. D. Molodov in Aachen was successfully continued. One focus of cooperative research efforts was the mechanical behavior of various grain boundaries in response to nanoindentation testing. The planned molecular dynamics simulations to study the mechanics of low angle boundaries in aluminum performed by utilizing the computational capacity of the supercomputer in the Research Center Jülich, Germany were successfully completed. The experiments using the HYSITRON TI 750 TriboIndenter available in the Laboratory of Prof. Tsurekawa were extended to explore the mechanical behavior in the vicinity of grain boundaries in magnesium bicrystals grown in the IMM in Aachen. Another focus of the cooperative work was on the investigation of the effect of a magnetic field on grain boundary energy in copper. The bicrystalline specimens of copper with various grain boundaries were grown/prepared in Aachen. First series of experiments with these bicrystals was conducted in Kumamoto within the framework of the student bachelor theses.

The time of the stay of Prof. D. Molodov in Kumamoto was used for intensive discussions with Prof. S. Tsurekawa and his students. Specifically, the results of investigations as outlined above were carefully considered and discussed, next steps were planned. Particularly, the partners agreed to continue the experiments with magnesium bicrystals by applying the in-situ TEM loading technique available in the lab of Dr. S. Ii in the National Institute for Materials Science, Tsukuba. Also, it has been decided to finalize the work on preparing the publication about the mechanical behavior of the special Sigma 3 boundaries in aluminum and in the following concentrate on the next paper concerning the respective properties of low angle boundaries.

During his stay in Kumamoto, on March 1st 2019, Prof. Molodov delivered the lecture on the “Recent Developments in the Study of Grain/Twin Boundary Mediated Plasticity”.

The great support of collaboration between groups of Profs. Tsurekawa and Molodov from the IROAST/Kumamoto University and particularly, the arrangement of the visit of Prof. Molodov to Kumamoto in March-February 2019 are very much appreciated.

No. 4-14	Grain boundary segregation of W in Mo		
Name	Pavel Lejček		
Affiliation	Institute of Physics, Academy of Sciences of the Czech Republic, Na Slovance 2, 182 21 Prague 8, Czech Republic Email: lejcekp@fzu.cz	Title	Prof., DrSc.
Research Field	Nanomaterial Science		
Period of Visit	November 03, 2018-November 16, 2018		
Host Professor	Prof. Sadahiro Tsurekawa		
Affiliation	FAST Email: turekawa@kumamoto-u.ac.jp	Title	Professor

During the stay at the Kumamoto University, Pavel Lejček presented a lecture for students entitled “Fundamentals of grain boundary segregation and related phenomena”, discussed the problems solved by individual students and prepared joint experiments between the Institute of Physics, Academy of Sciences of the Czech Republic (IP), and Kumamoto University (KU).

1. Research achievements. The collaboration between IP and KU has been active for many years. Presently, it resulted in joint paper on interpretation of the mechanisms of plastic deformation in vicinity of grain boundaries (K.E. Aifantis, H. Deng, P. Lejček, S. Tsurekawa, H. Shibata, S. Hackney: Interpreting slip transmission through mechanically induced interface energies – A Fe-3%Si case study, J. Mater. Sci. (2019) 54:1831–1843). Further papers on distribution of stress around grain boundaries and about recrystallization phenomena in bent single crystals are under preparation.

2. Overview and significance of the research collaboration with Kumamoto University. As is mentioned above, there exists close and constructive cooperation between IP and KU. It contributes to fundamental knowledge in the field of grain boundary properties and is also accepted by the research society. It covers problems of grain boundary migration with focus on anisotropy, effect of magnetic field and recrystallization, establishment of grain boundary plane in triple junction and mechanical properties as well as mechanisms of plastic deformation in vicinity of grain boundaries. The papers resulting from this collaboration have been published in impacted scientific journals such as Journal of Materials Science or ISIJ Int.

3. Comments or suggestions for IROAST/Kumamoto University. The activity of KU in international cooperation is very intensive. The police of IROAST to call *Visiting Professors* for supporting the research at KU and international cooperation is very useful and – as far as I know – unique activity worldwide. I suggest to continue in this police in future.

4. Prospect for further research collaboration with Kumamoto University. We plan to continue in scientific collaboration between KU and IP in future. During the stay of P. Lejček at KU, qualitatively new experiment concerning grain boundary segregation in Mo–W system was discussed. The experimental part already started by successful preparation of required Mo–W alloy. Now, the conditions of the thermal treatment, selection of grain boundaries for the study as well as selection of the technique to detect the chemistry at the grain boundaries were decided. We suppose that this study can bring breakthrough results in the field which should help in understanding the segregation behavior at the grain boundaries. Besides, some joint experiments

on dislocation behavior in vicinity of deformed grain boundary in nickel bicrystal are running.

5. *Impressions of Kumamoto University/Kumamoto.* Since 2010, I visited Kumamoto and Kumamoto University 5 times. I had chance to visit various Departments/Laboratories engaged in the field of materials science and to be familiar with the experimental studies done there. I consider this research to be at the top international level and to be – in some cases – leading the international activity. I had chance to discuss with bachelor, master and doctoral students individually the subjects of the problems solved by them. I must state that the level of English language applied in this discussion still needs some improvement, however, after the above mentioned period, I guess that the level of the English knowledge in both presentation and discussion is steadily increasing. I did also appreciate quick replacement of the facilities damaged during heavy earthquake in 2016. Kumamoto... Even in the city I appreciate the activity to remove the consequences of that earthquake despite the renovation of the castle will take quite long time. I appreciate pleasant behavior of the people on the street as well as their readiness to help the foreigners in unclear situation even if there is big language barrier. Simply, I like to visit Kumamoto University, I like to come to Kumamoto at all.

No. 4-15	Cooperative studies of theory and experiment on non-crystalline functional materials		
Name	Matthieu Micoulaut		
Affiliation	Sorbonne Université, Paris Email: mmi@lptl.jussieu.fr	Title	Professor
Research Field	Nanomaterial Science		
Period of Visit	October 30, 2018- November 4, 2018		
Host Professor	Shinya Hosokawa		
Affiliation	Department of Physics, Faculty of Advanced Science and Technology Email: shhosokawa@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

Professor Matthieu Micoulaut is a professor of Physics Department in Sorbonne University, Paris, who is an expert of theoretical physics on non-crystalline materials, and published a significant number of scientific papers in high impact journals, such as Nature Communications. He was an organizer of mini symposium ‘Structure-Property Relations in Amorphous Solids’ in Fall Meeting of Materials Research Society in 2014, and invited SH as an invited speaker.



Fig. 1. Talk of Prof. Micoulaut in the IROAST seminar

During the present visit, Professor Micoulaut gave an invited talk titled “Characterizing structure and dynamics of chalcogenides from coupled approaches: rigidity and molecular simulations” in the IROAST Seminar/International Symposium on Advanced Materials Having Multi-Degrees-of-Freedom held at Faculty of Science, Kumamoto University on 1-2 November 2018. See the photograph in Fig. 1. In his presentation, he introduced his recent works on the atomic structure and dynamics of archetypal chalcogenide glasses such as As-Se, Ge-Se, and Ge-Te systems investigated from rigidity theory and molecular dynamics (MD) simulations.

In the poster presentation, Professor Micoulaut discussed with Professors F. Shimojo and M. Aniya, and their students who investigate *ab initio* MD simulations on functional glasses or low-dimensional materials.

2. Overview and significance of the research collaboration with Kumamoto University

Concerning the materials of glasses, Department of Physics, Kumamoto University has one experimental and two theoretical professors, by which we have a strong basis of the collaborative works between Sorbonne University, Paris and Kumamoto University. Thus, the Agreements of Academic and Student-Exchange would be possible to be concluded between Physics Departments of Sorbonne University, Paris and Kumamoto University.

3. Comments or suggestions for IROAST/Kumamoto University

None.

4. Prospect for further research collaboration with Kumamoto University

To investigate complex systems like glasses, it is essential to collaborate between theoretical and experimental scientists. Since Professor Micoulaut would like to collaborate with us, it is a good opportunity to start the collaborations. At present, no candidate to go abroad to Paris. Since there are some graduate students to visit US for the inter-university collaboration, it would appear to go to Paris in the near future. From France, the host already accepted one undergraduate student for three months as an internship student from Polytech Clermont-Ferrand, and it is highly possible to accept again a French undergraduate or graduate student in Kumamoto University.

5. Impressions of Kumamoto University/Kumamoto

The foreign professors usually know only Tokyo area, which is highly crowded. However, he told me that he found a different Japanese culture, and he likes Kumamoto very much.

No. 4-16	Structure and functional property of nanocrystalline- amorphous alloy by severe plastic deformation		
Name	Christian Rentenberger		
Affiliation	Physics of Nanostructured Materials, University of Vienna, Austria Email: christian.rentenberger@univie.ac.at	Title	Professor
Research Field	Nanomaterial Science		
Period of Visit	Feb. 17, 2019 – Feb. 23, 2019		
Host Professor	Mitsuhiro Matsuda		
Affiliation	Faculty of Advanced Science and Technology Email: matsuda@alpha.msre.kumamoto-u.ac.jp	Title	Assoc. Prof.

1. Research achievements

- Severe plastic deformation allows to alter and modify the structure of crystalline and amorphous materials. As a consequence, the properties linked with the structure can be improved or even tailored. The potential and prospects of this method for the formation of nanocrystalline materials and rejuvenation of amorphous material was discussed with Prof. Mitsuhiro Matsuda.
- A lecture to graduate students was given on structural and mechanical properties of rejuvenated metallic glasses.
- Lab tour and discussion with graduate students on their research results.
- Meeting with Prof. Sadahiro Tsunekawa, Motohide Matsuda and Mitsuhiro Matsuda.

2. Overview and significance of the research collaboration with Kumamoto University

The research collaboration on severely deformed intermetallic alloys enables to study the formation of the deformation induced nanostructure and its properties.

3. Comments or suggestions for IROAST/Kumamoto University

IROAST at Kumamoto University promoting the establishment of an international research network is a very important organization for the initiation of international collaboration and the invitation of researchers.

4. Prospect for further research collaboration with Kumamoto University

We agreed to continue our research collaboration on the structural study of nanostructured and amorphous materials achieved and modified by severe plastic deformation.

5. Impressions of Kumamoto University/Kumamoto

Kumamoto University is very attractive place for other researchers to visit. I very much enjoyed the stay at the University and Kumamoto city that is a nice and historic place. I also enjoyed the tour of the surrounding area. I wish to thank Prof. Mitsuhiro Matsuda and the rest of the Kumamoto University staff for their hospitality and the invitation to come to Kumamoto.

No. 4-17	Studies on roles of nuage in piRNA biogenesis and functions		
Name	Ramesh Shanmughom Pillai		
Affiliation	Department of Molecular Biology, University of Geneva, Switzerland Email: Ramesh.Pillai@unige.ch	Title	Professor
Research Field	Advanced Green Bio		
Period of Visit	December 12, 2018-December 17, 2018		
Host Professor	Tokio Tani		
Affiliation	Faculty of Advanced Science and Technology Email: ttani@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

Our lab is interested in understanding how animal germ cells make small RNAs called Piwi-interacting RNAs (piRNAs). These small RNAs are essential for controlling mobile genetic elements called transposons that occupy a large part of eukaryotic genomes, including the human genome. Biogenesis of piRNAs takes place in specific cytoplasmic granules called nuage, which are membrane-less RNA-protein complexes/aggregations. Recently, we demonstrated that direct tethering of nuage-localizing factors to any artificial RNA sequence allows that RNA to enter the piRNA biogenesis machinery (Pandey et al., 2018). These artificial piRNAs have the exact same features as endogenous piRNAs. This demonstrates that at least some of the nuage components are involved in binding piRNA precursors and guiding them to the nuage. Now we would like to know how the handover of the precursor RNA takes place and which factors receive the RNA within the nuage. This also offers the potential for creation of designer piRNAs targeting any gene of interest.

2. Overview and significance of the research collaboration with Kumamoto University

Our collaboration with Prof. Tokio Tani's laboratory is critical for this research. We are convinced that identifying small molecule agents that can modulate nuage structure will massively facilitate molecular characterization. Using a cell biology-based screen, students in the Tani laboratory have made progress in identification of at least two molecules that have opposing effects: one promotes nuage formation, while the other disperses it. Current efforts are on to identify the molecular targets for these compounds.



3. Comments or suggestions for IROAST/Kumamoto University

I commend Kumamoto University for launching the IROAST initiative as it facilitates international research collaborations. Visiting scientists to Kumamoto will expose the students of the University to a range of international faculty. Continue this good work.

4. Prospect for further research collaboration with Kumamoto University

The research collaboration with the Tani laboratory is going strong and continuing at a strong pace. We hope that the joint research will lead to a joint publication in 2019. During my visit during Dec 2018, we discussed the possibility of enlarging this collaboration to a new area of research (study of RNA modifications). Significantly, we are giving the final touches to a MOU for collaborative research exchange visits between Kumamoto and Geneva. This is to foster stronger links between our research groups.

5. Impressions of Kumamoto University/Kumamoto

Impressed by the research environment at Kumamoto. I always enjoy discussions with the faculty and students. Great city with a deep history.



No. 4-18	Safety assessment of inorganic and dendritic nanoparticles		
Name	Hamid Ghandehari		
Affiliation	Utah Center for Nanomedicine, Department of Pharmaceutics and Pharmaceutical Chemistry and Bioengineering Email: hamid.ghandehari@pharm.utah.edu	Title	Professor, Director
Research Field	Nanomaterial Science / Advanced Green Bio		
Period of Visit	March 12, 2019 - March 15, 2019		
Host Professor	Hamid Hosano		
Affiliation	Institute of Pulsed Power Science Email: hamid@kumamoto-u.ac.jp	Title	Professor

1. Research achievements:

Details of findings in the Ghandehari laboratory regarding toxicology of silica nanoparticles and poly(amido amine) dendrimers were presented to the audience. Highlights of some of the ongoing projects on polymeric drug delivery were presented.

2. Overview and significance of the research collaboration with Kumamoto University

Potential of collaborative projects at the interface of nanoparticle and polymeric drug delivery research in the Ghandehari lab with ultrasound and pulsed power technologies in the Hosano lab were discussed.

3. Comments or suggestions for IROAST/Kumamoto University

The IROAST initiative can significantly enhance international collaboration.

4. Prospect for further research collaboration with Kumamoto University

Such collaborative projects can potentially open new avenues for externally triggered drug delivery leading to improved safety and reduced toxicity of bioactive agents for specific disease treatment.

5. Impressions of Kumamoto University/Kumamoto

Colleagues were very hospitable. Kumamoto University is a leading international institution in several areas of research.

No. 4-19	Sol-Gel Ru / SiO ₂ catalysts for Green Chemistry		
Name	Martino Di Serio		
Affiliation	Department of Chemical Sciences Università di Napoli Federico II Email: diserio@unina.it	Title	Professor
Research Field	Nanomaterial Science/ Green Energy/ Environmental Science/		
Period of Visit	January 23, 2019-February 15, 2019		
Host Professor	Shinya Hayami		
Affiliation	Faculty of Advanced Science and Technology Email: hayami@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

During January 23, 2019-February 15, 2019, we implemented the basic concepts for the design of a new class of catalysts based on metal, metal oxides and metal sulfides supported on different materials such carbon as graphene oxide, fullerene and in the future the use of metal organic frameworks (MOFs) to be used tested for biomass molecule conversion into key chemical feedstock and pharmaceutical precursors using conventional and microwave reaction type reactors and conditions.

2. Overview and significance of the research collaboration with Kumamoto University

We propose significant scientific and technical innovation in the development of the reactions to produce chemicals and fuels from waste rural biomass, and in the development of an entirely new class of catalysts and their application to biofuels. These hybrid nano-porous catalysts will substantially increase the productivity of chemicals synthesized produced from waste agriculture cellulose. These new catalysts will have a wide impact and be also important for the catalysis of many other reactions, including for example, the more effective production of transportation fuels. Moreover, these new technologies are a major challenge, for which we have promising preliminary results during 3 weeks I spent at Professor Hayami laboratory facilities. With improved catalysts this will be commercially viable. Development of a three-way tertiary metal promoted nano catalyst for the conversion of lignocellulosic material into valuable chemicals will be a major step forward in producing a large-scale industry for the Japanese market with export potential. This research will also substantially progress knowledge in the field of well-designed hybrid catalysts for energy and other applications.

3. Comments or suggestions for IROAST/Kumamoto University

An added novelty of the method to produce these catalysts is that we can produce bulk nano-porous catalysts in any desired shape or form, such as powder, rod, wire, sheet, chips etc., depending upon the precursor shape. Production of any desired precursor shape is easy because the precursors are in most cases nano ductile metals capable of being easily deformed to the desired shape. This allows greater flexibility in the reactor design for catalytic synthesis. Therefore, we can optimise the reactor and catalysts characteristics for greatest performance.

4. Prospect for further research collaboration with Kumamoto University

Professor Shinya Hayami research work and facilities at Chemistry Department at Kumamoto University is very well international recognized for his contribution on material synthesis and macromolecular design catalysts that open further international collaboration with research centers on the area of supramolecular chemistry, material design and cahractization, catalystis

and production of key and fine chemicals as well as sustainable fuels for the future economy of Japan and the entire world.

5. Impressions of Kumamoto University/Kumamoto

It is also important to remark the decisive contribution to this research project from IROAST at Kumamoto University that allowed my visit to be possible. I am planning to start to develop at Professor Hayami research facilities a project on Selective Catalytic Methane Oxidation using Metal Organic Framework (MOF) Functionalized Catalysts. Current routes to activate the strong C–H bond in methane require high temperatures, several steps, are costly and inefficient, and produce waste. Because of these reasons, the direct oxidation of methane to methanol is still regarded as one of the remaining grand challenges of catalysis

No. 4-20	Potential research collaboration with Prof. Otani at Kumamoto University		
Name	Andrew J. Whittle		
Affiliation	Department of Civil and Environmental Engineering Email: ajwhittl@mit.edu	Title	Edmund K. Turner Professor
Research Field	Advanced Green Bio		
Period of Visit	January 26, 2019 to January 30, 2019		
Host Professor	Jun Otani		
Affiliation	Faculty of Advanced Science and Technology Email: junotani@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

I am a long-time friend of Prof. Jun Otani working in the field of geotechnical engineering. At his invitation, I visited Kumamoto University and IROAST, January 26-30th 2019, to discuss potential collaborative research. During this time I met with the President of Kumamoto University, Professor Harada and the Director of IROAST, Professor Hiyama; and gave a lecture on recent research relating to constitutive modeling of soil behavior (the 50th IROAST Seminar, January 29th). I also had the opportunity to visit the X-ray CT scan facilities and had a series of meetings to discuss potential research collaboration with Professors Jun Otani and Toshifumi Mukunoki.

2. Overview and significance of the research collaboration with Kumamoto University

Jun Otani has been a pioneer in the development and use of X-ray CT scanning measurements in the field of geotechnical engineering (starting in the mid-1990's). I was particularly impressed to see the range and depth of the research in investigating the effects of complex pile-soil interactions (that elucidate difficult processes such as pile plugging). This has been enabled through the fusion of CT scanning and DIC techniques to enable high resolution imaging of volume changes. Toshifumi Mukunoki has added a further dimension through studies of pore-scale transport processes (including multi-phase fluids). I was very impressed by the quality and detail in the work – and realize this could present an excellent opportunity for collaboration as my own work deals primarily with numerical and computational modeling of material behavior. I am particularly interested to use the experimental data to evaluate numerical simulations of pile installation and filtration processes.

3. Comments or suggestions for IROAST/Kumamoto University

I am very grateful for the support from IROAST for my visit to Kumamoto and hope that this program continues to encourage international collaborations.

4. Prospect for further research collaboration with Kumamoto University

I think the prospects for collaboration are very high. I have great respect for the high quality research being conducted by Profs. Otani and Mukunoki and am already investigating how to proceed in the collaboration (this will require engagement of graduate students or Post-Doctoral researchers).

5. Impressions of Kumamoto University/Kumamoto

I very much enjoyed my (first) visit in Kumamoto. I was surprised to learn of the extensive damage from the 2016 Kumamoto Earthquake and the slow process of reconstruction for the

castle. I was also able to visit the Mt. Aso area and to see first-hand the areas of massive landsliding from the 2016 earthquake. Dr Otani also shared with me the very interesting reconnaissance report prepared by colleagues from Kumamoto and Fukuoka Universities. As a geotechnical engineer with a love of geology, I also very much enjoyed the tour of the local area – the opportunity to appreciate the scale of the Aso caldera. I look forward to further exploration of the area on a future trip to Kumamoto.

No. 4-21	Joint research for fabrication and functionalization of chiral molecular assemblies		
Name	Reiko Oda		
Affiliation	CBMN UMR5248, CNRS, Université de Bordeaux, France Email: reiko.oda@u-bordeaux.fr	Title	Research Director
Research Field	Nanomaterial Science/ Green Energy/ Environmental Science/		
Period of Visit	January 22, 2019-January 28, 2019		
Host Professor	Hirotaka Ihara		
Affiliation	Faculty of Advanced Science and Technology Email: ihara@kumamoto-u.ac.jp	Title	Professor

1. Research achievements

In collaboration with Kumamoto University, we develop optically active flexible materials based on molecular assembly-templated chiral hybrid nanostructures

Peer-reviewed publications for 2017-2018

2018

- Generation of strong circularly polarized luminescence induced by chiral organogel based on L-glutamide. Hisashi Oishi, Kyouhei Yoshida, Yutaka Kuwahara, Makoto Takafuji, **Reiko Oda**, **Hirotaka Ihara**, *Journal of the Taiwan Institute of Chemical Engineers* 92, 58-62.
- Mitigating human IAPP amyloidogenesis in vivo with chiral silica nanoribbons. Ava Faridi, Yunxiang Sun, Yutaka Okazaki, Guotao Peng, Jie Gao, Aleksandr Kakinen, Pouya Faridi, Mei Zhao, Ibrahim Javed, Anthony W Purcell, Thomas P Davis, Sijie Lin, **Reiko Oda**, Feng Ding, Pu Chun Ke, *Small* 14 (47), 1802825.
- Optically Active Polyoxometalate- Based Silica Nanohelices: Induced Chirality from Inorganic Nanohelices to Achiral POM Clusters. Mariam Attoui, Emilie Pouget, **Reiko Oda**, David Talaga, Gwénaëlle Le Bourdon, Thierry Buffeteau, Sylvain Nlate, *Chemistry—A European Journal* 24 (44), 11344-11353.
- Gold Nanoparticle Chains: Synthesis, Characterization, and Modeling Using Spectroscopic Ellipsometry. Julien Vieaud, Jie Gao, Jérémy Cane, Michel Stchakovsky, Aotmane En Naciri, Katsuhiko Ariga, **Reiko Oda**, Emilie Pouget, Yann Battie, *The Journal of Physical Chemistry C* 122 (22), 11973-11984.
- Induced circular dichroism of monoatomic anions: silica-assisted the transfer of chiral environment from molecular assembled nanohelices to halide ions, Yutaka Okazaki, Naoya Ryu, Thierry Buffeteau, Shaheen Pathan, Shoji Nagaoka, Emilie Pouget, Sylvain Nlate, **Hirotaka Ihara**, **Reiko Oda**, *Chemical Communications* 54 (73), 10244-10247.
- Structural and mechanical characterization of hybrid metallic-inorganic nanosprings. Sabrina Habtoun, Said Houmadi, Benjamin Reig, Emilie Pouget, Dmytro Dedovets, Marie-Hélène Delville, **Reiko Oda**, Fuccio Cristiano, Christian Bergaud, *Materials Research Express* 4 (10), 105023.
- Self-assembled nanostructured metamaterials Virginie Ponsinet, Alexandre Baron, Emilie Pouget, Yutaka Okazaki, **Reiko Oda**, Philippe Barois, *EPL (Europhysics Letters)* 119 (1), 14004
- A central small amino acid in the VAMP2 transmembrane domain regulates the fusion pore in exocytosis, Benoît Hastoy, Pier A Scotti, Alexandra Milochau, Zahia Fezoua-Boubegtiten, Jorge Rodas, Rémi Megret, Bernard Desbat, Michel Laguerre, Sabine Castano, David Perrais, Patrik Rorsman, **Reiko Oda**, Jochen Lang, *Scientific reports* 7 (1), 2835
- GoldHelix: Gold nanoparticles forming 3D helical superstructures with controlled morphology and strong chiroptical property. Jiaji Cheng, Guillaume Le Saux, Jie Gao, Thierry Buffeteau, Yann Battie, Philippe Barois, Virginie Ponsinet, Marie-Hélène Delville, Ovidiu Ersen, Emilie Pouget, **Reiko Oda**,

ACS nano 11 (4), 3806-3818.

- Induction of Strong and Tunable Circularly Polarized Luminescence of Nonchiral, Nonmetal, Low- Molecular- Weight Fluorophores Using Chiral Nanotemplates. Taisei Goto, Yutaka Okazaki, Masahiro Ueki, Yutaka Kuwahara, Makoto Takafuji, **Reiko Oda**, **Hirotaka Ihara**, *Angewandte Chemie International Edition* 56 (11), 2989-2993.
- Fluorescence emission originated from the H-aggregated cyanine dye with chiral gemini surfactant assemblies having a narrow absorption band and a remarkably large Stokes shift Naoya Ryu, Yutaka Okazaki, Emilie Pouget, Makoto Takafuji, Shoji Nagaoka, **Hirotaka Ihara**, **Reiko Oda**, *Chemical Communications* 53 (63), 8870-8873.
- MOLECULAR CHIRALITY TO SUPRAMOLECULAR CHIRAL SYSTEMS, FROM ORGANIC TO INORGANIC CHIRAL NANOSTRUCTURES, **Reiko Oda**, *Symmetry*, 211.

2. Overview and significance of the research collaboration with Kumamoto University

In the context of Laboratoire International Associé (Associated International Laboratory) for which both CNRS and University of Bordeaux fund our international collaboration, we have shared one double degree student, (15 months in Japan, 21 month in Bordeaux), 2 postdoctoral fellows -22 months in total and published 6 co-signed papers and two book chapters together

In terms of researchers exchange,

1. Professor Ihara visited Bordeaux, 30 June-1 July, 2018
2. 32nd IROAST Seminar, Kumamoto, 06 - 07 August, 2018
3. The 4th Annual Meeting of LIA-CNPA, Bordeaux, 20 - 21 September, 2018
4. Oda gave a seminar at the 4th IROAST Symposium–8th PHOENICS International Symposium, 24 - 26 January, 2019

3. Prospect for further research collaboration with Kumamoto University

Thanks to the fact that our LIA is renewed starting 2019 up till 2022, we wish to continue and promote further our exchange and collaboration.

4. Impressions of Kumamoto University/Kumamoto

Our long ongoing collaboration has proven to be very fruitful and we are very happy that development of collaborations between young professors are growing.

No. 4-22	Development of catalytic system for CO ₂ reduction by supramolecular system		
Name	Etsuko Fujita		
Affiliation	Chemistry Division, Brookhaven National Laboratory, USA Email: fujita@bnl.gov	Title	Senior Chemist
Research Field	Green Energy		
Period of Visit	January 21, 2019-January 28, 2019		
Host Professor	Yutaka Kuwahara		
Affiliation	Faculty of Advanced Science and Technology Email: kuwahara@kumamoto-u.ac.jp	Title	Assistant Professor

I attended the 4th IROAST International Symposium on Jan. 24-25, 2019 at Kumamoto University. I was promptly picked up by Prof. Kuwahara and Dr. Shirosaki upon my arrival at the Kumamoto Airport. The next two days I attended at the symposium and presented a talk entitled “CO₂ Reduction vs CO₂ Hydrogenation” in the section entitled “Waves for Advanced Materials Related with Analysis, Environment and Energy”. Listening to various talks presented at the symposium, I realized that the faculty members of Kumamoto University and their collaborators are investigating a wide-range of advanced materials, especially chiral molecular assemblies, polymers, nano-celluloses and their composites, for cutting edge research in biology, analytical chemistry, environmental chemistry and energy science. I was very impressed by the strong global academic networks and international collaborative research programs via the IROAST program.

The excursion on Jan. 26 to the Mt. Aso area including the Suntory Beer Brewery, Yamamura Sake Brewery, Shirakawa Springs and lunch at Takamori-Dengaku were wonderful for learning about Japanese culture, especially around Kumamoto, with great hospitality that was provided by members of Kumamoto University, despite the bad snowy weather preventing us from visiting Daikanbo, Mt. Aso. Meeting and talking with a large group of International students visiting Kumamoto via IROAST programs at the Symposium reception and Mt. Aso excursion, I was also very impressed by the continuing achievements on internationalization via IROAST and dedication of the faculty members of Kumamoto University.

Prof. Kuwahara visited us in the Chemistry Division at Brookhaven National Laboratory (BNL) from July 18 to Sept. 15, 2018. Owing to technical problems, CO₂ reduction with the original chiral assemblies bearing Re catalysts could not be pursued. However, we investigated the effect of proton source on electrochemical CO₂ reduction using cobalt complexes in CH₃CN. Because we obtained promising initial results, I am looking forward to Prof. Kuwahara’s visit to BNL in the summer of 2019. I hope we will also have a chance to try the CO₂ reduction using chiral assemblies bearing Re catalysts in an appropriate solvent.



Snapshot at the invited talk of
the 4th IROAST International Symposium on Jan. 24-25, 2019

5. Researchers Supported by the IROAST International Joint Research Travel Support Program

No.	Name	Project Title
5-1	Akira Yoshiasa	Performance and achievement of international collaborative research with Poland: research on extreme conditions experiments and mass extinction records left in sediments.
5-2	Fuyuki Shimojo	International collaboration for ab initio investigation of functional materials
5-3	Kei Toda	Study on natural chemicals as cues for whale predation in the Antarctic Ocean
5-4	Yoshitaka Nakanishi	Surface engineering for potential application in dental engineering (Innovative Surface Engineering for Health)
5-5	Shinya Hosokawa	Studies on the structure and dynamics of functional materials using synchrotron radiation
5-6	Toshitaka Yamakawa	Clinical and Healthcare Application of a Wearable HRV Sensor
	Makiko Kobayashi	
	Masayuki Tanabe	
5-7	Masatoshi Kuroda	Mechanical Characterisation of Nuclear Graphite for Improving Plant Reliability
5-8	Akira Yoshiasa	On the start of international collaboration between RWTH Aachen University and Kumamoto University: significance of quantum theoretical chemistry and extreme condition experiments
5-9	Shinya Hayami	Development of Graphene oxide hybrid materials

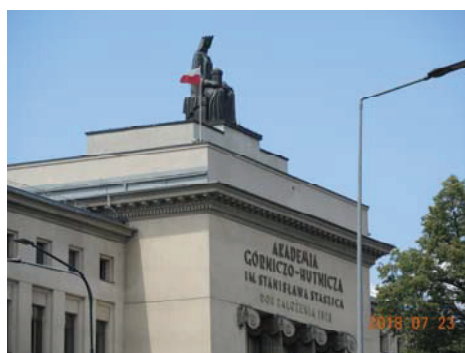
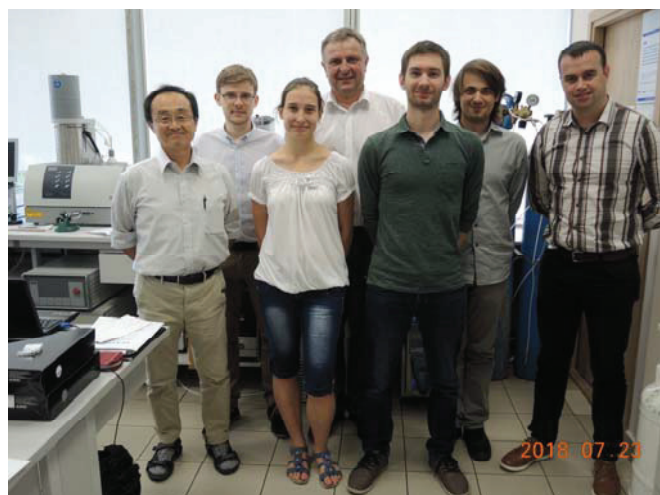
No. 5-1	Performance and achievement of international collaborative research with Poland: research on extreme conditions experiments and mass extinction records left in sediments.		
Name	Akira Yoshiasa		
Affiliation	Faculty of Advanced Science and Technology Email:yoshiasa@sci.kumamoto-u.ac.jp	Title	Prof. Dr.
Research Field	Nanomaterial Science/Environmental Science		
Period of Travel	July 21, 2018-July 28, 2018		
Visited Researcher	Krzysztof Wojciechowski		
Affiliation	AGH University, Poland	Title	Prof. Dr.

We focus on research on extreme condition experiments and carried out advanced research through international collaborative research. The international collaborative research performed to develop high performance experimental and theoretical approach under extreme conditions. The experiments are performed in-situ, using technologically advanced equipment. The project aims at the construction of a theory that links nano-scale structures, the unique local structures of ppb-order trace elements in multi-element systems, macroscopic properties and histories (related to environmental assessment, understanding mass extinction events by meteorite impact etc.).

The researches are progressed by the collaboration with the researchers of foreign countries (AGH University of Science and Technology (Poland), Université de Lorraine and Université Blaise Pascal (France), Universitaet Aachen and Max Planck Institute FKF (German)), and at, Yoshiasa laboratory, the precise crystal analytical investigations have been carried out by using Synchrotron Radiation facilities to apply for the high pressure research of solids and for earth science. Yoshiasa group and Wojciechowski group (AGH University, Poland) have coworked for excellent thermoelectric material research.

In this activity, Professor Yoshiasa gave a lecture at AGH University (Photo). Professor Krzysztof Wojciechowski was visited to our university based on the international research cooperation agreement between AGH University and Kumamoto University. Several researchers and students visited AGH University and studied on thermoelectric materials. Three exchange students are enrolled in Kumamoto University.

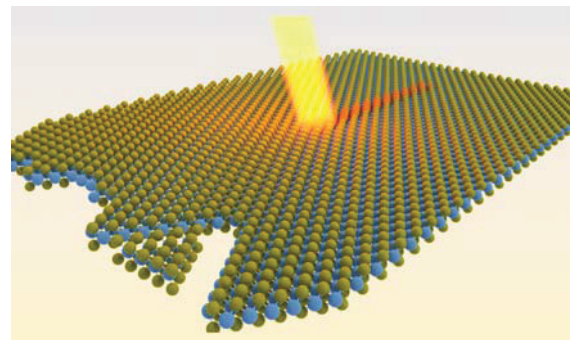
Professor Yoshiasa will visit AGH University in May 2019 again. From the basis of an on-going collaboration between Prof. Yoshiasa (Kumamoto) and Prof. Wojciechowski (AGH University, Poland), they try to explore new materials under ultra-super gravity and have already succeeded in evaluating precision materials.



No. 5-2	International collaboration for ab initio investigation of functional materials		
Name	Fuyuki Shimojo		
Affiliation	Faculty of Advanced Science and Technology Email: shimojo@kumamoto-u.ac.jp	Title	Professor
Research Field	Nanomaterial Science		
Period of Travel	July 30, 2018-August 19, 2018		
Visited Researcher	Aiichiro Nakano, Priya Vashishta, Rajiv K. Kalia		
Affiliation	Collaboratory for Advanced Computing and Simulations, University of Southern California	Title	Professor

The international collaboration with Collaboratory for Advanced Computing and Simulations, University of Southern California (USC), is conducted to investigate the static, dynamic and mechanical properties of functional materials, such as transition metal dichalcogenides (TMDC), from first principles. The study includes i) the mechanical stability of various isomers of Tellurene monolayer, ii) the dielectric anisotropy and effects of interstitial defects of polyethylene, iii) the dielectric breakdown in polymers, iv) the photo-induced lattice contraction in layered materials, v) the anisotropic structural dynamics of WSe₂ monolayer, vi) the initial sulfidation process of MoO₃ surfaces, vii) the semiconductor-metal structural phase transformation in MoTe₂ monolayers, viii) the dynamic behavior of excited electrons in TMDC, ix) the microscopic mechanism of shock compression of silica, etc. Our project is also targeted at developing a new computational method for large-scale quantum molecular-dynamics (QMD) simulations of materials. Recently, many first-principles studies of materials properties based on density-functional theory (DFT) have been reported due to the spread of computer program codes. However, there have been only few studies on non-adiabatic atomic dynamics from first principles. The main originality of this project resides in implementing nonadiabatic QMD simulations of materials based on linear-response time-dependent DFT combined with linear-scaling electronic structure calculations using the divide-and conquer algorithm. We have developed our own program code for this purpose. Our international collaboration with USC has continued about 20 years, and more than 70 research papers have been published so far.

For 21 days from July 30, 2018 to August 18, 2018, I visited USC with my graduate students to share and evaluate the current status of research projects stated above, to discuss the physics behind the numerical results obtained in each study, and to figure out ways of overcoming difficulties we have faced. We have also prepared and examined manuscripts for publication of completed studies. We have agreed to continue our international collaboration, and made a research plan in future.



Optically-induced structural transformation opens up the possibility of patterning contacts and circuit elements on TMDC.

No. 5-3	Study on natural chemicals as cues for whale predation in the Antarctic Ocean		
Name	Kei Toda		
Affiliation	Department of Chemistry, Faculty of Advanced Science and Technology Email: todakei@kumamoto-u.ac.jp	Title	Professor
Research Field	Environmental Science		
Period of Travel	August 25, 2018 - September 4, 2018		
Visited Researcher	Dr. Daniel Zitterbart		
Affiliation	Woods Hole Oceanographic Institution	Title	Assistant Scientist

1. Overview and significance of the international research collaboration

Professor Toda at Kumamoto University (KU) and Dr. Zitterbart at Woods Hole Oceanographic Institute (WHOI) are starting collaborative research regarding relationship between whale bionomic behavior and chemicals produced from phytoplankton and small krill. KU members provide analytical method and instrument for the research and WHOI provides monitoring techniques of plankton, fishes and whales. We have a hypothesis that whales find a place, where their foods exist in rich, in accordance to a concentration profile of a certain chemicals emitted from plankton clusters and small fish groups. In order to proof this, we are going to have observation of whales and the chemicals simultaneously.

2. Research achievements and progress of the international joint research

In the WHOI visit, we discussed possibility of the project. Our conclusion was start from the ocean near WHOI. The institute is in the end of Cape Cod. One of the major industries of Cape Cod was whale fishing (John Manjiro was rescued from wreck by an American whale ship and taken to Cape Cod to study English). We can see whale groups by 3 h voyage from the institute. Probably the next June is a good season to do the investigation. We are preparing a list of items we need to take to US and we want Dr. Zitterbart to collect at WHOI. Another candidate is in the fiord of Patagonia in Chile. There, mineral rich water come from Glaciers to the fiord ocean in summer, and big plankton blooms appear and whales gather for predation. This is very interesting place for investigations. Research in Antarctic is attractive, but 6 weeks voyage from Australia is too hard for the first examination. So, we decided to start from Cape Cod, then fiord in Chile.

3. Prospect for further research collaboration with the visited university/institution

As mentioned above, our aim and plan are concrete. Furthermore, we combine different strength to do the on-board investigation. We need grants to go to the investigation places. So, we applied to get support from Japanese government, US government and WHOI. We are waiting results of the applications, and just yesterday I received a notification that application to JSPS had been accepted and selected!

4. Comments or suggestions for IROAST (programs).

It was very nice I could visit WHOI. We had been discussing more than two years about this project, but only via email. We met first time each other. Also, Dr. Owen came to see me from Sweden. She is a person who contacted me first, at that time from Australia and is living in Sweden. She will join our project of course. We got know each other well via my visiting WHOI.

No. 5-4	Surface engineering for potential application in dental engineering (Innovative Surface Engineering for Health)		
Name	Yoshitaka Nakanishi		
Affiliation	Faculty of Advanced Science and Technology Email: y-naka@mech.kumamoto-u.ac.jp	Title	Dr.Eng. / Professor
Research Field	Advanced Green Bio		
Period of Travel	August 26, 2018-September 2, 2018		
Visited Researcher	1. Emile van der Heide 2. David Matthews 3. Anthonie van den Boomgaard 4. Dmitrii Sergachev		
Affiliation	1-4. Faculty of Engineering Technology, University of Twente	Title	1. Dr. ir. / Professor 2. Dr. MSc. / Associate Professor 3. Dr. ir. / Professor 4. PhD student

1. Overview and significance of the international research collaboration

Knowledge on surface engineering is fragmented over the groups that have knowledge on surface technology, the groups that specialize in the performance of surfaces and the groups that have a knowledge base in design of surfaces. This is especially true for research fields for health. Both Japan and The Netherlands have active academic groups in Surface Engineering, capable of creating innovation in this field. The international collaborative group is able to create synergy and breakthrough innovations in the health field. A platform on "**Innovative Surface Engineering for Health**" is proposed.

2. Research achievements and progress of the international joint research

Main topics for the international collaborative research are as bellow.

Topic 1 Surface Processing Technologies for supporting the Innovative Surface Engineering

Overall aim is to create fine geometric structures to the material surfaces and to improve the properties of the materials relevant for health technologies. Targeted techniques include, GeometryDirect method, Laser processing method, and MEMS processing method. How to improve the processing accuracy, enlarge the processed surface area, progress 3D processing, adopt a variety of materials, and reduce the processing cost, have been discussed and explored.

Topic 2 Improvement of mechanical strength of brittle material (such as a ceramics)

Crack propagation is thought to derived from, 1) Micro defects (micro cracks) in the surface layer of the material, and 2) Existence of crystal defects / work affected layer. How to remove these factors, increase the mechanical strength, and overcome the weak points "hard but brittle" for expanding the application fields, have been discussed and explored.

Topic 3. Prediction of function on processed surface

The surface functions that are considered highly relevant for health technologies are: Anti-fingerprint, Stain resistance, Anti dust, Anti-fogging, Touch of feeling and grip. How to model and optimize these functionalities, adopting by control of texture, adding boundary layers and hydrophobic/hydrophilic behavior, have been discussed and explored.

Topic 4. Skin care (nursing care)

Avoiding and reducing skin irritation during health care is the aim of this research topic. Medical aspects are discussed in relation to improving nursing care products applied to skin trauma. Related product development includes e.g. an adhesive tape for newborns and elderly patients and decubitus prevention.

Topic 5. Surface finish of 3-dimensional products

Products with 3-dimensional surfaces, which are made of carbon fiber reinforced plastics (CFRPs), TiAlV-alloys etc. share common functionality problems, when it comes to surface finishing. This influences the tribological properties negatively and also creates problems with respect to adhesion, physical anchoring and activation of chemical / physical adsorption. The surface texturing brings innovation in this area.

Topic 6. Improvement of heat transfer by using the surface texturing

Energy transport and conversion efficiency is dramatically improved in case the heat transfer at the interface of two contacting surfaces is optimized. The same holds for heat transfer between a surface and the working fluid, e.g. in order to control nucleate boiling. Removal of heat from surfaces and health care instruments might also be effective, and creates possibilities for further miniaturization and improved functionality.

Topic 7. Bio-inspired dentures

Microstructures possessed in living things (moth-eye, gecko-skin, lotus-leaf etc.) have informative contents for developing denture-supporting structure.

3. Prospect for further research collaboration with the visited university/institution

Collaborative research project at each topic has already launched. Academic agreements both initiatives has been extended, and MOU will be issued as necessary. Furthermore, the setup of an international exchange programme for MSc-students on '**Innovative Surface Engineering for Health**' will be discussed and explored.

4. Comments or suggestions for IROAST (programs).

Yoshitaka Nakanishi would like to sincerely thank you for this supporting program by IROAST.

No. 5-5	Studies on the structure and dynamics of functional materials using synchrotron radiation		
Name	Shinya Hosokawa		
Affiliation	Department of Physics, Faculty of Advanced Science and Technology Email: shhosokawa@kumamoto-u.ac.jp	Title	Professor
Research Field	Nanomaterial Science		
Period of Travel	August 27, 2018-September 9, 2018		
Visited Researcher	Wolf-Christian Pilgrim		
Affiliation	Faculty of Chemistry, University of Marburg	Title	Professor

1. Overview and significance of the international research collaboration

The conductor of the project, SH, has collaborated for a long time with Professor Pilgrim of University of Marburg on the studies of atomic structures and dynamics of functional materials, such as Ge-based phase change materials, Fe-based high-temperature superconductors, and Bi-based topological insulators using third-generation synchrotron radiation facilities at ESRF at Grenoble, France, and SPring-8 at Sayo, Japan. From University of Marburg, SH was a host for a JSPS fellow, Dr. J. R. Stellhorn, for two years and a doctor course student, Mr. B. Paulus, for a half year to intensively carry out the cooperative studies on the above subjects. The aim of the present laboratory visit is to summarize the previously conducted experimental results and to prepare papers to publish in journals. A final administrative work on the Academic and Student-Exchange Agreements between University of Marburg and Kumamoto University is another important aim for this visit.

2. Research achievements and progress of the international joint research

On the experimental methods of the collaborated works, anomalous x-ray scattering (AXS) and x-ray fluorescence holography (XFH), SH and his collaborators in Japan have excellent experimental techniques, and they achieved remarkable results on several functional materials, the latter of which was one of the important driving forces that the Grant-in-Aid for scientific Research on Innovative Areas (3D Active Site Science) was approved by Japan Society of Promotion of Science in 2014. To improve these techniques further, the use of new-generation synchrotron radiation facilities, such as PETRA ring at DESY in Hamburg, Germany and MAXIV in Lund, Sweden, is necessary, and strong international collaborations are essential. Thus, we are performing collaborative works with financial supports by JSPS and CREST/JST.

At this time, we mainly discussed the experimental results of XFH performed in this June at ESRF on a topological superconductor, and pointed out experimental problems at ESRF (See Fig. 1). Since the ESRF will be shut down for one and a half years for upgrades of the beamlines, we will try to carry out the experiment at DESY, where Dr. Stellhorn moved to from this November, and actual experimental setups have been prepared for the future XFH experiments at DESY.

Final discussion on three accepted papers was performed to published in *Physica Status Solidi* (b) as a special issue. The publications are dedicated to the international symposium held in Kumamoto University, for which SH organized last November.

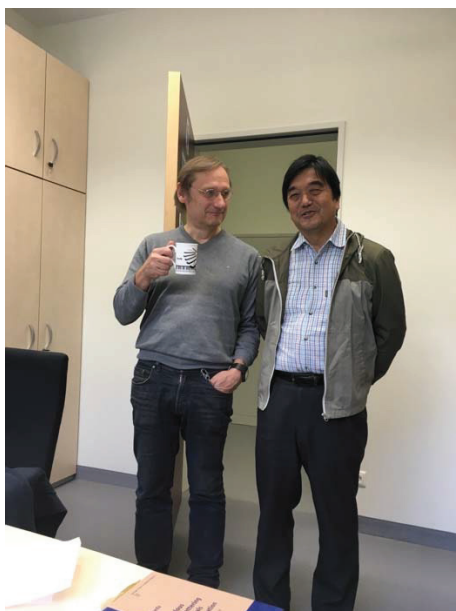


Fig. 1. Discussion with Prof. Pilgrim

3. Prospect for further research collaboration with the visited university/institution

The next visit will be in March 2019 to DESY and University of Marburg using a partial financial support by the Alexander von Humboldt foundation. Using this opportunity, we would like to complete Dr. Stellhorn's works at Kumamoto University.

We also agreed to present a number of our collaborative works at "14th International Conference on the Structure of Non-Crystalline Materials (NCM14)" held at Kobe, Japan on 3-8 November 2019, for which SH will be the organizer, and the subsequent satellite meeting "Pan Pacific Symposium on Chalcogenide Functional Materials" held at Kumamoto University on 10-11 November 2019.

Finally, we discussed Mr. Paulus' second visit to Kumamoto University for the further analyses of experimental data on his doctor work.

4. Comments or suggestions for IROAST (programs).

None.

No. 5-6	Clinical and Healthcare Application of a Wearable HRV Sensor		
Name	Toshitaka Yamakawa		
Affiliation	Priority Org. of Innovation and Excellence Email: yamakawa@cs.kumamoto-u.ac.jp	Title	Assistant Professor
Research Field	Advanced Green Bio		
Name	Makiko Kobayashi		
Affiliation	Faculty of Advanced Science and Technology Email: kobayashi@cs.kumamoto-u.ac.jp	Title	Associate Professor
Research Field	Advanced Green Bio		
Name	Masayuki Tanabe		
Affiliation	Faculty of Advanced Science and Technology Email: mtanabe@cs.kumamoto-u.ac.jp	Title	Assistant Professor
Research Field	Advanced Green Bio		
Period of Travel	September 5, 2018-September 9, 2018		
Visited Researcher	(1) Rajendra Acharya (2) Andrew Thuraiajah Sabaratnam		
Affiliation	Ngee Ann Polytechnic	Title	(1) Visiting Lecturer (2) Senior Director

1. Overview and significance of the international research collaboration

Our group visited Ngee Ann Polytechnic and National Heart Center in Singapore. An MOU of the joint research between Acharya's group and our group has been signed to have further discussion on the specific research topics and the grant opportunities.

2. Research achievements and progress of the international joint research

Dr. Kobayashi and Dr. Tanabe are developing new type piezoelectric/ultrasonic transducers, which are flexible and can be attached anywhere even on human body. This flexible ultrasonic/piezoelectric transducer attracted the visited researchers, especially Dr. Tan Ru San proposed new idea using our transducer.

As a result of the discussion, we achieved an agreement of starting new research projects that Dr. Kobayashi and Dr. Tanabe will fabricate customized medical sensors for surgery monitoring, patient monitoring during MRI, and detect diabetes in early stage. Dr. Yamakawa will develop the measuring system embedding the new sensor, Dr. Tan Ru San will measure biological signals at a certain body point, and Prof. Rajendra Acharya will analyze the obtained signals.

The joint research meeting and the MOU signing ceremony have been held with the following schedule.

- 6th September 2018

10:00am: Meet Professor Hiyama and team at Block 1 Level 1 (Admin One – this building is right near the entrance to the Polytechnic)

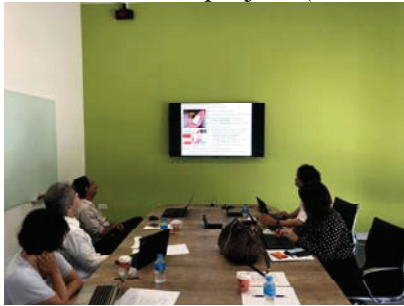
10:10am: Presentation by Dr Rajendra

11:00am: Visit to Dr Rajendra's lab

12:00pm: Adjourn for lunch – hosted by the Director/Technology, Development &

Innovation, Ms Regina Ng)

2:00pm: Meeting with Dr Tan Ru San, Senior Consultant, National Heart to discuss the ECG project (Block 1 Level 1) related photos below:



7:00pm: Dinner – hosted by Andrew Sabaratnam/ Senior Director

- 7th September 2018

10:00 am: Meet at Block 1 - Discussion on previous day's presentations and lab visits

10:30 am: MOU Signing Ceremony



11:00am: Adjourn for lunch hosted by Dr Rajendra

2:00pm: Visit to National Heart Centre of Singapore



3. Prospect for further research collaboration with the visited university/institution

The research project may contain several novel points, and we will acquire research impact to this world. Currently we are developing the new sensor. Both groups agreed on the revisit and joint meeting in Singapore with the sample devices developed by Kumamoto Univ. to discuss the potential specific research topic and to do the pilot trial of them.

4. Comments or suggestions for IROAST (programs).

This program is helpful to build a deeper partnership with research teams from other countries. We need the continuous financial/regal/man-power support to have further discussion and to obtain the research achievements with the tighter joint research partnership, followed by the conclusion of the Research Collaboration Agreement and the joint grant application.

No. 5-7	Mechanical Characterisation of Nuclear Graphite for Improving Plant Reliability		
Name	Masatoshi Kuroda		
Affiliation	Department of Mechanical and Mathematical Engineering Email: mkuroda@mech.kumamoto-u.ac.jp	Title	Associate Professor
Research Field	Green Energy		
Period of Travel	September 9, 2018-September 16, 2018		
Visited Researcher	Graham Hall		
Affiliation	The University of Manchester	Title	Senior Lecturer

1. Overview and significance of your international research collaboration

In recent years, special attention has been focused on the safety and the reliability of nuclear power plants especially after the nuclear accident in Fukushima. High-temperature gas-cooled reactor (HTGR) is one of the most promising candidate for the next generation nuclear reactors due to its inherent safety characteristics as well as its high efficiency. Nuclear graphite plays a key role in HTGR because it is employed as a neutron moderator in the reactor core. In order to secure the safety and the reliability under seismic conditions, it is required to evaluate the mechanical properties, especially the impact and dynamic properties. However, there exists limited information on the impact and dynamic properties of the isotropic nuclear graphite. Because this requires sophisticated expertise of the nuclear graphite technology, it is significant to carry out this research project in collaboration with the Nuclear Graphite Research Group of The University of Manchester which has an international reputation for the nuclear graphite technology.

2. Research achievements and progress of your international joint research

The purpose of the international joint research project is to compare the static and dynamic mechanical properties of the isotropic nuclear graphite for further improving the safety and the reliability of HTGR under seismic conditions. In this project, the static and dynamic mechanical properties such as Young's modulus and stress-strain relationship, which are key mechanical properties for the isotropic nuclear graphite, have been evaluated.

(i) Young's modulus

Young's modulus of the isotropic graphite has been evaluated by comparing the experimental results obtained by pulse-echo resonance method, pulse-echo time of flight method and compressive test. It was found that the Young's modulus of the pulse-echo resonance method agreed well with that of the pulse-echo time of flight method. On the other hand, the Young's modulus evaluated by the compressive test did not always agree with the data obtained by the pulse-echo methods. Further investigation and experiments should be required to discuss the results.

(ii) Stress-strain relationship

Dynamic stress-strain relationship of the isotropic graphite has been evaluated by split Hopkinson pressure bar (SHPB) method, and the results were compared with the static stress-strain curve obtained by the compressive tests. It was found that the stress-strain curve depends on the strain rate. Further investigation and experiments should be required to discuss the results.

3. Prospect for further research collaboration with the visited university/institution

This research project in collaboration with the Nuclear Graphite Research Group of The University of Manchester will continue after next fiscal year for further investigation and experiments. The

international joint research project may be expanded further by including the other research groups.

4. Any comments to or suggestions for IROAST (programs).

We sincerely appreciate the programme to enhance our international joint research project. We hope this programme continue after next fiscal year.

No. 5-8	On the start of international collaboration between RWTH Aachen University and Kumamoto University: significance of quantum theoretical chemistry and extreme condition experiments		
Name	Akira Yoshiasa		
Affiliation	Faculty of Advanced Science and Technology Email:yoshiasa@sci.kumamoto-u.ac.jp	Title	Prof. Dr.
Research Field	Nanomaterial Science/ Environmental Science/		
Period of Travel	January 9, 2019-January 15, 2019		
Visited Researcher	1. Richard Dronskowski 2. Massimo Nespolo		
Affiliation	1. RWTH Aachen University, Germany 2. Université de Lorraine, France	Title	Prof. Dr.

Experimental and simulation studies are promoted to investigate the structure of condensed matters, and properties under extreme conditions. The experiments are performed in-situ, using technologically advanced equipment. The project aims at the construction of a theory that links nano-scale structures, the unique local structures of ppb-order trace elements in multi-element systems, macroscopic properties and histories (related to environmental assessment, understanding mass extinction events by meteorite impact etc.). The researches are progressed by the collaboration with the researchers of foreign countries (Université de Lorraine and Université Blaise Pascal (France), Universitaet RWTH Aachen and Max Planck Institute FKF (Germany) and AGH University of Science and Technology (Poland). At Yoshiasa laboratory, the precise crystal analytical investigations have been carried out by using Synchrotron Radiation facilities to apply for the high pressure research of solids and for earth science. Yoshiasa group and Dronskowski group have coworked for the earth interior science research.

Visit to RWTH Aachen University in Germany and Lorraine University in France was planned. As one of the achievements of this time, we are able to contribute international collaborative achievements to the international journal (Acta Crystallograph) with prof. Massimo Nespolo, Université de Lorraine, France. Two other international collaborative activities with Professor Nespolo were published in international journals. A group of Université Blaise Pascal (France) visited Kumamoto and succeeded in collecting samples of Ultra super high pressure metamorphic rocks. International collaborative research is ongoing.

Activities among universities that concluded the agreement on academic exchange
To increase the research activity of “the precise atomic level structure observation and physical property under extreme condition”, we will enter into the Agreement on Academic Exchange between Graduate School of Science and Technology, Kumamoto University and Solid-State and Quantum Chemistry, Universitaet RWTH Aachen. Professor Dr. Richard Dronskowski will visit to our university based on the international research cooperation agreement between Universitaet RWTH Aachen and Kumamoto University. Professor Dr. Richard Dronskowski arranged with Prof. Yoshiasa about the research works at the international conference.

At January 10, 2016, Prof. Yoshiasa visited in Universitaet RWTH Aachen. Prof. Yoshiasa gave the lecture at Inorganic Chemist Building 3F Auditorium. We were asked to participate in the international conference hosted by Professor Richard Dronskowski and to write the review paper. New international collaborative researches started this time.



No. 5-9	Development of Graphene oxide hybrid materials		
Name	Shinya Hayami		
Affiliation	Faculty of Advanced Science and Technology Email: hayami@kumamoto-u.ac.jp	Title	Professor
Research Field	Nanomaterial Science/ Green Energy/ Environmental Science/		
Period of Travel	January 21, 2019-January 31, 2019		
Visited Researcher	Prof. Rahul Raveendran Nair Prof. Malcolm Halcrow Prof. Sanjit Nayak Prof. Graham Newton		
Affiliation	University of Manchester University of Leeds University of Bradford University of Nottingham	Title	Professor Professor Professor Professor

1. Overview and significance of the international research collaboration

Nanomaterials are expected to be applied in various fields in the fields of chemistry, physics, biology and medicine. Research fields specialized in nanomaterial research occur one after another, and are research fields that are being intensively studied all over the world. We have revealed that they have excellent multifunctionality of nanomaterials. Synthesis of nanomaterials by oxidation / reduction are easily and large amount of the materials are obtained at one time in the processes. Applied for this project, thinking that it is necessary to build "nanomaterial research center" at Kumamoto University as an international collaborative research center of nanomaterial with advantage of biomass energy and energy devise utilizing the nanomaterials.

2. Research achievements and progress of the international joint research

The search for new materials based on GO and rGO is an undeveloped area, and these materials are used for energy development, medical and environmental problems. Furthermore, the research in hybridization with GO and rGO are challenging research topics, and international joint research are as follows.

1. Reversible external field precise control in GO, rGO and hybrid synthesis and $GO \leftrightarrow rGO$ reaction
2. Energy development of GO, rGO and hybrids thereof
3. Construction of drug release system responding to $GO \leftrightarrow rGO$ conversion
4. Preparation and evaluation test of PM 2.5 model substance
5. Development of a new pollutant removal process

3. Prospect for further research collaboration with the visited university/institution

We have published 30 articles in 2018 for international peer review journal, and some part of the research have been reported in newspaper and achieved by the Nanomaterials International Collaborative Research Project. The research results of this international collaboration in the future will surely spread more and more, we plan to further develop research after 2019 and accelerate research results such as papers in collaborative research. Contribute to the top journal including Nature, Science, and publish research results deserving it. Also, as external funds, we are currently in the process of continuing the scientific research base A, and we will try for S or CREST in the next step.

4. Comments or suggestions for IROAST (programs)

Recently, there many kinds of intra and external research funds for young researcher, and it is very important for encouragement and growing up for young and next generation. However when we consider about real collaboration now, our generation is also important for it. Anyway finally I would like to thank IROST program because we succeed to collaborate with many researchers in UK.

6. Internship Researchers

No.	Name	Project Title
6-1	Michael Hok Fai Chan	Experiment to estimate the stress distribution of rock joint surface asperities
6-2	Woocheol Kim	Practice of in vitro analysis of nanoparticles
6-3	Wonseok Choi	Cellular analysis of nanoparticles behavior

No. 6-1	Experiment to estimate the stress distribution of rock joint surface asperities		
Name	Michael Hok Fai Chan		
Affiliation	McGill University Email: michael.chan4@mail.mcgill.ca	Status	IROAST Young Internship Researcher
Research Field	Green Energy		
Period of Internship	June 29, 2018-August 20, 2018		
Host Professor	Atsushi Sainoki		
Affiliation	IROAST Email: atsushi_sainoki@kumamoto-u.ac.jp	Title	Associate Professor

The following is my final research report for the 2018 IROAST internship program with Professor Atsushi Sainoki. I would like to thank my Host Professor Atsushi Sainoki for this opportunity to conduct research in this field, and the staff of IROAST and Kumamoto University their kindness and hospitality during my time in Japan.

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INTRODUCTION

The project title of the FY2019 IROAST Internship Program at Kumamoto University, Japan is “Experiment to estimate the stress distribution of rock joint surface asperities”. The Intern, Mike Chan, is a third-year Mining Engineering student at McGill University, Canada. Associate Professor Atsushi Sainoki oversaw the work term where the student’s focus was to create a number of rock-like samples representing actual fault surface asperities by using Rhino and a 3D printer, and perform loading tests under a microscope. The experimental results will be compared to the numerical analysis performed by Prof. Sainoki himself. Later in the work term, the tasks expanded to include the image analysis of the printed samples with programs coded in C and Fortran 90.

TASKS

Fractal Theory and JRC Literature Review

The first step was to briefly review geometrical characteristics of fault surface asperities such as the fractal characteristic and its relation to Barton’s surface roughness coefficient. This involved first learning about fractal theory and reviewing joint roughness coefficient literature. The background research provided the basic concepts employed in the papers which used fractal theory to characterize the roughness of joint surfaces. Many papers justified the use of fractal Brownian motion to model rock surfaces and proposed empirical equations to accurately calculate the joint roughness coefficient based on different fractal dimension measurement techniques. In summary, the fractal dimension offers a unique approach to the quantitative description of surface roughness, which had otherwise been qualitatively described.

fBm Algorithm Literature Review

The next task was reviewing numerous fractal generation algorithms which would lead to the selection of the ideal algorithm that would be employed in the fractal surface point generation program. Older methods such as the midpoint displacement method, successive random additions method, and the random cut method all proposed by Dietmar Saupe in Algorithms for random fractals (Saupe, 1988). Newer and improved methods were reviewed as well including a summary of many advanced exact and approximate fractal methods in New Methods for Simulation of Fractional Brownian Motion (Yin, 1996). Finally, the corrected successive random additions method (Liu, Bodvarsson, Lu, & Molz, 2004) was selected for its simplicity and accuracy.

fBm Generation

With basic programming knowledge acquired from first-year computer science courses and the FISH manual, the corrected successive random additions method was put into code. Both one-dimensional and two-dimensional versions of the code were written. The code combined the fBm algorithm, and an empirical equation relating the fractal dimension and JRC (Li & Huang, 2015) to generate a .txt file containing point coordinates to a rock-like surface given a joint roughness coefficient. The surfaces generated by the 2D code can be used for future sample experimentation.

$$JRC = 520.28(D - 1)^{0.7598}$$

Equation 1: Empirical equation relating joint roughness coefficient and fractal dimension (Li & Huang, 2015).

Sample Modelling

Once the fBm surface generation code was complete, the generated points in the .txt file were imported into Rhino and converted into a 3D surface. This surface was attached to a base that would fit into the loading apparatus. The base is a 1mm x 2mm x 2.75mm block with holes running along the length of the sample. Once loaded, the amount of deformation captured in these tubes reflect the stress distribution from the asperities on the surface of the model. Asperities with higher stress would transfer this stress to the tube underneath it. The tubes are 700 µm in diameter with centres located 1200 µm from the lowest point of the fractal surface. The tubes are spaced 1700 µm (centres) between adjacent holes.

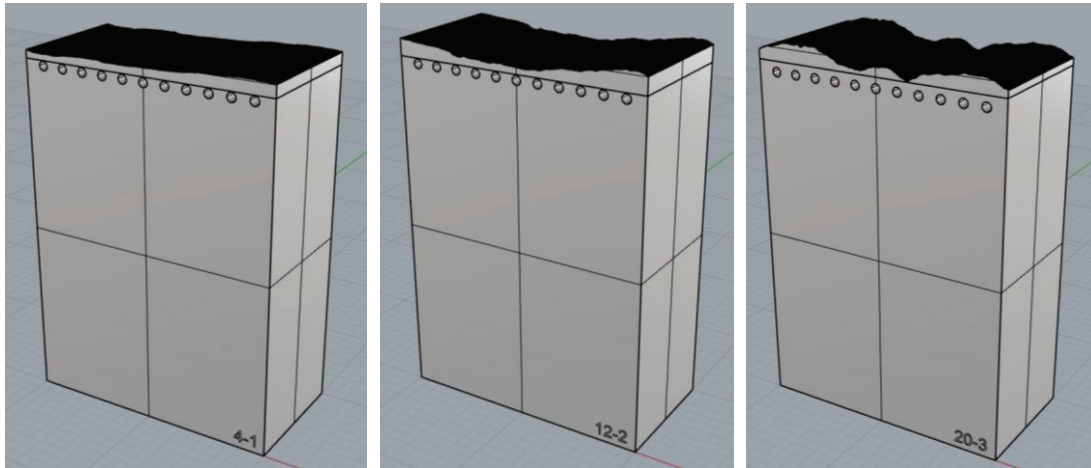


Figure 1: Rock-like sample Rhino models with joint roughness coefficients of 4, 12, and 20 respectively.

Sample Printing and Testing

Samples were printed using a 3D printer. Once printed, each sample had the temporary structural material removed. The material in the holes were removed via an air gun connected to an air compressor. These samples were then submerged in a liquid that dissolves the temporary structure for a minimum of one hour.

Testing involves a special loading apparatus illustrated in Figure 2. Samples were loaded up to 1.0 kN in 0.2 kN increments underneath a microscope which took pictures of the deformed holes.

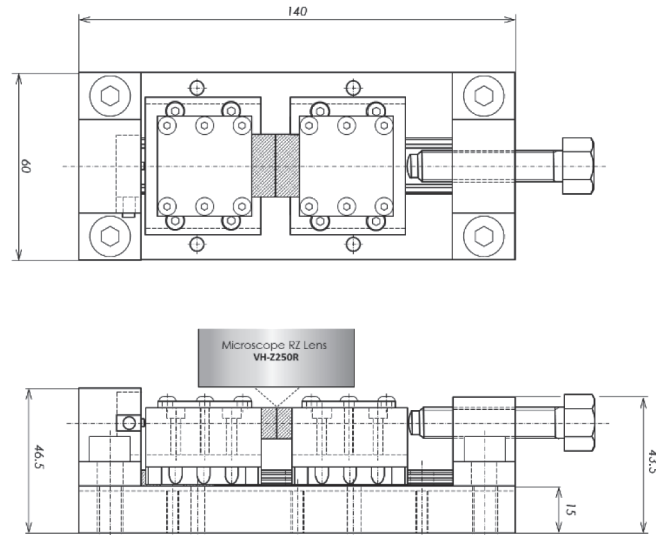


Figure 2: Rock-like sample loading apparatus. Samples are shaded in grey.

Sample Analysis

Prof. Sainoki provided and updated one C program and three Fortran programs which make up the image analysis program. Through a series of steps, the program scans the .bmp image of the holes and evaluates their area, perimeter, and circularity of each hole. The values of the same hole are then compared over the different loads.

The images taken by the microscope are full colour ~2 000 x 20 000 pixel images. The images are manually prepared for the image analysis program by converting the original image into greyscale, removing extra details, and adjusting image properties to maximise hole clarity. The image analysis program can clean up an image but is only capable of handling small imperfections.



Figure 3: Test sample Rhino model. Holes are numbered 1-11 from left to right.

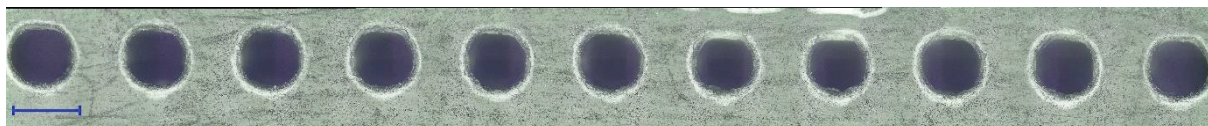


Figure 4: Original image taken by the microscope. The scale bar indicates a length of 1000 μm .

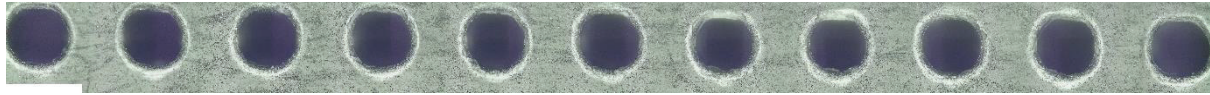


Figure 5: Image size reduced by resizing.

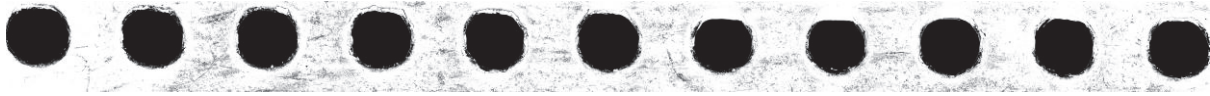


Figure 6: Greyscale filter applied with brightness and contract values adjected for improved hole definition.



Figure 7: Manual clean-up of image to remove visible imperfections.

0kN	Area (um ²)	Perimeter (um)	Circularity	1kN	Area (um ²)	Perimeter (um)	Circularity	Hole	Δcircularity (abs)
1	4.37E+06	2.34E+04	0.1	1	4.63E+06	3.14E+04	0.059	1	0.041
2	4.57E+06	2.69E+04	0.079	2	4.41E+06	2.29E+04	0.105	2	0.026
3	4.41E+06	2.53E+04	0.086	3	4.44E+06	2.90E+04	0.067	3	0.019
4	4.50E+06	2.20E+04	0.117	4	4.43E+06	2.20E+04	0.116	4	0.001
5	4.27E+06	2.20E+04	0.11	5	4.28E+06	2.54E+04	0.083	5	0.027
6	4.38E+06	2.24E+04	0.109	6	4.37E+06	2.46E+04	0.091	6	0.018
7	4.63E+06	2.55E+04	0.09	7	4.66E+06	2.83E+04	0.073	7	0.017
8	4.28E+06	2.68E+04	0.075	8	4.22E+06	2.84E+04	0.066	8	0.009
9	4.45E+06	2.45E+04	0.093	9	4.46E+06	2.61E+04	0.082	9	0.011
10	4.50E+06	2.44E+04	0.095	10	4.48E+06	2.51E+04	0.089	10	0.006
11	4.53E+06	2.65E+04	0.081	11	4.60E+06	2.71E+04	0.079	11	0.002

Figure 8: Analysis of a test sample with JRC 10.

Results & Discussion

Results from preliminary samples show that the area and perimeter of a hole does not change significantly throughout loading. Therefore, circularity may be the key indicator used to quantify hole deformation.

For an individual hole, the circularity is expected to decrease as load increases. However, the results have shown that though the circularity changes, it does not necessarily result in a decrease in circularity. In Figure 8, a sample with a JRC of 10 was loaded to 1.0 kN. Only the circularity between the loaded and unloaded tests were compared. As expected, the circularity decreased in most holes. However, in Figure 11, the circularity does not seem to follow an intuitive pattern. Between these two examples, there are many factors that set them apart with JRC likely having the largest influence. One must also consider the interactions between the holes themselves as the deformation in one hole may result in the improvement in the circularity of the holes adjacent to it. All these factors can and will be analysed using numerical analysis.

There are some unexpected results such as the significant difference in area from no load compared to any of the loaded hole areas. This is likely due to the improper image processing and dealt with in future iterations of this experiment.

Area (um ²)		Load (kN)					
		0	0.2	0.4	0.6	0.8	1.0
Hole	1	2.47E+06	5.15E+06	5.15E+06	5.11E+06	4.88E+06	4.52E+06
	2	2.42E+06	5.27E+06	5.04E+06	5.20E+06	4.86E+06	4.59E+06
	3	2.42E+06	5.18E+06	5.03E+06	5.13E+06	4.87E+06	4.60E+06
	4	2.14E+06	4.71E+06	4.54E+06	4.62E+06	4.38E+06	4.09E+06
	5	2.24E+06	4.88E+06	4.71E+06	4.82E+06	5.10E+06	4.68E+06
	6	2.56E+06	5.39E+06	5.23E+06	5.39E+06	4.92E+06	4.79E+06
	7	2.46E+06	5.18E+06	5.11E+06	5.34E+06	4.55E+06	4.29E+06
	8	2.54E+06	5.33E+06	5.37E+06	5.19E+06	5.06E+06	4.71E+06
	9	2.57E+06	5.51E+06	5.28E+06	5.40E+06	5.16E+06	4.70E+06
	10	2.57E+06	5.46E+06	5.35E+06	5.39E+06	5.02E+06	4.76E+06
	11	2.68E+06	5.57E+06	5.51E+06	5.51E+06	5.28E+06	5.05E+06

Figure 9: Area analysis of a sample with JRC 16.

Area (um ²)		Load (kN)					
		0	0.2	0.4	0.6	0.8	1.0
Hole	1	2.18E+04	3.31E+04	3.94E+04	3.27E+04	3.34E+04	2.74E+04
	2	2.37E+04	3.48E+04	3.40E+04	3.68E+04	2.70E+04	3.18E+04
	3	1.93E+04	3.50E+04	3.77E+04	3.54E+04	3.01E+04	2.59E+04
	4	2.02E+04	3.58E+04	3.63E+04	3.57E+04	3.13E+04	2.43E+04
	5	1.83E+04	3.98E+04	3.87E+04	3.75E+04	3.07E+04	2.65E+04
	6	1.96E+04	4.17E+04	3.43E+04	3.68E+04	3.30E+04	3.22E+04
	7	2.08E+04	3.50E+04	3.33E+04	3.77E+04	3.30E+04	2.63E+04
	8	2.13E+04	3.53E+04	3.74E+04	3.67E+04	3.10E+04	2.98E+04
	9	2.36E+04	4.07E+04	3.90E+04	3.66E+04	3.98E+04	2.59E+04
	10	2.21E+04	3.49E+04	3.50E+04	4.05E+04	3.40E+04	2.83E+04
	11	2.08E+04	3.74E+04	3.63E+04	3.71E+04	3.10E+04	2.84E+04

Figure 10: Perimeter analysis of a sample with JRC 16.

Area (um ²)		Load (kN)					
		0	0.2	0.4	0.6	0.8	1.0
Hole	1	0.065	0.059	0.042	0.06	0.055	0.076
	2	0.054	0.055	0.055	0.048	0.084	0.057
	3	0.082	0.053	0.044	0.052	0.067	0.086
	4	0.066	0.046	0.043	0.046	0.056	0.087
	5	0.084	0.039	0.04	0.043	0.068	0.084
	6	0.084	0.039	0.056	0.05	0.057	0.058
	7	0.071	0.053	0.058	0.047	0.052	0.078
	8	0.071	0.054	0.048	0.049	0.066	0.066
	9	0.058	0.042	0.044	0.051	0.041	0.088
	10	0.066	0.056	0.055	0.041	0.055	0.075
	11	0.078	0.05	0.052	0.05	0.069	0.079

Figure 11: Circularity analysis of a sample with JRC 16.

Conclusion

The results of this experiment show that the hole deformation method may be a viable way to determine asperity stresses by measuring the amount of deformation in each hole. The perimeter and area of a hole may not change significantly over the applied loads of 0.0 kN to 1.0 kN in 0.2 kN increments and this the third measurement, circularity, may be the best way to analyse asperity stresses. Standardizing the experimental procedure and gathering more information by testing the remaining samples will provide more data to improve the method. The remaining samples' analysis will be performed by another student and will be followed by the comparison between empirical results and numerical analysis by Professor Sainoki.

The purpose of this experiment is to validate the hole deformation method to find asperity stress. Different plastic models are available for use, however comparing numerical results with laboratory tests will decide which plastic model is suitable to model the sample. If the results are conclusive, a paper may be published on the topic. The next step is to perform a similar experiment with concrete using x-rays to monitor the deformation in bubbles within the concrete. The final step involves measuring failure of rock samples which are loaded until just before peak stress. The ultimate goal of the research is to create an empirical equation for time-dependent asperity degradation. With good results produced in the first step in this series of experiments, the research is promising.

KNOWLEDGE GAINED AND SKILLS DEVELOPED

The literature review performed for proper theory review prior to experimentation provided a deep understanding behind the geometrical characteristics of fault surfaces and objective methods to quantify the roughness of joints. This work acquainted myself with topics such as fractal theory, its relevance, and the meaning behind its terms such as the fractal dimension. Reading papers linking fractal theory and joint roughness was eye-opening and it was interesting learn that rock surfaces can be characterized with fractal Brownian motion. After reviewing many fractal Brownian motion algorithms, a program was written to generate points on a rock-like surface based on a given JRC. The simple task of creating this program was the culmination of many experiences that improved not only my research skills, but my problem-solving and critical thinking skills as well.

This internship provided lots of experience with the Rhino CAD program as well as experience coding in FISH with Flac3D. However, the most improved skill during my time at IROAST was independent work. After a brief meeting at the beginning of the internship with Prof. Sainoki, the first month's work was summarized into three bullet points. From there, my success was determined by the work ethic I brought to Kumamoto. Without micromanagement or a clear outline of the steps I was supposed to take, I have grown significantly and have improved the way I tackle projects like these with little background on the subject.

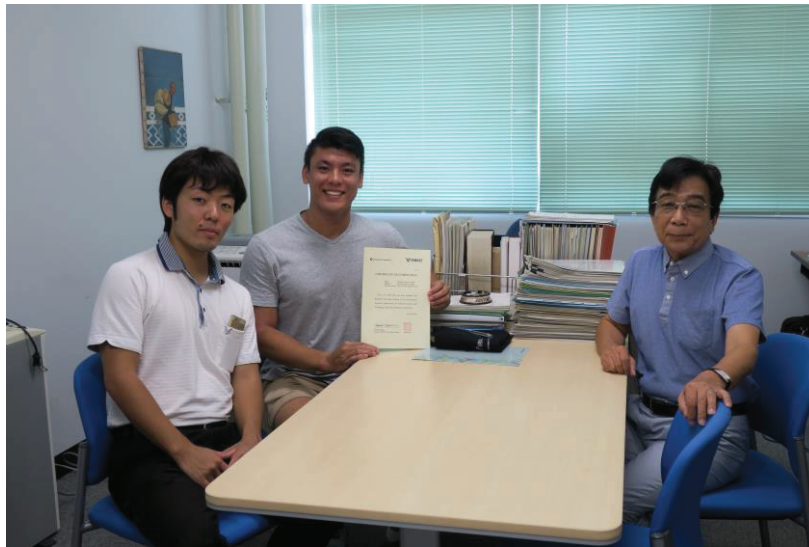
CONCLUSION & NEXT STEPS

The IROAST Internship has been an incredible experience. The learning environment fosters personal growth and the amount of support and kindness provided by everyone in the program contributed to a great learning experience. Working with Prof. Sainoki was very rewarding, and I thoroughly enjoyed working as his student. From this internship, I have grown and improved both personally, and academically.

Currently, I do not have any future research plans in mind as my focus is on graduation. Once I complete my degree, I hope to gain valuable work experience in the industry to compliment the research skills I have developed at IROAST. From working in mines, I hope to gain a deeper understanding of what kind of improvements the mining sector is looking for and hopefully, draw from ground-breaking research to improve the safety and efficiency of mining in Canada.

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(From left, host professor Sainoki, Mike and Director Hiyama)

No. 6-2	Practice of in vitro analysis of nanoparticles		
Name	Woocheol Kim		
Affiliation	Email: papo3187@gmail.com	Status	IROAST Young Internship Researcher
Research Field	Advanced Green Bio		
Period of Internship	January 21, 2019-February 21, 2019		
Host Professor	Ruda Lee		
Affiliation	IROAST Email: aeju-lee@kumamoto-u.ac.jp	Title	Associate Professor

I would like to thank IROAST for giving me a valuable opportunity. I was a student studying nanotechnology and Kumamoto University was a starting point for me to improve my skills. The professor's sincere guidance and the professional equipment that Kumamoto University possesses have made my experiments to be brilliant.

Generally, I made the particle based on the paper, but depending on the situation, I could change it to the desired condition, and I could measure the state and the component of the particle through various experiment equipments like TEM. I also learned how to check the stability of particles used H-NMR machine and by evaluating whether the particles could be toxic to the cells used MTT assay process. As a result, I was able to acquire the entire understanding and technology of nanoparticle development and cell experiment.

I was able to use the excellent equipment of Kumamoto University to direct me how to experiment in the future. I able to complete the plan so that I could proceed to animal experiments in the future. I would like to thank IROAST and my post professor for hard work. I want to tell the students who are reading this paper. Do not worry. IROAST will make your best memories and experiences. I promise.



No. 6-3	Cellular analysis of nanoparticles behavior		
Name	Wonseok Choi		
Affiliation	Email: ko3suom@gmail.com	Status	IROAST Young Internship Researcher
Research Field	Advanced Green Bio		
Period of Internship	January 21, 2019-February 21, 2019		
Host Professor	Ruda Lee		
Affiliation	IROAST Email: aeju-lee@kumamoto-u.ac.jp	Title	Associate Professor

First of all, I would like to thank everyone at IROAST Headquarters, Professor Ruda Lee, and everyone at Labs for their support for my research at Kumamoto University.

I was assigned a clean bench in the lab and learned basic knowledge about cell culture, especially how to grow and manage cells and how to treat drugs and test cell viability. Furthermore, I was able to see advanced experimental equipment such as TEM (transmission electron microscopy), H-NMR, and confocal microscopy, and actually see how they were used. I was able to learn many cell-related experiments that could be done in-vitro for a short period of a month. This will be a great help for my research life in the future.

My research goal is a pure science of signaling for degenerative diseases such as Alzheimer 's. Recently, inorganic particles such as iron oxide nanoparticles have attracted great interest to researchers because of their therapeutic effects related to the brain. My goal is pure science and far from nanotechnology, but I believe in the near future, nanotechnology will be used as a powerful tool in all fields.

I will use nanotechnology as a technology and tool in brain degenerative disease research. I think that it is the best value that an engineer can do by saving people suffering from brain diseases through engineering techniques.

The memories of Kumamoto University will never be forgotten. Thank you for all your support.



In front of cherry tree at Kumamoto University international house



Seminar with Woocheol Kim about our experiments

IROAST Symposiums

No.	Title	Organizer	Date
1	2nd IROAST Symposium–International Workshop on Geomechanics from Micro to Macro–Trends and Challenges	Jun Otani FAST/IROAST Gioacchino Viggiani IROAST Visiting Professor	06/11/2018
2	3rd IROAST Symposium–Kumamoto Symposium on Advanced Nano & Supramolecular Materials (KSANSM)	Shinya Hayami FAST	08/06/2018
3	4th IROAST Symposium–8th PHOENICS International Symposium: New Waves in Supramolecular Chemistry and Superstructured Materials	Hiroataka Ihara FAST	01/24/2019- 01/25/2019

KU-KAIST Joint Symposium

No.	Title	Organizer	Date
1	1st KU–KAIST Joint Symposium–3 rd IRCMS & IROAST Joint Seminar	Toshio Suda IRCMS Takashi Hiyama IROAST	10/22/2018
2	2nd KU-KAIST Joint Symposium–4 th IRCMS & IROAST Joint Seminar	Toshio Suda IRCMS Takashi Hiyama IROAST	01/25/2019

IRCMS: International Research Center for Medical Sciences, Kumamoto University

IROAST Symposium Report 1

Organizer 1	Name	Jun Otani		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Organizer 2	Name	Gioacchino (Cino) Viggiani		
	Affiliation	Universite Grenoble Alpes 3SR, CNRS, France	Title	Professor Director
Symposium Title	2 nd IROAST Symposium–International Workshop on Geomechanics from Micro to Macro–Trends and Challenges			
Venue	905, Kurokami South C3, Kumamoto University			
Time & Date	9:00-17:00, June 11, 2018			
Speaker’s Name/ Title/Affiliation	Prof. Jose Andrade, Caltech, USA Prof. Cino Viggiani, University of Grenoble, France Prof. Takashi Matsushima, Tsukuba University, Japan Prof. Itai Einav, University of Sydney, Australia Prof. Yosuke Higo, Kyoto University, Japan Prof. Toshifumi Mukunoki, Kumamoto University, Japan Dr. Daiki Takano, Port and Airport Research Institute, Japan			
Number of Participants	From KU	Faculty: 3 (Int'l participants: 0)	Total	23
		Students: 6 (Int'l participants: 5)		
	From outside KU	Faculty: 14 (Int'l participants: 5)		
		Students: 0 (Int'l participants: 0)		
<p>Since Prof. Cino Viggiani is the visiting professor of IROAST, the discussion on the possibility of having some international symposium or workshop at Kumamoto University was conducted when Prof. Hiyama and Prof. Otani visited 3SR, CNRS, University of Grenoble Alpes, France and this is the result of this discussion. The topic is one of the current issues for geomaterials or particulate media, which is the relation between micro and macro behaviors. After the discussion with Prof. Viggiani, we set the title as “International Workshop on Geomechanics from Micro to Macro – Trends and Challenges –”. Some number of active researchers worldwide including Japan were selected as lecturers for this workshop and this is total of 7 speakers. Following is the program of this workshop:</p> <p>09:00 – 09:10 Welcome speech by the Director of IROAST (Prof. Hiyama)</p> <p>09:10 – 09:20 Introduction to the workshop by Cino Viggiani</p> <p>09:20 – 10:00 Jose Andrade, Caltech (USA)</p> <p>“Is the discrete element method predictive? Who cares?”</p> <p>10:00 – 10:40 Cino Viggiani, University of Grenoble (France)</p> <p>“3D experimental micromechanics at the grain scale: what for?”</p> <p>COFFEE BREAK</p> <p>10:55 – 11:35 Takashi Matsushima, Tsukuba University (Japan)</p> <p>“Statistical granular mechanics approach toward distribution-based constitutive model”</p> <p>11:35 – 12:15 Itai Einav, University of Sydney (Australia)</p> <p>“Heterarchy in geomechanics – How macro looks at micro”</p>				

LUNCH

13:30 – 14:10 Yosuke Higo, Kyoto University (Japan)

“Observations of micro-scale geometry changes of unsaturated soils to interpret phenomenological behaviors”

14:10 – 14:50 Toshifumi Mukunoki, Kumamoto University (Japan)

“Prediction of Water Retention Curve of Granular Materials using Image Analysis of X-Ray CT”

COFFEE BREAK

15:05 – 15:45 Daiki Takano, Port and Airport Research Institute (Japan)

“Visualization of ground behavior in physical modeling with transparent soil”

15:45 – 16:30 Final discussion and closure

16:30 – 17:00 Visit of the X-Earth Center (X-ray CT apparatus)

Some of the photos are as follows:



Prof. Jose Andrade



Prof. Itai Einav



Prof. Cino Viggiani



Photo of all the participants

Total participants are 23 including 14 professors from other university (5 from abroad) and 6 graduate students (5 international students). As shown in the program, we started with opening speech by Prof. Hiyama of the Director of IROAST. All the lectures were very interesting and advanced contents and we had a fruitful discussion about this topic during the discussion time.

One of the related action is the MOU signing ceremony between IROAST and 3SR, CNRS, University of Grenoble Alpes in France. Prof. Hiyama, Prof. Viggiani and Prof. Otani attended this ceremony. Of course, IROAST expects another MOU with Caltech (USA) and University of Sydney (Australia) and this will be done soon.

June 11, Monday, 2018

9:00-16:30

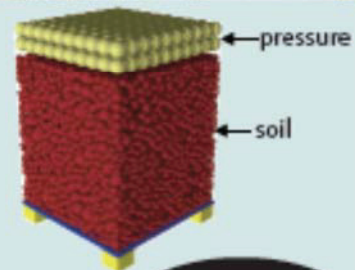
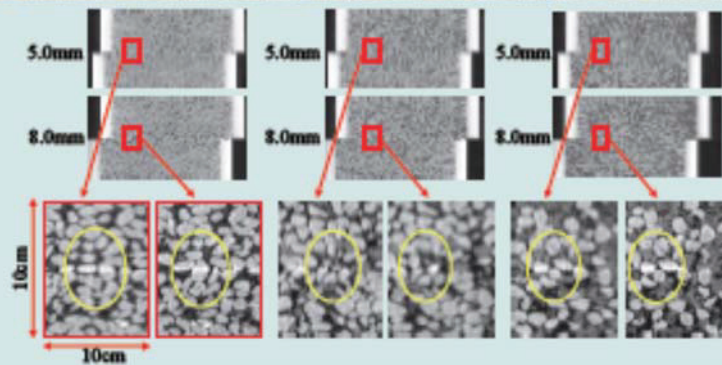
Kurokami South Campus: South C3(Mechanical System Engineering)
(Material Science and Engineering), 905
<http://www.kumamoto-u.ac.jp/en/about/access/campus/>

Pre-registration Required.

Please send 1.Name 2. Department/Division
to Organizer: Professor Jun OTANI
junotani@gpo.kumamoto-u.ac.jp

The 2nd IROAST Symposium

International Workshop on Geomechanics from Micro to Macro: Trends and Challenges



Free Admission

Lecture

Is the discrete element method predictive? Who cares?

Jose Andrade,
California Institute of Technology, USA

3D experimental micromechanics at the grain scale: what for?

Cino Viggiani,
Université Grenoble Alpes, France

Statistical granular mechanics approach toward distribution-based constitutive model

Takashi Matsushima,
Tsukuba University, Japan

Heterarchy in geomechanics – How macro looks at micro

Itai Einav,
The University of Sydney, Australia

Observations of micro-scale geometry changes of unsaturated soils to interpret phenomenological behaviors

Yosuke Higo,
Kyoto University, Japan

Prediction of Water Retention Curve of Granular Materials using Image Analysis of X-Ray CT

Toshifumi Mukunoki
Kumamoto University, Japan

Visualization of ground behavior in physical modeling with transparent soil

Daiki Takano,
Port and Airport Research Institute, Japan



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junotani@gpo.kumamoto-u.ac.jp
Faculty of Advanced Science and Technology

IROAST Symposium Inquiries
URA Chen(ext.3362 • 3303)
szk-kiko@jimu.kumamoto-u.ac.jp

IROAST Symposium Report 2

Organizer	Name	Shinya Hayami		
	Affiliation	Kumamoto University	Title	Professor
Symposium Title	3 rd IROAST Symposium–Kumamoto Symposium on Advanced Nano & Supramolecular Materials (KSANSM)			
Venue	Kumamoto University, 100th Anniversary Hall			
Time & Date	9:30-18:00, August 6, 2018			
Speaker's Name/ Title/Affiliation	Leonard F. Lindoy (Univ. Sydney) Peter Comba (Univ. Heidelberg) Janusz S. Lipkowski (Cardinal Stefan Wyszynski Univ.) Ok-Sang Jung (Pusan National Univ.) Malcolm Halcrow (Univ. Leeds) Masato Machida (Kumamoto Univ.) Martino Di Serio (Università di Napoli Federico II) Javier Campo (Univ. Zaragoza) Takafumi Kitazawa (Toho Univ.) Selvan Demir (Univ. Göttingen) Yoichi Habata (Toho Univ.) Murray Baker (Univ. Western Australia) Toshihiro Ihara (Kumamoto Univ.) Kil Sik Min (Kyungpook National Univ.) Jonathan R. Nitschke (Univ. of Cambridge) Gang Wei (CSIRO)			
Number of Participants	From KU	Faculty: 8 (Int'l participants: 1)	Total	62
		Students: 40 (Int'l participants: 4)		
	From outside KU	Faculty: 14 (Int'l participants: 12)		
		Students: 0 (Int'l participants: 0)		
<p>1. Symposium Overview</p> <p>KSANSM is an international meeting to tie and foster relationships in various fields of chemistry (nano materials and supramolecular chemistry). Following ICC2018 in Sendai, KSANSM was held as the Post ICC2018. The symposium aims to amalgamate international high-profilers and young scientists in nano- and supramolecular chemistry, this time with a special focus on f-block elements, and the applications of functional materials in diverse areas in order to promote visibility of our disciplines.</p> <p>The KSANSM was held at Kumamoto University on 6th August 2018. We aimed to bring many delegates to the symposium from all over the world, working in nano- and supramolecular chemistry and the applications of functional materials in diverse areas. The KSANSM featured outstanding invited speakers with international reputations, as well as student’s poster presentations.</p> <p>2. Symposium Outcomes and Future Plan (e.g. about contribution to the development of young researchers and the initiation of international collaborative research aiming for the publication of international collaborative papers, etc.)</p> <p>Now I have many international collaborators with Prof. Lindoy, Prof. Min and so on. Furthermore, Prof. Comba asked to me about agreement and exchange program. Prof. Serio also ask to me about agreement, and I also apply for him as a visiting professor in IROST.</p> <p>In near future, we will publish many papers with collaborated results.</p> <p>3. Others</p> <p>Finally, I would like to thank this support for Kumamoto Symposium on Advanced Nano &</p>				



The 3rd IROAST Symposium



Kumamoto Symposium on Advanced Nano & Supramolecular Materials

2018

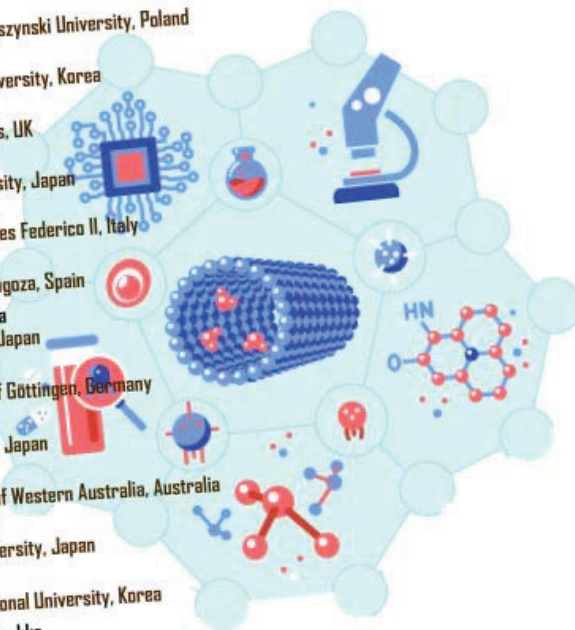
08 06, 9:30-18:00

100th Anniversary Hall

Guest Speakers

Leonard F. Lindoy
The University of Sydney, Australia
Peter Comba
Heidelberg University, Germany
Janusz Lipkowski
Cardinal Stefan Wyszyński University, Poland
Ok-Sang Jung
Pusan National University, Korea
Malcolm Halcrow
University of Leeds, UK
Masato Machida
Kumamoto University, Japan
Martino Di Serio
University of Naples Federico II, Italy
Javier Campo
University of Zaragoza, Spain
Takafumi Kitazawa
Toho University, Japan
Selvan Demir
The University of Göttingen, Germany
Yoichi Habata
Toho University, Japan
Murray Baker
The University of Western Australia, Australia
Toshihiro Ihara
Kumamoto University, Japan
Kil Sik Min
Kyungpook National University, Korea
Jonathan R. Nitschke
University of Cambridge
Gang Wei
Commonwealth Scientific and Industrial Research Organisation, Australia

Free Admission



Organizer

Professor HAYAMI Shinya
Faculty of Advanced Science and Technology
hayami@kumamoto-u.ac.jp

Sponsor

IROAST Symposium Inquiries
szk-kiko@jimu.kumamoto-u.ac.jp

IROAST Symposium Report 3

Organizer	Name	Hirotaka Ihara		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Symposium Title	4 th IROAST Symposium–8 th PHOENICS International Symposium: New Waves in Supramolecular Chemistry and Superstructured Materials			
Venue	100 th Anniversary Hall, Kumamoto University			
Time & Date	13:00-17:05, January 24, 2019 8:50-17:20, January 25, 2019			
Speaker's Name/ Title/Affiliation	Reiko ODA (Research Director, CNRS, University of Bordeaux, France) Takashi SAGAWA (Prof., Kyoto University, Japan) Jeanne CRASSOUS (Research Director, CNRS, Université de Rennes, France) Yutaka OKAZAKI (Assist. Prof., Kyoto University, Japan) Naoya RYU (Researcher, Kumamoto Industrial Research Institute, Japan) Kyohei YOSHIDA (Researcher, Kumamoto Industrial Research Institute, Japan) Toshihiko SAKURAI (Assoc. Prof., Tottori University, Japan) Atsuomi SHUNDO (Assoc. Prof., Kyushu University, Japan) Masamichi NISHIHARA (Assoc. Prof., Kyushu University, Japan) Longhai GUO (Assoc. Prof., Beijing University of Chemical Technology, China) Xiaoyu LI (Prof., Beijing University of Chemical Technology, China) Audrius Sigita MARUSKA (Prof., Vytautas Magnus University, Lithuania) Etsuko FUJITA (Senior Chemist, Brookhaven National Laboratory, USA) Hirokuni JINTOKU (Researcher, National Institute of Advanced Industrial Sci. and Tech.) Tomoyasu MANI (Assist. Prof., University of Connecticut, USA) Eugenio CORONADO (Prof., University of Valencia, Spain) You-Lo HSIEH (Prof., University of California at Davis, USA) Jaehwan KIM (Fellow Prof., Inha University, Korea) Kazuo KITAGAWA (Fellow, Kyoto Municipal Institute of Industrial Tech. and Culture) Asahiro NAGATANI (Deputy Manager, Hyogo Prefectural Institute of Technology) Shuichi ASAKURA (Research Specialist, Industrial Tech. Center Gifu Prefectural Gov.) Maki HORIKAWA (Senior Researcher, Kumamoto Industrial Research Institute, Japan)			
Number of Participants	From KU	Faculty: 9 (Int'l participants: 0)	Total	145
		Students: 64 (Int'l participants: 4)		
	From outside KU	Faculty: 52 (Int'l participants: 14)		
		Students: 20 (Int'l participants: 20)		

1. Symposium Overview

The 4th IROAST symposium was held on 24-26 January, 2019 at the 100th Anniversary Hall, Kumamoto University. This symposium involved three scientific sessions, which were assigned to "Chiral Technology", "Advanced Materials Related with Analysis, Environment and Energy", and "Nano-Cellulose". The topics in this symposium were focused on advanced materials for cutting edge technologies in biology, medicine, analytical chemistry, environmental chemistry and energy science. We organized 21 invited talks from 7 countries (France, USA, Spain, China, Lithuania, Korea, Japan) written below, including two Visiting Professors of IROAST, Dr. Reiko Oda (CNRS and University of Bordeaux, France) and Dr. Etsuko Fujita (Brookhaven National Laboratory, USA). Almost 150 participants including more than 80 students joined the symposium and exchanged scientific discussions in each invited talk.

The scientific session-A, "Chiral Technology", was organized with the French partner, Dr. Oda, as an annual meeting of the France-Japan Laboratoire International Associé on "Chiral Nanostructures for Photonic Applications" (LIA-CNPA), between University of Bordeaux and Kumamoto University.

The program of symposium is briefly written below:

< **Session A:** New Waves for Chiral Technologies > (24th January, 2019)

[Opening Remarks] Takashi Hiyama, [Congratulatory Remarks] Isao Taniguchi, Isao

[Invited Talk] R. ODA (CNRS, Univ. of Bordeaux, France), T. SAGAWA (Kyoto Univ.), J. CRASSOUS (CNRS, Univ. de Rennes, France), Y. OKAZAKI (Kyoto Univ.), N. RYU (Kumamoto Industrial Research Institute), K. YOSHIDA (Kumamoto Industrial Research Institute), T. SAKURAI (Tottori Univ.)

< **Session B:** Waves for Advanced Materials Related with Analysis, Environment and Energy > (25th January)

[Invited Talk] A. SHUNDO (Kyushu Univ.), M. NISHIHARA (Kyushu Univ.), L. GUO and X. LI (Beijing Univ. of Chemical Tech., China), A. S. MARUSKA (Vytautas Magnus Univ., Lithuania), E. FUJITA (Brookhaven National Lab., USA), H. JINTOKU (National Institute of Advanced Industrial Sci. and Tech.), T. MANI (Univ. of Connecticut, USA), E. CORONADO (Univ. of Valencia, Spain)

< **Session C:** New Waves on Nano-Celluloses and Their Composites > (25th January)

[Invited Talk] Y.-L. Hsieh (Univ. of California at Davis, USA), J. KIM (Inha Univ., Korea), K. KITAGAWA (Kyoto Municipal Institute of Industrial Tech. and Culture), A. NAGATANI (Hyogo Prefectural Institute of Tech.), S. ASAKURA (Industrial Tech. Center Gifu Prefectural Gov.), M. HORIKAWA (Kumamoto Industrial Research Institute)

< Excursion > (26th January)

Organized committee: Hirotaka Ihara, Makoto Takafuji, Yutaka Kuwahara and Yoko Ryu in FAST, Kumamoto Univ.; Shoji Nagaoka, Tomohiro Shirotsaki and Maki Horikawa in Kumamoto Industrial Research Institute.

2. Future Prospects / Improvements

The LIA-CNPA has been undergoing since 2015. We have also succeeded to promote the second period of the LIA-CNPA for next four years. We believe that our collaboration will be accelerated through the 4th IROAST symposium.





The 4th IROAST Symposium
the 8th PHONICS International Symposium

Free Admission

New Waves in Supramolecular Chemistry and Superstructured Materials

2019 January 24-25

100th Anniversary Hall, Kumamoto University

13:00-17:05, January 24th(Thur.)

Session-A New Waves for Chiral Technologies

ODA, Reiko
CNRS, University of Bordeaux, France

SAGAWA, Takashi
Kyoto University, Japan

CRASSOUS, Jeanne
CNRS, Université Rennes, France

OKAZAKI, Yutaka
Kyoto University, Japan

RYU, Naoya
Kumamoto Industrial Research Institute, Japan

YOSHIDA, Kyohei
Kumamoto Industrial Research Institute, Japan

SAKURAI, Toshihiko
Tottori University, Japan

8:50-17:20, January 25th(Fri.)

Session-B New Waves for Advanced Materials Related with Analysis, Environment and Energy

SHUNDO, Atsushi
Kyushu University, Japan

NISHIHARA, Masamichi
Kyushu University, Japan

GUO, Longhai; LI, Xiaoyu
Beijing University of Chemical Technology, China

MARUSKA, Audrius Sigita
Vytautas Magnus University, Lithuania

FUJITA, Etsuko
Brookhaven National Laboratory, USA

JINTOKU, Hirokuni
National Institute of Advanced Industrial
Science and Technology, Japan

MANI, Tomoyasu
University of Connecticut, USA; Presto, Japan

CORONADO, Eugenio
University of Valencia, Spain

Organizer

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Takafuji Makoto
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Kuwahara Yutaka
kuwahara@kumamoto-u.ac.jp

Sponsor

International Research Organization for Advanced
Science and Technology(IROAST)
Kumamoto Institute for Photo-Electro-Organics (PHONICS)
Forum of Supramolecular and Superstructural Chemistry and
Superstructural Materials, Kumamoto University
Kumamoto Prefecture

Session-C New Waves on Nano-Celluloses and Their Composites

HSIEH, You-Lo
University of California at Davis, USA

KIM, Jaehwan
Inha University, Korea

KITAGAWA, Kazuo
Kyoto Municipal Institute of Industrial
Technology and Culture, Japan

NAGATANI, Asahiro
Hyogo Prefectural Institute of Technology, Japan

ASAKURA, Shuichi
Industrial Technology Center Gifu Prefectural
Government, Japan

HORIKAWA, Maki
Kumamoto Industrial Research Institute Japan

KU-KAIST Joint Symposium Report 1

Organizer 1	Name	Toshio Suda		
	Affiliation	IRCMS, Kumamoto University	Title	Director
Organizer 2	Name	Takashi Hiyama		
	Affiliation	IROAST, Kumamoto University	Title	Director
Symposium Title	1 st KU-KAIST Joint Symposium–3 rd IRCMS & IROAST Joint Seminar			
Venue	Matrix Hall, KI Building, KAIST, Daejeon, Korea			
Time & Date	9:30-17:00, October 22, 2018			
Speaker's Name/ Title/Affiliation	Hitoshi Takizawa, IRCMS, Kumamoto University (KU) Jinju Han, KAIST Goro Sashida, IRCMS, KU Koichi Nishiyama, IRCMS, KU Injune Kim, KAIST Guojun Sheng, IRCMS, KU Ho Min Kim, KAIST Takumi Higaki, IROAST, KU Hidenobu Mizuno, IRCMS, KU Pilhan Kim, KAIST Aeju Lee, IROAST, KU Young Seok Ju, KAIST Yorifumi Satou, IRCMS, KU Yufeng Zheng, IROAST, KU Jaemyoung Suh, KAIST Gou Young Koh, KAIST			
Number of Participants	From KU	Faculty: 15 (Int'l participants: 2)	Total	40
		Students: 0 (Int'l participants: 0)		
	From outside KU	Faculty & students: 25 (Int'l participants: 25)		
		Students: - (Int'l participants: -)		

The 1st KU-KAIST Joint Symposium was held on October 22nd, 2018 at Matrix Hall, KI Building, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea.

The symposium was jointly organized by KAIST and Kumamoto University (KU), and it was also held as the 3rd IRCMS & IROAST Joint Seminar (IRCMS: The International Research Center for Medical Sciences, Kumamoto University; IROAST: The International Research Organization for Advanced Science and Technology, Kumamoto University.).

The symposium started with the opening remarks by Prof. Yong-Mahn Han, the Dean of College of Life Science & Bioengineering, KAIST. Then, before starting joint sessions, the Introduction of GSMSE, KAIST by Prof. Gou Yong Koh, the Introduction of IRCMS by Prof. Takizawa, and the Introduction of IROAST by Prof. Hiyama followed.

The Symposium theme was “Stem cell-vascular biology and related technologies.” Six primary investigator (PIs) from IRCMS, 3PIs from IROAST and 5 PIs from KAIST introduced their cutting-edge researches in the four sessions of “Cell Biology,” “Vascular Biology,” “New Technology” and “Human Disease.”

The aim of this symposium was to match potential research collaborations between Kumamoto University and KAIST, in the field of bio-engineering to harness medicine and technology, in particular, bio-imaging (microscopy, nanotechnology and microfluidics) and single cell analysis (big data informatics, mathematical modeling, etc.) . Also, we agreed to have The 2nd KU-KAIST Joint Symposium that has been scheduled on January 25, 2019 in Kumamoto, Japan.



KAIST-KU Joint Symposium



• Program

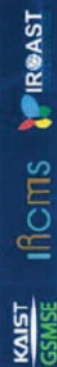
Time	Talk Title	Speaker (Affiliation)
09:30~09:35	Opening Remarks	Yong-Mahn Han (KAIST)
09:35~09:45	Introduction of GSMSE, KAIST	Gou Young Koh (KAIST) Injune Kim (KAIST)
09:45~10:00	Introduction of IRCMS, IROAST, KU	Hiroshi Takizawa (IRCMS) Takashi Hiyama (IROAST)
Session I. Cell Biology		
10:00~10:20	1. Inflammation-instructed modification and alteration of early hematopoiesis	Hiroshi Takizawa (KU-IRCMS)
10:20~10:40	2. Small noncoding RNAs in Neurogenesis	Jinju Han (KAIST)
10:40~11:00	3. Epigenetic dysregulation in the development of leukemia	Goro Sushida (KU-IRCMS)
11:00~11:10	Short Break	
Session II. Vascular Biology		
11:10~11:30	1. Endothelial angiogenic morphogenesis and the modifiers	Koichi Nishiyama (KU-IRCMS)
11:30~11:50	2. Dlk1 regulation of adult blood-retina barrier	Injune Kim (KAIST)
11:50~12:10	3. Epithelial-Mesenchymal Transition in development and disease	Guojun Sheng (KU-IRCMS)
12:10~13:30	Lunch (KAIST Faculty Club)	

Session III. New Technology

13:30~13:50	1. Single particle EM from low to high resolution for macromolecular complex structure & biomedical research	Ho Min Kim (KAIST)
13:50~14:10	2. Biomechanical clustering and classification	Takumi Higashi (KU-IRCMS)
14:10~14:30	3. In vivo two-photon imaging of developing neuronal circuits in the cerebral cortex	Hidenobu Mizuno (KU-IRCMS)
14:30~14:50	4. Intravital microscopy for dynamic cellular phenotype analysis, in vivo	Pilsan Kim (KAIST)
14:50~15:10	5. Multi-functional polymeric nanoparticles for target drug delivery and molecular imaging	Aeju Lee (KU-IRCMS)
15:10~15:30	Short Break	

Session IV. Human Disease

15:30~15:50	1. Timing and patterns of structural variations in lung adenocarcinoma	Young Seok Ju (KAIST)
15:50~16:10	2. Massive single cell profiling of peripheral blood from human T-cell leukemia virus infected individuals	Yorifumi Saitou (KU-IRCMS)
16:10~16:30	3. Biological response of degradable metallic biomaterials by stem cell model and animal testings	Yuleng Zheng (KU-IRCMS)
16:30~16:50	4. FGF1 takes on new roles in metabolism and tissue homeostasis	Jaemyoung Suh (KAIST)
16:50~17:00	Closing Remark & Group Photo	Gou Young Koh (KAIST)



KU-KAIST Joint Symposium Report 2

Organizer 1	Name	Toshio Suda		
	Affiliation	IRCMS, Kumamoto University	Title	Director
Organizer 2	Name	Takashi Hiyama		
	Affiliation	IROAST, Kumamoto University	Title	Director
Symposium Title	2 nd KU-KAIST Joint Symposium–4 th IRCMS & IROAST Joint Seminar			
Venue	Kumamoto City Medical Association Hall			
Time & Date	9:30-17:10, January 25, 2019			
Speaker's Name/ Title/Affiliation	<p> Young Seok Ju, KAIST Hiroto Ohguchi, Faculty of Life Sciences, KU Tokio Tani, FAST, KU Takashi Minami, Faculty of Life Sciences, KU Jae Myoung Suh, KAIST Takatsugu Ishimoto, IRCMS Su-Hyung Park, KAIST Masaya Baba, IRCMS Injune Kim, KAIST Yuichiro Arima, Faculty of Life Sciences, KU Gou Young Koh, KAIST/ IBS Vascular Biology Center Toshio Suda, IRCMS/ CSI Takuro Niidome, FAST Thinh Minh Do, GSST Pihan Kim, KAIST Yoshitaka Nakanishi, FAST </p> <p> KU: Kumamoto University KAIST: Korea Advanced Institute of Science and Technology, Korea IBS: Institute for Basic Science, Korea CSI: Cancer Science Institute, Singapore IRCMS: International Research Center for Medical Sciences, Kumamoto University IROAST: International Research Organization for Advanced Science and Technology, Kumamoto University FAST: Faculty of Advanced Science and Technology, Kumamoto University GSST: Graduate School of Science and Technology, Kumamoto University </p>			
Number of Participants	From KU	Faculty: 37 (Int'l participants: 10)	Total	79
		Students: 26 (Int'l participants: 13)		
	From outside KU	Faculty: 11 (Int'l participants: 10)		
		Students: 5 (Int'l participants: 5)		

IRCMS, IROAST and KAIST had their 2nd Joint Symposium on January 25, 2019 at the Kumamoto City Medical Association Hall. This joint symposium followed the first one held on October 22, 2018 at KAIST, Daejeon, Korea. The aim of the symposium was to match potential research collaborations between Kumamoto University and KAIST in the field of bio-engineering to harness medicine and technology, in particular, bio-imaging (microscopy, nanotechnology and microfluidics) and single cell analysis (big data informatics, mathematical modeling, etc.).

The symposium started with KU President Harada's opening remarks. Its theme was "Integrating basic and translational biomedical research." Ten researchers from KU and five researchers from KAIST made presentations on their research achievements in the four sessions entitled "Genetic and epigenetic mechanisms in disease," "Metabolism and cancer," "Stem cell and cardiovascular biology," "Cutting-edge technology." About 80 people attended the symposium and exchanged their opinions. The symposium was closed by Dean Yong-Mahn Han from KAIST.

The next 3rd KU-KAIST Symposium will be held in Daejeon in 2019.



At Kumamoto Castle (Jan. 24)



2nd KU-KAIST Joint Symposium



Opening remarks by KU President Shinji Harada



Prof. Tokio Tani, FAST



Prof. Takuro Niidome, FAST



Prof. Yoshitaka Nakanishi, FAST



Mr. Thanh Minh Do, GSST



Closing remarks by Dean Yong-Mahn Han, KAIST



The 2nd KU-KAIST Joint Symposium

~The 3rd IRCMS-IROAST Joint Seminar~

January 25(Fri.), 2019

Kumamoto City Medical Association Hall

Time	Speaker	Affiliation	Talk title
9:30-9:35	Shinji Harada (President)	KU	Opening remarks
Session I	Genetic and epigenetic mechanisms in disease Chaired by Takashi Minami		
9:35-9:55	Young Seok Ju	KAIST	Cell identities and driver mutations of thymic epithelial tumors
9:55-10:15	Hiroto Ohguchi	Faculty of Life Sciences	The biological and molecular functions of histone demethylases in multiple myeloma
10:15-10:35	Tokio Tani	FAST	Novel roles of non-coding RNAs in chromatin dynamics and their application to anti-cancer drugs
10:35-10:55	Takashi Minami	Faculty of Life Sciences	Epigenomics of endothelial cell identity and the activation
10:55-11:05	Short Break		
Session II	Metabolism and cancer Chaired by Jae Myoung Suh		
11:05-11:25	Jae Myoung Suh	KAIST	FGF1 takes on new roles in metabolism and tissue homeostasis
11:25-11:45	Takatsugu Ishimoto	IRCMS	The role of extracellular vesicles derived from cancer-associated fibroblasts on drug-resistance in gastric cancer
11:45-12:05	Su-Hyung Park	KAIST	Heterogenous T-cell exhaustion in cancer
12:05-12:25	Masaya Baba	IRCMS	Metabolic regulation by TFE3 in cell proliferation and differentiation
12:25-14:00	Lunch Break		
Session III	Stem cell and cardiovascular biology Chaired by Injune Kim		
14:00-14:20	Injune Kim	KAIST	Dll4 regulation of adult blood-retina barrier
14:20-14:40	Yuichiro Arima	Faculty of Life Sciences	Ketone body metabolism and cardiovascular diseases
14:40-15:00	Gou Young Koh	KAIST/IBS Vascular Biology Center	Organ specific lymphatic capillaries
15:00-15:20	Toshio Suda	IRCMS/CSI	Mitochondrial Metabolism in hematopoietic stem cells
15:20-15:40	Coffee Break		
Session IV	Cutting-edge technology Chaired by Yoshitaka Nakanishi		
15:40-16:00	Takuro Niidome	FAST	Drug delivery system controlled by photothermal effect of metallic nanoparticles
16:00-16:20	Thinh Minh Do	GSST	Automatic time-series analysis of Online Activities
16:20-16:40	Pilhan Kim	KAIST	Real-time intravital microscopy platform for <i>in vivo</i> live cell imaging
16:40-17:00	Yoshitaka Nakanishi	FAST	Macrophage activation induced by particle generated from artificial joint
17:00-17:05	Yong-Mahn Han (Dean)	KAIST	Closing Remarks

Affiliation

KU: Kumamoto University

KAIST: Korea Advanced Institute of Science and Technology, Korea

IBS: Institute for Basic Science, Korea

CSI: Cancer Science Institute, Singapore

IRCMS: International Research Center for Medical Sciences, Kumamoto University

IROAST: International Research Organization for Advanced Science & Technology, Kumamoto University

FAST: Faculty of Advanced Science and Technology, Kumamoto University

GSST: Graduate School of Science and Technology, Kumamoto University

The 2nd KU-KAIST Joint Symposium

January 25 (Fri.), 2019

9:30-17:10

Kumamoto City Medical Association Hall

Theme:

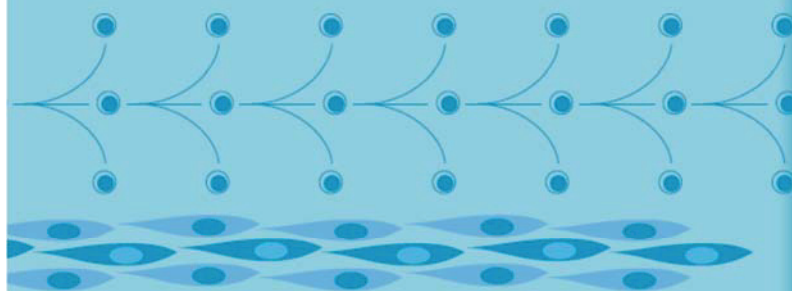
Integrating basic and translational biomedical research

Session I. Genetic and epigenetic mechanisms in disease

Session II. Metabolism and cancer

Session III. Stem cell and cardiovascular biology

Session IV. Cutting-edge technology



Korea Advanced Institute of Science and Technology (KAIST)
The International Research Center for Medical Sciences (IRCMS)
International Research Organization for Advanced Science & Technology (IROAST)
Faculty of Advanced Science and Technology (FAST)
Graduate School of Science and Technology (GSST)

SPEAKERS

Young Seok Ju

Korea Advanced Institute of Science and Technology

Hiroto Ohguchi

Faculty of Life Sciences, Kumamoto University

Tokio Tani

FAST, Kumamoto University

Takashi Minami

Faculty of Life Sciences, Kumamoto University

Jae Myoung Suh

Korea Advanced Institute of Science and Technology

Takatsugu Ishimoto

IRCMS, Kumamoto University

Su-Hyung Park

Korea Advanced Institute of Science and Technology

Masaya Baba

IRCMS, Kumamoto University

Injune Kim

Korea Advanced Institute of Science and Technology

Yuichiro Arima

Faculty of Life Sciences, Kumamoto University

Gou Young Koh

Korea Advanced Institute of Science and Technology
Vascular Biology Center, Institute for Basic Science (IBS)

Toshio Suda

IRCMS, Kumamoto University
Cancer Science Institute (CSI) of Singapore

Takuro Niidome

FAST, Kumamoto University

Thinh Minh Do

GSST, Kumamoto University

Pilhan Kim

Korea Advanced Institute of Science and Technology

Yoshitaka Nakanishi

FAST, Kumamoto University

IROAST Seminars

No.	Title	IROAST Speaker (Organizer)	Date
1	29th IROAST Seminar–Special Lecture at X-Earth Center: Full-field methods and multi-scale approaches in experimental geomechanics	Gioacchino Viggiani IROAST Visiting Professor (Jun Otani , FAST)	06/13/2018
2	30th IROAST Seminar–Basics of Image Processing and Analysis (9 series)	Patrice Delmas IROAST Visiting Professor (Toshifumi Mukunoki , FAST)	06/27/2018 06/29/2018 07/04/2018 07/06/2018 07/11/2018 07/13/2018
3	31st IROAST Seminar–International Workshop for Advancing Imaging, Image Processing and Data Visualization in the BRAIN/MINDS and MBIE Catalyst Projects	Patrice Delmas IROAST Visiting Professor (Toshifumi Mukunoki , FAST/ Patrice Delmas)	07/10/2018
4	32nd IROAST Seminar–Kinetic Evolution of Chiral Molecular Assemblies: Molecular Chirality to Supramolecular Chirality	Reiko Oda IROAST Visiting Professor (Hiroataka Ihara , FAST)	08/07/2018
5	33rd IROAST Seminar–2nd IROAST & IRCMS Joint Seminar	Mitsuhiro Aida IROAST Professor Takumi Higaki IROAST Associate Professor (Jun Otani , FAST/ Hitoshi Takizawa , IRCMS)	08/21/2018
6	34th IROAST Seminar–Kumamoto International Symposium on Recent Advancements of Mineralogy and Petrology XI and The Eighth Meeting of Research Consortium on High-pressure Research	Krzysztof Wojciechowski AGH University of Science and Technology, Poland (Akira Yoshiasa , FAST/ Fuyuki Shimojo , FAST)	10/01/2018

7	35th IROAST Seminar–The role of weathering in the carbon cycle at different time scales	Jens Hartmann IROAST Visiting Professor (Takahiro Hosono , POIE/ Jens Hartmann)	10/04/2018
8	36th IROAST Seminar–Part I: "Understanding the Fundamentals of Biomass Fractionation in Sub/Supercritical Water"/ Part II: "Supercritical Water Oxidation for Clean Energy Production"	Maria Jose Cocero IROAST Visiting Professor (Tetsuya Kida , FAST/ Armando T. Quitain , College of Cross-Cultural and Multidisciplinary Studies)	10/11/2018 10/18/2018
9	37th IROAST Seminar–International Symposium on Advanced Materials Having Multi-Degrees-of-Freedom	Marc de Boissieu IROAST Visiting Professor Matthieu Micoulaut IROAST Visiting Professor László Pusztai IROAST Distinguished Professor (Ichiro Akai , FAST/ Shinya Hosokawa , FAST)	11/01/2018- 11/02/2018
10	38th IROAST Seminar–Kumamoto International Symposium on Recent Advancements of Mineralogy and Petrology XI and The Eighth Meeting of Research Consortium on High-pressure Research	Kenneth Koga Université Blaise Pascal5, Clermont-Ferrand, France Estelle Rose-Koga Laboratoire Magmas et Volcans, CNRS, France (Akira Yoshiasa , FAST/ Tadao Nishiyama , FAST)	11/02/2018

11	39th IROAST Seminar–Fundamentals of Grain Boundary Segregation and Related Phenomena	Pavel Lejček IROAST Visiting Professor (Sadahiro Tsurekawa, FAST)	11/07/2018
12	40th IROAST Seminar–Autonomous Robots–Theory and Success for Real Field Autonomy	Tomonari Furukawa IROAST Visiting Professor (Makoto Kumon, FAST/ IROAST)	11/08/2018
13	41st IROAST Seminar–Historical Origins of Public Health	Josep-Lluís Barona-Vilar IROAST Visiting Professor (Kazuaki Otsubo, Faculty of Life Sciences/ Hirotaka Ihara, FAST)	11/28/2018
14	42nd IROAST Seminar–The latest technology advancement for sustainable energy development	Agus Sasmito McGill University, Canada Ali Madiseh The University of British Columbia, Canada (Atsushi Sainoki, IROAST/ Yuzo Obara, FAST)	12/04/2018
15	43rd IROAST Seminar–Exploring ammonia as carbon free fuel: A bottom up approach	Debasish Chakraborty Technical University of Denmark, Denmark Satoshi Hinokuma, FAST/ IROAST (Satoshi Hinokuma, FAST/ IROAST)	12/05/2018

16	44th IROAST Seminar–Enhanced Properties of Biodegradable Magnesium Alloys After Severe Plastic Deformation	Alexei Vinogradov Norwegian University of Science and Technology, Norway (Yoshihito Kawamura, MRC)	12/06/2018
17	45th IROAST Seminar–IPPS Lecture & Seminar No. 42	Konstantinos Kontis IROAST Distinguished Professor (Hamid Hosano, IPPS)	12/11/2018
18	46th IROAST Seminar–IPPS Lecture & Seminar No. 43	Viren Menezes IROAST Visiting Professor (Hamid Hosano, IPPS)	12/13/2018
19	47th IROAST Seminar–Chemical modification of RNA in control of mammalian gene expression	Ramesh S. Pillai IROAST Visiting Professor (Tokio Tani, FAST)	12/14/2018
20	48th IROAST Seminar–Chirality in crystallography	Massimo Nespolo Université de Lorraine, CNRS, CRM2, France (Akira Yoshiasa, FAST/ Tadao Nishiyama, FAST)	12/18/2018
21	49th IROAST Seminar–Materials processing with supercritical fluids	Youn-Woo Lee Seoul National University, Republic of Korea Olivier Boutin Aix-Marseille University, France (Mitsuru Sasaki, IPPS)	01/24/2019
22	50th IROAST Seminar–Building a Better Mousetrap–The Continuing Quest for More Reliable Models of Clay Behavior	Andrew J. Whittle Massachusetts Institute of Technology, USA (Jun Otani, FAST)	01/29/2019

23	51st IROAST Seminar–Sol-Gel Ru/SiO ₂ catalysts for Green Chemistry	Martino Di Serio IROAST Visiting Professor (Shinya Hayami , FAST)	02/01/2019
24	52nd IROAST Seminar–Structural and mechanical properties of rejuvenated metallic glasses	Christian Rentenberger IROAST Visiting Professor (Mitsuhiro Matsuda , FAST)	02/21/2019
25	53rd IROAST Seminar–What governs the ductility of metals?	Alexey Vinogradov Norwegian University of Science and Technology, Norway (Yoshihito Kawamura , MRC)	02/21/2019
26	54th IROAST Seminar–Recent developments in the study of grain/twin boundary mediated plasticity	Dmitri A. Molodov IROAST Visiting Professor (Sadahiro Tsurekawa , FAST)	02/28/2019
27	55th IROAST Seminar–New Aspects of Chemical Bonding in Solids using Orbitals and Plane Waveselit	Richard Dronskowski RWTH Aachen University, Germany (Akira Yoshiasa , FAST/ Tadao Nishiyama , FAST)	03/05/2019
28	56th IROAST Seminar–IPPS Lecture & Seminar No.48	Hamid Ghandehari IROAST Visiting Professor (Hamid Hosano , IPPS)	03/14/2019

MRC: Magnesium Research Center, Kumamoto University

IROAST Seminar Report 1

Organizer	Name	Jun Otani		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	29 th IROAST Seminar–Special Lecture at X-Earth Center: Full-field methods and multi-scale approaches in experimental geomechanics			
Venue	Kurukami South C3, 9 th floor room #905			
Time & Date	14:40-16:10, June 13, 2018			
Speaker’s Name/ Title/Affiliation	Prof. Cino Viggiani Professor of University of Grenoble Alpes, 3SR of CNRS, France (also Visiting Professor of IROAST)			
Number of Participants	From KU	Faculty: 2 (Int’l participants: 0)	Total	25
		Students: 22 (Int’l participants: 6)		
	From outside KU	Faculty: 1 (Int’l participants: 1)		
		Students: 0 (Int’l participants: 0)		
<p>Prof. Cino Viggiani visited Kumamoto University because of organizing international workshop on June 11, 2018. Since he was here at Kumamoto University, we asked him to give us research seminar for research students and this is the idea of having this seminar at this time.</p> <p>The seminar was organized by his own lecture on the topic on “Full-field methods and multi-scale approaches in experimental geomechanics”. In fact, he has done a lot of researches on this topic and also has given a lecture about this topic not only in his institution but also at the Alliance of Laboratories in Europe for Research and Technology (ALERT) . In his lecture, he showed us many of the results of his own research with his colleagues and those were very interesting for younger reseachers including research students and finally, he stated following message to the students:</p> <p><i>1. observing, measuring (w/statistics), understanding the relevant physics at some appropriately small scale</i></p> <p><i>2. injecting this physics into double-scale models or micro-inspired models (micro to macro)</i></p> <p><i>The success of multi-scale approaches crucially depends on the quality of the physics one injects: ideally, this comes directlyfrom experiments.</i></p> <p><i>There is still plenty of work (and fun) ahead of us!</i></p> <p>I hope many of our students have got some creative minds from this lecture. Finaly, some of the photos are shows for his lecture.</p>				



Prof. Viggiani



During lecture



Photo of all students with Prof. Viggiani at the end of his lecture

THE 29TH IROAST SEMINAR

**-SPECIAL LECTURE AT X-EARTH CENTER: FULL-FIELD METHODS AND
MULTI-SCALE APPROACHES IN EXPERIMENTAL GEOMECHANICS-**

DR. CINO VIGGIANI

PROFESSOR, UNIVERSITÉ GRENOBLE ALPES/
DIRECTOR, 3SR, CNRS, FRANCE
IROAST VISITING PROFESSOR

Time & Date	14:40-16:10, Wednesday, June 13, 2018
Venue	#905, Kurokami South C3, Faculty of Engineering Building 1
Organizer	Prof. Jun Otani, Faculty of Advanced Science and Technology junotani@gpo.kumamoto-u.ac.jp

IROAST Seminar Report 2

Organizer	Name	Toshifumi Mukunoki		
	Affiliation	Faculty of Advanced Science and Technology	Title	Associate Professor
Seminar Title	30 th IROAST Seminar–Basics of Image Processing and Analysis (9 series)			
Venue	Engineering Research tower #1 room 905			
Time & Date	June 27th (3rd-4th periods: 12:55-16:10) 29th (3rd period: 12:55-14:25) July 4th (3rd-4th periods: 12:55-16:10) 6th (3rd period: 12:55-14:25) 11th (3rd-4th periods: 12:55-16:10) 13th (3rd period: 12:55-14:25)			
Speaker's Name/ Title/Affiliation	Associate Professor Patrice Delmas, The University of Auckland, New Zealand			
Number of Participants	From KU	Faculty: 1 (Int'l participants: 0)	Total	23
		Students: 21 (Int'l participants: 5)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		
<p>1.Seminar Overview</p> <p>Over the course of 9 classes, Prof. Delmas provided students and academics introductory and medium difficulty level image processing knowledge related to the processes required to analyse CT-scan images. Formally Prof. Delmas first introduced main image related notions and simple descriptors, such as, normed histograms of pixel/voxel-wise signals or their pairwise co-occurrences. He then focused on adjusting visual appearance (in terms of integral brightness and contrast) to normalise an image and make it invariant to a few unessential signal deviations. One of the most popular processing tools, namely, a moving-window filtering to suppress some types of image noise and estimate local, or window-wide statistical signal features were introduced in detail. Examples such as linear mean and Gaussian filters, non-linear median and more general rank filters were provided and he gave actual exercise to students. Prof. Delmas followed with two simple techniques for image segmentation: Building a binary region map by pixel-wise classification, or thresholding signal values after analysing their histogram. He concluded with some basic morphological moving-window filtering to modify shapes of objects in a binary region map. ImageJ was used as a support teaching tool throughout the class.</p> <p>2. Seminar Outcomes and Future Plan</p> <p>Before Dr. Delmas visited Kumamoto University, we had discssuoion about this seried lecture. I knew students' status and let him know it. So, he prepared well organized note for this lecture. All students became foundamnetal user of Image J and could understand the fundamental mathematics of Image processing for well Image analysis. Especially, Dr Delmas did interact class during his lecture. Hence, students could understand his lecture well. I also tool his lecture and learned how to give interact lecture. This was one of great FD activity.</p> <p>3. Others</p>				



Other photos can be seen in below website:

<http://iroast.kumamoto-u.ac.jp/symposiumsseminars/the-30th-iroast-seminar/>

THE 30TH IROAST SEMINAR

BASICS OF IMAGE PROCESSING AND ANALYSIS (9 SERIES)

DR. PATRICE DELMAS

ASSOCIATE PROFESSOR, THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
IROAST VISITING PROFESSOR

Venue: #905, Kurokami South C3, Faculty of Engineering Building 1
Organizer: Assoc. Prof. Toshifumi Mukunoki, Faculty of Advanced
Science and Technology
mukunoki@kumamoto-u.ac.jp

-Schedule-

June

27th (12:55-16:10)

29th (12:55-14:25)

July

4th (12:55-16:10)

6th (12:55-14:25)

11th (12:55-16:10)

13th (12:55-14:25)

IROAST Seminar Report 3

Organizer 1	Name	Toshifumi Mukunoki		
	Affiliation	Kumamoto University	Title	Associate Professor
Organizer 2	Name	Patrice Delmas		
	Affiliation	The University of Auckland, New Zealand	Title	Associate Professor
Seminar Title	31 st IROAST Seminar–International Workshop for Advancing Imaging, Image Processing and Data Visualization in the BRAIN/MINDS and MBIE Catalyst Projects			
Venue	Room 224 Engineering lecture hall (C8)			
Time & Date	13:00-17:30, July 10th, Tue, 2018			
Speaker’s Name/ Title/Affiliation	Alexander Woodward: RIKEN, Japan Rui Gong : RIKEN, Japan Trevor Gee : The University of Auckland Patrice Delmas : The University of Auckland (IROAST Visiting Professor) Toshifumi Mukunoki: Kumamoto University			
Number of Participants	From KU	Faculty: 1 (Int'l participants: 0)	Total	26
		Students: 21 (Int'l participants: 5)		
	From outside KU	Faculty: 4 (Int'l participants: 4)		
		Students: 0 (Int'l participants: 0)		
13:00-13:05	Opening address	MC: Toshifumi Mukunoki		
13:05-13:10	Welcome speech from Patrice Delmas as a chair of workshop			
13:10-13:15	Welcome speech from Jun Otani as a vice director of IROAST			
13:15-13:55	Dr. Alexander Woodward			
	"The Brain/MINDS project: image processing techniques for 3D brain reconstruction and atlasing of the common marmoset "			
14:00-14:40	Dr. Rui Gong			
	"The Brain/MINDs project: tracer injection site segmentation and flat map construction "			
14:45-15:25	Dr. Trevor Gee			
	"3D object creation combining turn-table and stereo-SLAM "			
15min. break				
15:45-16:25	Assoc. Prof. Patrice Delmas			
	"In-situ multi-scale mapping for marine ecology and estuary health monitoring "			
16:30-17:10	Assoc. Toshifumi Mukunoki			
	"Application of X-ray CT for Geoenvironmental engineering"			
17:10-17:30	Discussion			

17:30

Closing remark

The 31 IROAST Seminar was held on July 10, 2018. The seminar was organized by Associate Professor Toshifumi Mukunoki from the Faculty of Advanced Science and Technology. The chair of this workshop was IROAST Visiting Professor Patrice Delmas from University of Auckland. After his welcome speech, IROAST Vice Director Jun Otani talked about IROAST and Kumamoto University. Four invited speakers gave interesting lectures related to the theme, “Image Processing and Data Visualization in the BRAIN/MINDS and MBIE Catalyst Projects” . Dr. Mukunoki also gave a talk about micro-macro mechniacs based on image analysis and concluded the workshop. About 20 faculty members and students attended the seminar.



Prof. Delmas (Left) and Prof. Otani (Right)



Group photo of all speakers

July 10th (Tue)
13:00-17:30

THE 31ST IROAST SEMINAR

INTERNATIONAL WORKSHOP
*for Advancing Imaging, Image Processing and Data Visualization
in the BRAIN/MINDS and MBIE Catalyst Projects*

SPEAKERS

➤ Dr. Alexander Woodward	RIKEN, Japan
➤ Dr. Trevor Gee	University of Auckland, New Zealand
➤ Dr. Rui Gong	RIKEN, Japan
➤ Dr. Patrice Delmas	University of Auckland, New Zealand (IROAST Visiting Professor)
➤ Dr. Toshifumi Mukunoki	Kumamoto University

Venue: #224, Engineering Lecture Hall
Organizer: Assoc. Prof. Toshifumi Mukunoki, FAST
mukunoki@kumamoto-u.ac.jp

IROAST Seminar Report 4

Organizer	Name	Hirotaka Ihara		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	32 nd IROAST Seminar–Kinetic Evolution of Chiral Molecular Assemblies: Molecular Chirality to Supramolecular Chirality			
Venue	International Seminar Room, 2F, Faculty of Engineering Research Building II-2 (Department of Applied chemistry and Biochemistry)			
Time & Date	10:00-11:00, August 7, 2018			
Speaker's Name/ Title/Affiliation	Reiko Oda, Research Director, CBMN UMR5248, CNRS, Université de Bordeaux, France (IROAST Visiting Professor)			
Number of Participants	From KU	Faculty: 6 (Int'l participants: 2)	Total	33
		Students: 23 (Int'l participants: 2)		
	From outside KU	Faculty: 4 (Int'l participants: 2)		
		Students: 0 (Int'l participants: 0)		

We invited Dr. Reiko Oda, who was a Visiting Professor of IROAST and a Research Director of CNRS (University of Bordeaux), France, and the 32nd IROAST seminar was held on August 7, 2018. The presenter, Dr. Oda, is also a collaborator based on the France-Japan Laboratoire International Associé on “Chiral Nanostructures for Photonic Applications” (LIA-CNPA) between University of Bordeaux and Kumamoto University. About 30 students and faculty members joined the seminar and had discussion about her talk entitled “Kinetic Evolution of Chiral Molecular Assemblies: Molecular Chirality to Supramolecular Chirality”.






The 32nd IROAST Seminar

Kinetic Evolution of Chiral Molecular Assemblies:
Molecular Chirality to Supramolecular Chirality

REIKO ODA, Ph.D.

Research Director
CBMN UMR5248, CNRS,
Université de Bordeaux, France



August 7th, 10:00-


@International Seminar Room,
2F, Engineering Research Bldg. II
(Applied Chemistry and Biochemistry)

Organizer/Contact

Prof. Hirotaka Ihara, FAST

Ext. 3662

dragon@chem.kumamoto-u.ac.jp



IROAST Seminar Report 5

Organizer 1	Name	Jun Otani		
	Affiliation	IROAST, Faculty of Advanced Science and Technology	Title	Vice Director, Professor
Organizer 2	Name	Hitoshi Takizawa		
	Affiliation	IRCMS	Title	Vice Director, Professor
Seminar Title	2 nd IROAST & IRCMS Joint Seminar–33 rd IROAST Seminar			
Venue	Meeting Room C, 2F Temporary Prefab Building D			
Time & Date	14:00-17:00, August 21st, 2018			
Speaker’s Name/ Title/Affiliation	Prof. Hitoshi Takizawa from IRCMS Assoc. Prof. Hidenobu Mizuno from IRCMS Prof. Mitsuhiro Aida from IROAST Assoc. Prof. Takumi Higaki from IROAST			
Number of Participants	From KU	Faculty: 32 (Int'l participants: 3)	Total	33
		Students: 1 (Int'l participants: 0)		
	From outside KU	Faculty: 0 (Int'l participants: 0)		
		Students: 0 (Int'l participants: 0)		

1. Seminar Overview

The first joint seminar with IRCMS was held at the Medical School in January 22, 2018 and at that time, both IROAT and IRCMS agreed that we have a periodic seminar. Under this agreement, the second joint seminer was held at IROAST at this time. The basic ideas at this time were as follows:

1) To have research presentations from both sides; and

2) To discuss about recent issues about our collaboration such as a) establishment of new joint research group, b) collaboration methods (exchanging both sides of research activities), c) and recent joint activity (KAIST symposium)

Following was the contetnts of the seminar with its time schedule:

14:00~

Opening address by Director Takashi Hiyama from IROAST

14:10~14:30

Prof. Hitoshi Takizawa from IRCMS
Title: “Single cell analysis for hematopoietic stem cell biology”

14:35~14:55

Assoc. Prof. Hidenobu Mizuno from IRCMS
Title: “In vivo two-photon imaging to elucidate mechanisms for brain development”

15:00~15:20

Prof. Mitsuhiro Aida from IROAST
Title: “Shoot stem cell formation in plant development”

15:25~15:45

Assoc. Prof. Takumi Higaki from IROAST
Title: “Quantification and classification of bioimages”

15:45~15:55

Break

15:55~16:55

Discussion
About feasibility of collaborative research with IRCMS and future plans, etc.

16:55~17:00

Closing address by Vice Director, Otani

In the discussion, followings were the agenda:

- 1) Joint research between IROAST and IRCMS
 / Possible group:
 - a) Dr. Nishiyama, Dr. Arima, Assoc. Prof. Mukunoki, Prof. Otani
 - b) Prof. Takizawa, Prof. Satoh, Prof. Sakurai (Single cell analysis)
 - c) Assoc. Prof. Mizuno, Assoc. Prof. Higaki, (Quantitative analysis of microscopic images)
 / How we do continue our collaboration in the future?
- 2) Joint seminar between IROAST and IRCMS
 / Twice per year (one at IROAST and the other at IRCMS)
 / Next schedule at IRCMS (topic and time schedule)
- 3) Remote Lecture of IRCMS/IROAST seminar: Simultaneous reporting through Web conference system
 / Theme for Remote Lecture
 Both IRCMS/IROAST director and vice director will select appropriate lectures from all of them
 / Permission of simultaneous reporting
 In case applying to an appropriate lecture, IRCMS/IROAST should confirm the lecture whether simultaneous reporting through Web conference system is OK or not beforehand.
 / How to remote lecture
 Use of the system called “Omunijoin”
- 4) KAIST-KU Joint Symposium
 / Date: Oct.22-23, Participants from IROAST: Prof. Hiyama, Prof. Zheng, and Prof. Lee

2. Seminar Outcomes and Future Plan (e.g. about contribution to the development of young researchers and the initiation of international collaborative research aiming for the publication of international collaborative papers, etc.)

- 1) About total of 4 lectures, we exchanged the current research activities for both IROAST and IRCMS. For IROAST, the topic of biology was selected and since the biology is the part of life science, so that there were comments and questions from IRCMS.
- 2) About discussion, we had a fruitful discussion about the joint activities, which are a) having periodic joint seminar twice a year (the next one (3rd) will be at IRCMS around December or January in this fiscal year, 2) exchanging seminar as a remote lecture using web system called “Omunijoin”, and the confirmation of the contents of KAIST-KU joint symposium (October 22-23 in this year).
- 3) In the discussion, the group discussion was also done in which both on going joint research and possible new group of research were discussed as a group discussion. Based on this discussion, not only on going joint research but also the new research topic will be started between IROAST and IRCMS. In fact, this is one of the main objective of this seminar.

As mentioned before, the main objective of this seminar is to enhance the joint research between IROAST and IRCMS and based on the discussion at this time, not only the exchanging research topics but also the way of joint activities such as having remote lecture system. The continuation of this joint activities are highly expected.

Finally, IROAST would like to appreciate following participants except the lecturers for their valuable discussion about the joint activities:

FAST: Prof. Prof. Sawa, Assoc. Prof. Ishikawa (Science Field),

Prof. Niidome, Prof. Sakurai, Assoc. Prof. Mukunoki (Engineering Field)

IRCMS: Prof. Sheng, Prof. Sashida, Assoc. Prof. Baba, Assoc. Prof. Nishiyama, Prof. Suzu, Prof. Ueno, Prof. Satoh, Assoc. Prof. Ishimoto

3. Others



Photo.1 Opening by Prof. Hiyama



Photo.2 MC by Prof. Otani



Photo.3 Photo of the lecture



Photo.4 Lecturers (Prof. Takizawa, Prof. Mizuno, Prof. Aida, and Prof. Higaki)



Photo.5 Presentation by Prof. Mukunoki



Photo.6 Group meeting



Free Admission

The 2nd IROAST&IRCMS Joint Seminar

-The 33rd IROAST Seminar-

2018

8. 21 (Tuesday) 14:00-17:00

Kurokami South Campus, Meeting Room C, 2F KUROkami South W14 Building D
(Faculty of Engineering Temporary School Building)
<http://www.kumamoto-u.ac.jp/en/about/access/campus/>

Single cell analysis for hematopoietic stem biology
Hitoshi Takizawa, Professor, IRCMS

In vivo two-photon imaging to elucidate mechanisms
for brain development

Hidehito Mizuno, Associate Professor, IRCMS

Shoot stem cell formation in plant development
Mitsuhiro Aida, Professor, IROAST

Quantification and classification of bioimages
Takumi Higaki, Associate Professor, IROAST

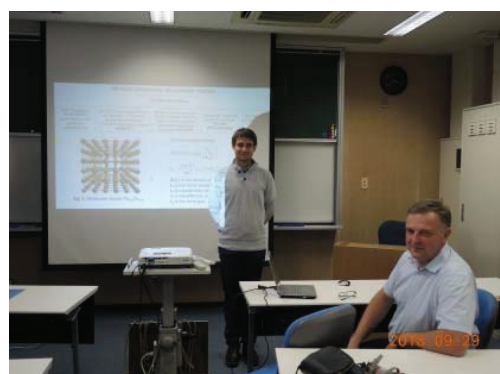
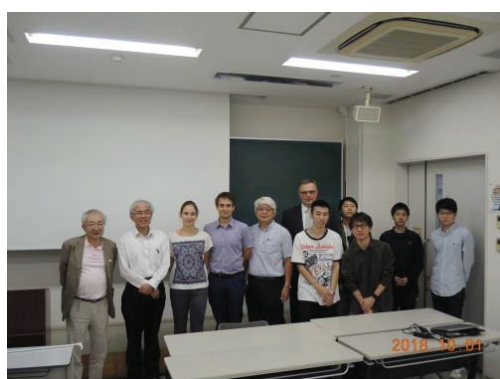
Organizer	Jun Otani	Hitoshi Takizawa
	Vice Director, IROAST	Vice Director, IRCMS
	Professor, FAST	

Contact for IROAST Seminar
szk-biko@jimu.kumamoto-u.ac.jp

IROAST Seminar Report 6

Organizer 1	Name	Akira Yoshiasa		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Organizer 2	Name	Fuyuki Shimojo		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	34 th IROAST Symposium–Kumamoto International Symposium on Recent Advancements of Mineralogy and Petrology XI and The Eighth Meeting of Research Consortium on High-pressure Research			
Venue	Department of Science, Building C 2F Auditorium C329			
Time & Date	October 1 (Monday), 2018. Symposium Ocrober 3 (Wednesday), 2018. Field Survey, Sampling and Facilities visit			
Speaker’s Name/ Title/Affiliation	Prof. Krzysztof Wojciechowski, Faculty of Materials Science and Ceramics, AGH University of Science and Technology, Poland Prof. Tsutomu Mashimo, Kumamoto University			
Number of Participants	From KU	Faculty: 13 (Int'l participants: 0)	Total	34
		Students: 17 (Int'l participants: 3)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 3 (Int'l participants: 3)		
16:40 - 16:50 Opening Remarks by Takashi Hiyama (IROAST, Kumamoto University)				
Session-1 (Chaired by Akira Yoshiasa) 16:50 -17:40 (50 minutes) Prof. Krzysztof Wojciechowski “New approach to the development of efficient materials for direct conversion of heat into electricity” 17:40 -18:10 (30 minutes) Prof. Tsutomu Mashimo “Materials processing and design under strong gravitational field”				
<p>The 34th IROAST Seminar was held on October 1st, 2018. The seminar was organized by Professor Akira Yoshiasa from the Faculty of Advanced Science and Technology (FAST). This time, the first half of the symposium took place from the viewpoint of research on thermoelectric elements under ultra-super gravity, in particular. Following IROAST Director Takashi Hiyama’s introduction of his organization, Professor Krzysztof Wojciechowski from the Faculty of Materials Science and Ceramics, AGH University of Science and Technology, Poland, and Professor Tsutomu Mashimo from FAST gave talks on their research. Some 33 faculty members and students attended the seminar and listened to the their presentations attentively.</p> <p>Through this international collaborative research, we aim to foster young researchers and publish international collaborative research papers. Experimental and simulation studies are promoted to investigate the structure of condensed matters, and properties under extreme conditions. The experiments are performed in-situ, using technologically advanced equipment. The project aims at the construction of a theory that links nano-scale structures, the unique local structures of ppb-order trace elements in multi-element systems, macroscopic properties and histories. The researches are progressed by the collaboration with the researchers of foreign countries (Université de Lorraine and Université Blaise Pascal (France), Universitaet Bayreuth and RWTH Aachen (German), University of Chicago (USA))</p>				

and AGH University of Science and Technology (Poland). At Yoshiasa laboratory, the precise crystal analytical investigations have been carried out by using Synchrotron Radiation facilities to apply for the high pressure research of solids and for earth science. Yoshiasa group, Shimojo group and Mashimo group have coworked for the earth interior science research.



The 34th IROAST Seminar

The Kumamoto International Symposium on Recent Advancements of Mineralogy and Petrology XI
And
The Eighth Meeting of Research Consortium on High-pressure Research

16:50-17:40
"New approach to the development of efficient materials for direct conversion of heat into electricity"

Prof. Krzysztof Wojciechowski
Faculty of Materials Science and Ceramics,
AGH University of Science and Technology, Poland

Oct 1st (Mon) 16:40-
Place
C329, 3F, Faculty of Science Bldg. 2

Organizers
-Akira Yoshiasa, FAST
yoshiasa@kumamoto-u.ac.jp

-Fuyuki Shimojo, FAST
-Tsutomu Mashimo, FAST
-Shinya Hosokawa, FAST
-Masaru Aniya, FAST
-Hidetoshi Shibuya, FAST
-Tadao Nishiyama, FAST

17:40-18:10
"New materials processing and design under strong gravitational field"

Prof. Tsutomu Mashimo
Kumamoto University



IROAST Seminar Report 7

Organizer 1	Name	Dr. Takahiro Hosono			
	Affiliation	Priority Organization for Innovation and Excellence	Title	Associate Professor	
Organizer 2	Name	Dr. Jens Hartmann			
	Affiliation	Institute for Geology, Universität Hamburg, Germany	Title	Professor	
Seminar Title	35 th IROAST Seminar–The role of weathering in the carbon cycle at different time scales				
Venue	C329, Science-2				
Time & Date	16:30-17:30, October 4 th , 2018				
Speaker’s Name/ Title/Affiliation	Dr. Jens Hartmann/ Professor/ Institute for Geology, Universität Hamburg				
Number of Participants	From KU	Faculty: 4 (Int'l participants: 0)	Total	14	
		Students: 9 (Int'l participants: 0)			
	From outside KU	Faculty: 1 (Int'l participants: 1)			
		Students: 0 (Int'l participants: 0)			

1. Seminar Overview

Following matters are discussed in the seminar: Weathering is over geological time scale one of the major sinks for atmospheric CO₂. Dissolved inorganic carbon is transferred as alkalinity to the ocean where it is fixed in carbonates or to some proportion transferred back to the atmosphere. Over very long time scales the global weathering sink rate follows varying mantle degassing rates and helps to sustain climate conditions within habitable limits. Some of the major carbon cycle perturbations in Earth's history are closely linked with major trends and changes in weathering indices over the past 3 billions years, like the Lomagundi event (The Great Oxidation Event) or Snowball Earth events. Over shorter time scales certain geological settings (volcanic + humid) are the cause for a large part of the CO₂ sink silicate weathering. Recent findings suggest that the reactivity of the volcanic weathering sink can age rapidly. Based on model simulations it is suggested that climate change has already caused changes in the weathering sink and related nutrient release. Increasing knowledge about the weathering system has lead to suggestions to use Enhanced Weathering as one of the methods in a portfolio of Carbon dioxide Removal technologies within the next century. I will show that studying weathering can bring new insides into the evolution of the Earth system, and help to find solutions to manage the global carbon cycle and productivity of soils."

2. Seminar Outcomes and Future Plan

We have already conducted collaboration field surveys with many young researchers from both laboratories. We are submitting research articles and will submit more manuscripts for publications in international journals. However, the authors strongly require financial supports for publications.

3. Others




October 4th (Thu) 16:30-17:30

The 35th IROAST Seminar

The role of weathering in the carbon cycle at different time scales

Prof. Dr. Jens Hartmann
Institute for Geology, Universität Hamburg, Germany
IROAST Visiting Professor

Venue: C329, 3F, Faculty of Science Bldg.2
Organizer: Assoc. Prof. Takahiro Hosono, POIE
 hosono@kumamoto-u.ac.jp



IROAST Seminar Report 8

Organizer 1	Name	Tetsuya Kida		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Organizer 2	Name	Armando T. Quitain		
	Affiliation	College of Cross-Cultural and Multidisciplinary Studies	Title	Professor
Seminar Title	36 th IROAST Seminar Part I: "Understanding the Fundamentals of Biomass Fractionation in Sub/Supercritical Water"/ Part II: "Supercritical Water Oxidation for Clean Energy Production"			
Venue	Conference Room, Applied Chemistry and Biochemsitry Building			
Time & Date	October 11, 2018 (10:30-11:30) October 18, 2018 (10:30-11:30)			
Speaker's Name/ Title/Affiliation	Dr. Maria Jose COCERO Professor High Pressure Research Group/Department of Chemical Engineering and Environmental Technology, University of Valladolid (Spain) Email: mjcocero@iq.uva.es			
Number of Participants	From KU	Faculty: 4 (Int'l participants: 1)	Total	39
		Students: 34 (Int'l participants: 15)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		
<div>1. Seminar Overview</div> <div>The two seminars focused on the application of supercritical water to biomass fractionation and clean energy production. These twin seminars highlighted the technology that Prof. Cocero has been working with for over 3 decades, and were well attended by both undergraduate and graduate students from the Department of Applied Chemistry and Biochemistry. Participants from other departments were also present, and showed interests in the current trends in the biomass utilization technologies.</div> <div>2. Seminar Outcomes and Future Plan</div> <div>These seminar and lectures broadened the perspective of the participating students to the science and technology of this promising environmental technology. Possibility for future collaboration and joint international publication was also discussed after the twin seminars.</div> <div>3. Others</div>				



The 36th IROAST Seminar

Professor
Maria Jose COCERO

The University of Valladolid
Spain

Organizers
 -Prof. Tetsuya KIDA, FAST, tetsuya@kumamoto-u.ac.jp
 -Prof. Armando T. QUITAIN, College of Cross-Cultural and
 Multidisciplinary Studies, quitain@kumamoto-u.ac.jp

-Seminar 1-
**"Understanding the Fundamentals of Biomass
 Fractionation in Sub/ Supercritical Water"**
October 11 (Thu), 2018
 10:30-11:30
 @Meeting Room, 2F, Engineering Research Tower II
 (Applied Chemistry and Biochemistry)

-Seminar 2-
**"Supercritical Water Oxidation for Clean
 Energy Production"**
October 18 (Thu), 2018
 10:30-11:30
 @Meeting Room, 2F, Engineering Research Tower II
 (Applied Chemistry and Biochemistry)

IROAST Seminar Report 9

Organizer 1	Name	Ichiro Akai		
	Affiliation	Institute of Pulsed Power Science	Title	Professor
Organizer 2	Name	Shinya Hosokawa		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	37 th IROAST Seminar–International Symposium on Advanced Materials Having Multi-Degrees-of-Freedom			
Venue	Kurokami South E1 Building			
Time & Date	November 1-2, 2018			
Speaker’s Name/ Title/Affiliation	Marc de Boissieu, Dr., SIMaP, Univ. Grenoble Alpes, France Matthieu Micoulaut, Prof., Sorbonne Universite, France Tomas Wagner, Prof., University of Pardubice, Czech Republic Laszlo Pusztai, Prof., Hungarian Academy of Sciences, Hungary/IROAST, Kumamoto University, Japan Kouichi Hayashi, Prof., Nagoya Institute of Technology, Japan Yasuhiko Igarashi, Dr., JST PRESTO, The University of Tokyo, NIMS, Japan Yoshifumi Sakaguchi, Dr., Comprehensive Research Organization for Science and Society (CROSS), Japan Hiroyuki Kumazoe, Mr., GSST, Kumamoto University, Japan Koichi Shimakawa, Prof., Gifu University, Japan Jens R. Stellhorn, Dr., Department of Physics, Kumamoto University, Japan			
Number of Participants	From KU	Faculty: 2 (Int’l participants: 0)	Total	41
		Students: 30 (Int’l participants: 0)		
	From outside KU	Faculty: 9 (Int’l participants: 4)		
		Students: 0 (Int’l participants: 0)		
<p>The scope of the symposium [1] covered comprehensive researches on material science and technology for advanced materials having multi-degrees-of-freedom. The following topics were discussed in this symposium.</p> <ul style="list-style-type: none">• Informatics in Advanced Measurements• Materials Informatics• Structure and Electronic states for optical functionalities• Structural Imaging at active sites in advanced materials• Multi-DoFin superionicconducting phenomena• Hierarchical macro-structured materials• Optical Properties of amorphous materials• Dynamic processes under high temperature and high pressure• Novel methods for Spectroscopy and analysis for advanced materials• Control methods of multi-DoF by using extreme conditions <p>For this symposium, we invited ten distinguished researchers who are intensively investigating such</p>				

functional materials.

Dr. Marc de Boissieu, SIMaP, Univ. Grenoble Alpes, France
“Icosahedral quasicrystals : atomic structure and lattice dynamics”

Prof. Matthieu Micoulaut, Sorbonne Universite, France
“Characterizing structure and dynamics of chalcogenides from coupled approaches : rigidity and molecular simulations”

Prof. Tomas Wagner, University of Pardubice, Czech Republic
“Metal doped chalcogenides for nanoscale memories”

Prof. Laszlo Pusztai, Hungarian Academy of Sciences, Hungary/IROAST, Kumamoto University, Japan
“Understanding the structure of disordered materials via combinations of Molecular Dynamics Simulations and Reverse Monte Carlo modeling: handling information deficiency”

Prof. Kouichi Hayashi, Nagoya Institute of Technology, Japan
“Element-selective structural analyses of disordered systems by X-ray fluorescence holography”

Dr. Yasuhiko Igarashi, JST PRESTO, The University of Tokyo, NIMS, Japan
“Sparse modeling of extended X-ray absorption fine structures”

Dr. Yoshifumi Sakaguchi, Comprehensive Research Organization for Science and Society (CROSS), Japan
“Kinetics study on silver photodiffusion into amorphous germanium sulfide using neutron reflectivity technique”

Mr. Hiroyuki Kumazoe, GSST, Kumamoto University, Japan
“Non-adiabatic *ab initio* molecular dynamics study of electric properties of layered transition metal dichalcogenides”

Prof. Koichi Shimakawa, Gifu University, Japan
“Optical and Electronic Properties in Phase-Change Ge-Sb-Te System: Resonance bonds and metal-insulator transition”

Dr. Jens R. Stellhorn, Department of Physics, Kumamoto University, Japan
“A Model for the Fast Phase-Change Mechanism in Cu_2GeTe_3 ”

Four young scientists also present their own works concerning sciences on functional materials. Totally, more than 40 participants enjoyed the invited and contributed talks. See Fig. 1 for the photographs of the participants. We would like to continue this series of seminar soon to effectively improve our scientific level for materials science.

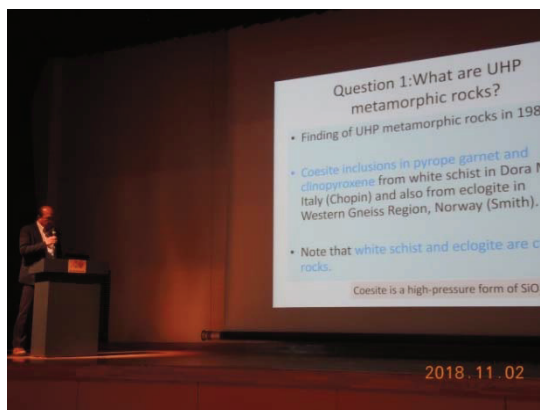
IROAST Seminar Report 10

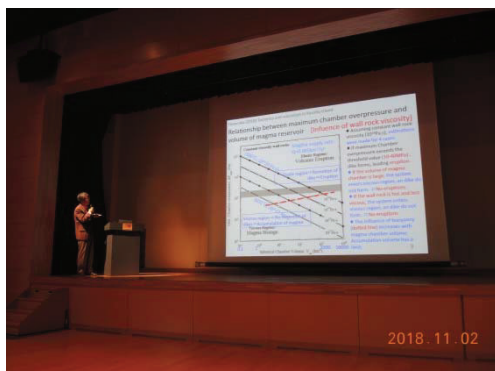
Organizer 1	Name	Akira Yoshiasa		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Organizer 2	Name	Tadao Nishiyama		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	38 th IROAST Seminar–Kumamoto International Symposium on Recent Advancements of Mineralogy and Petrology XI and The Eighth Meeting of Research Consortium on High-pressure Research			
Venue	The 100th Anniversary Hall			
Time & Date	November 2 (Friday), 2018 Symposium October 27-31, November 3-6, 2018. Field Survey and Sampling			
Speaker’s Name/ Title/Affiliation	Prof. Kenneth Koga, Université Blaise Pascal5, Clermont-Ferrand, France Prof. Tadao Nishiyama, Kumamoto University Dr. Nicolas Cluzel, Université Blaise Pascal5, Clermont-Ferrand, France Dr. Estelle Rose-Koga, Laboratoire Magmas et Volcans, CNRS, France Prof. Toshiaki Hasenaka, Kumamoto University			
Number of Participants	From KU	Faculty: 10 (Int'l participants: 0)	Total	42
		Students: 25 (Int'l participants: 0)		
	From outside KU	Faculty: 5 (Int'l participants: 5)		
		Students: 2 (Int'l participants: 2)		
10:00 - 10:10 Opening Remarks by Jun Otani (IROAST, Kumamoto University)				
Session-2 (Chaired by Akira Yoshiasa)				
10:10 -10:50 (40 minutes)				
Prof. Kenneth Koga (Université Blaise Pascal5, Clermont-Ferrand, France) “Experimental study of Li isotope fractionation during volcanic degassing”				
10:50 - 11:30 (40 minutes)				
Prof. Tadao Nishiyama (Kumamoto Univ.) “Ultrahigh pressure Nishisonogi and Higo Metamorphic Rocks, Kyushu, Japan, and its implication”				
11:30 - 12:10 (40 minutes)				
Dr. Nicolas Cluzel (Université Blaise Pascal5, Clermont-Ferrand, France) “Introducing the melt inclusion laboratory of Clermont. An application to melt inclusion from Montcineyre, Massif Central, France”				
Session-3 (Chaired by Hiroshi Isobe)				
13:30 -14:10 (40 minutes)				
Dr. Estelle Rose-Koga (Laboratoire Magmas et Volcans, CNRS, France)” “What can we learn from melt inclusion? The example of Iwate volcano, Japan”				
14:10 - 14:50 (40 minutes)				
Prof. Toshiaki Hasenaka (Kumamoto Univ.)				

“Tectonics and volcanism in Kyushu island: Why we had caldera-forming gigantic eruptions in Kyushu?”

The IROAST Seminar was held on November 2nd, 2018. The seminar was organized by Professor Akira Yoshiasa from the Faculty of Advanced Science and Technology (FAST). This time the second half of the symposium took place from the viewpoint of the study of huge volcanic eruption and ultrahigh pressure metamorphic rock in particular. Following IROAST Vice Director Jun Otani's introduction of his organization, Professor Kenneth Koga and Dr. Nicolas Cluzel from the Université Blaise Pascal, Clermont-Ferrand, France, Dr. Estelle Rose-Koga from Laboratoire Magmas et Volcans, CNRS, France and Professors Tadao Nishiyama and Toshiyasu Hasenaka from FAST gave talks on their research. Some 42 faculty members and students attended the seminar and listened to their presentations attentively.

To increase the research activity of “the precise atomic level structure observation and physical property under extreme condition”, we entered into the Agreement on Academic Exchange between Graduate School of Science and Technology, Kumamoto University and Faculté des Sciences et Technologies, Université Blaise Pascal, Clermont-Ferrand, France. Through this international collaborative research, we aim to foster young researchers and publish international collaborative research papers. Experimental and simulation studies are promoted to investigate the structure of condensed matters, and properties under extreme conditions. The experiments are performed in-situ, using technologically advanced equipment. The project aims at the construction of a theory that links nano-scale structures, the unique local structures of ppb-order trace elements in multi-element systems, macroscopic properties and histories. The researches are progressed by the collaboration with the researchers of foreign countries (Université de Lorraine and Université Blaise Pascal (France), Universitaet Bayreuth and RWTH Aachen (German), University of Chicago (USA) and AGH University of Science and Technology (Poland). At Yoshiasa laboratory, the precise crystal analytical investigations have been carried out by using Synchrotron Radiation facilities to apply for the high pressure research of solids and for earth science. Yoshiasa group, Shimojo group and Mashimo group have coworked for the earth interior science research.





The 38th IROAST Seminar

The Kumamoto International Symposium on Recent
Advancements of Mineralogy and Petrology XI
And
The Eighth Meeting of Research Consortium on High-
pressure Research

Organizers/Chairpersons

Akira Yoshiasa, FAST
yoshiasa@kumamoto-u.ac.jp
Hiroshi Isobe, FAST
Fuyuki Shimojo, FAST
Tsutomu Mashimo, FAST
Shinya Hosokawa, FAST
Masaru Aniya, FAST
Yoichi Nakajima, FAST
Hidetoshi Shibuya, FAST
Tadao Nishiyama, FAST



November 2, 2018
10:00-14:50
100th Anniversary Hall

Speakers

- Prof. Kenneth Koga, Université Blaise Pascal, Clermont-Ferrand, France
- Prof. Tadao Nishiyama, Kumamoto University
- Dr. Nicolas Cluzel, Université Blaise Pascal, Clermont-Ferrand, France
- Dr. Estelle Rose-Koga, Laboratoire Magmas et Volcans, CNRS, France
- Prof. Toshiaki Hasenaka, Kumamoto University

IROAST Seminar Report 11

Organizer	Name	Sadahiro Tsurekawa		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	39 th IROAST Seminar–Fundamentals of grain boundary segregation and related phenomena			
Venue	#308, Faculty of Engineering Research Building I			
Time & Date	14:40-16:10, November 7, 2018			
Speaker’s Name/ Title/Affiliation	Pavel Lejček, Professor, Institute of Physics, Academy of Sciences of the Czech Republic, Czech Republic, AND University of Chemistry and Technology, Prague, Czech Republic			
Number of Participants	From KU	Faculty: 5 (Int'l participants: 1)	Total	33
		Students: 27 (Int'l participants: 2)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		
<p>Prof. P. Lejček delivered a special lecture on “<i>Fundamentals of grain boundary segregation and related phenomena</i>” on November 7, 2018. More than 30 audiences including academic staffs and graduate students in Kumamoto University attended his lecture (<i>see photo 1</i>). The abstract of his lecture is as follows:</p> <p>Grain boundaries are important components of the structure in polycrystalline materials, which seriously affect the properties of the parts used in applications. One of the important phenomena affecting this behavior is their chemical composition, which differs from that of the grain interior, i.e., grain boundary segregation. The seriousness of this phenomenon can be demonstrated by the fact that extended segregation changes the bonds at the grain boundaries and consequently their cohesion, which can result in quick intergranular brittle fracture. On the other hand, solute atoms accumulated at the grain boundaries reduce their mobility thus stabilizing the structure of nanocrystalline materials.</p> <p>In this lecture, fundamentals of the grain boundary segregation will be presented. After short description and classification of grain boundaries, the methods to study the grain boundary segregation will be shown. Further, basic segregation isotherms will be derived and effect of various parameters influencing the chemical composition of the grain boundaries will be discussed. Finally, the relationship between grain boundary segregation and other materials phenomena will be mentioned.</p>				

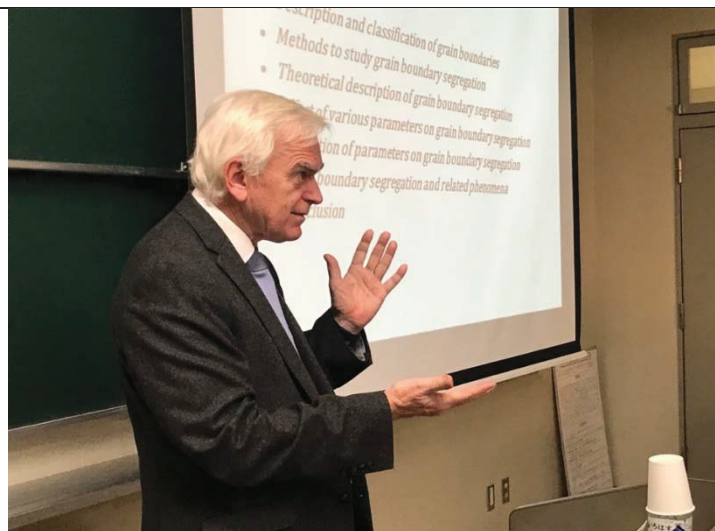


Photo 1



Photo 2

The 39th IROAST Seminar


FUNDAMENTALS OF GRAIN BOUNDARY SEGREGATION AND RELATED PHENOMENA

Prof. Pavel Lejček

Institute of Physics, AS CR, Prague, Czech Republic, and
University of Chemistry and Technology in Prague, Czech Republic

November 7

Time & Date: 14:40-16:10, Wednesday, November 7, 2018
Place: #308, 3F, Faculty of Engineering Bldg. I
Organizer: Prof. Sadahiro Tsurekawa, FAST
turekawa@kumamoto-u.ac.jp



IROAST Seminar Report 12

Organizer	Name	Makoto Kumon		
	Affiliation	FAST/IROAST	Title	Associate Professor
Seminar Title	40 th IROAST Seminar Autonomous Robots–Theory and Success for Real Field Autonomy–			
Venue	Rm211, Kogakubu 2-goukan			
Time & Date	15:00-16:00, November 8, 2018			
Speaker’s Name/ Title/Affiliation	Tomonari Furukawa, Professor, Department of Mechanical Engineering, Virginia Tech. (IROAST Visiting Professor)			
Number of Participants	From KU	Faculty: 8 (Int'l participants: 0)	Total	41
		Students: 28 (Int'l participants: 4)		
	From outside KU	Faculty: 1. Industrv: 3 (Int'l participants: 0)		
		Students: 1 (Int'l participants: 0)		

1. Seminar Overview

Professor Furukawa gave a talk on his research topics, Recursive Bayesian Estimation for autonomous systems and its application to Search, Tracking, Localization and Mapping (STLAM) problem. He also introduced acoustic source localization in practical cases, or in Human-Centric environment, and future plans to extend the approach to develop devices to support visually impaired people.

2. Seminar Outcomes and Future Plan

As most of participants of the seminar were master course students including several international students, the seminar was organized not only to present the cutting-edge technology, but also to motivate them to explore field-robotics which is one of active research fields. Some of participants were seriously attracted to the talk, and they were eager to communicate with the professor.

Non-line of sight sound source localization device for visually impaired people that was shown in the seminar is one of the collaborative research projects between VT and KU, and KU project member had a project meeting with Prof. Furukawa even after the seminar.

Search and tracking of acoustic target by a drone, that is studied by a KU group, also exchanged ideas with the professor, which might be published in the near future.

3. Others



THE 40TH IROAST SEMINAR

NOVEMBER 8, 2018

15:00-16:00

@#211, FACULTY OF ENGINEERING BLDG. II

**Autonomous Robots
- Theory and Success for Real Field Autonomy -**

Prof. Tomonari FURUKAWA
Department of Mechanical Engineering, Virginia Tech, USA

Organizer: Makoto KUMON, IROAST/FAST
kumon@gpo.kumamoto-u.ac.jp



IROAST Seminar Report 13

Organizer 1	Name	Kazuaki Ohtsubo		
	Affiliation	Faculty of Life Sciences	Title	Professor
Organizer 2	Name	Hirotaka Ihara		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	41 st IROAST Seminar–Historical Origins of Public Health			
Venue	#C503, School of Health Sciences Bldg. C (Honjo South 1)			
Time & Date	18:00-19:30, November 28, 2018			
Speaker’s Name/ Title/Affiliation	Prof. Josep-Lluís BARONA-VILAR Professor Instituto de Historia de la Medicina y de la Ciencia López Piñero (IHMC), Universidad de Valencia, Spain			
Number of Participants	From KU	Faculty: 21 (Int'l participants: 0)	Total	39
		Students: 17 (Int'l participants: 0)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		

1.Seminar Overview

Public health is a scientific discipline relevant to epidemiology, biostatistics and health services, aiming to prevent disease and to promote human health. Environmental health, community health, behavioral health, health economics, public policy, mental health and occupational safety, gender issues in health, sexual and reproductive health are other important subfields. Well-understanding of the history of public health is very important for training medical staffs and Health care professionals.

At this time, we invited Dr. Josep-Lluís Barona-VILAR, a visiting professor of IROAST, to give a lecture entitled “Historical Origins of Public Health” to students of school of health sciences and graduate school of Health Sciences Kumamoto University. At the following discussion session, we had many profound discussions.

2. Seminar Outcomes and Future Plan

This seminar attracted and stimulated attending students and faculty staffs very much. This was good opportunity to think about the elements of health care, wellness, social medicine, and so on. Many attendees would like to have more seminars like this in the future.

3. Others





The 41st IROAST Seminar

-Historical Origins of Public Health-

Prof. Josep-Lluís BARONA-VILAR

Instituto de Historia de la Medicina y de la Ciencia
López Piñero (IHMC), Universidad de Valencia, Spain

18:00-, November 28 (WED), 2018

#C503 School of Health Sciences Bldg. C (Honjo South 1)

Organizer: Prof. Kazuaki OHTSUBO, Faculty of Life Sciences

kohtsubo@kumamoto-u.ac.jp

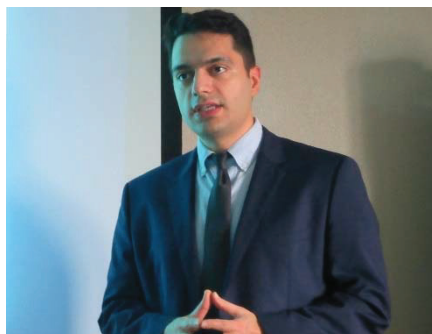
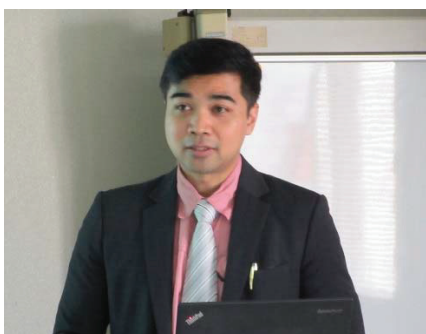


IROAST Seminar Report 14

Organizer 1	Name	Atsushi Sainoki		
	Affiliation	Kumamoto University	Title	Associate Professor
Organizer 2	Name	Yuzo Obara		
	Affiliation	Kumamoto University	Title	Professor
Seminar Title	42 nd IROAST Seminar–The latest technology advancement for sustainable energy development			
Venue	Room 905, Kurokami C3			
Time & Date	13:00-14:30, Dec. 4, 2018			
Speaker's Name/ Title/Affiliation	Agus Sasmito/Assistant Professor/McGill University Ali Madiseh/Assistant Professor/University of British Colombia			
Number of Participants	From KU	Faculty: 2 (Int'l participants: 1)	Total	14
		Students: 9 (Int'l participants: 2)		
	From outside KU	Faculty: 3 (Int'l participants: 2)		
		Students: 0 (Int'l participants: 0)		

1. This seminar is about sustainable energy development, particularly focusing on the energy utilization of deep underground mines as well as geothermal energy development. Prof. Sasmito talked about the novel methodology to optimize a ground freezing method being used for an uranium mine in Canada, while Prof. Madiseh presented a coaxial ground heart exchanger that is being used to extract heat from a geothermal reservoir with the aim of reducing the cost of geothermal energy development. Also, he talked about the other interesting methodologies related to the use of sustainable energy like storing solar energy in rock pile for winter. Students at Kumamoto university showed a strong interest in the novel methogologies regarding renewable energy use.

2. After the seminar, it was found that the geothermal energy development with a coaxial heat exchanger is also beging studied by a Japanese private company in Japan. Then, we visited the geothermal site located in Oita prefecture after the seminar with Dr. Madiseh and Dr. Sasmito, although the visit had not been planed before the seminar. At the site in Oita prefecture, the engineer of the company explained what is going on and what has been investigated in the past there regarding the response of the geothermal reservoir under the influence of the coaxial heat exchanger while showing actual monitoring data. The discussion was really meaningful for all of us. Then, we had decided to conduct collaborative research on this topic in the future while working with the private company.





The 42nd IROAST Seminar

The latest technology advancement for sustainable energy development

Prof. Agus Sasmito *McGill University*

Prof. Ali G. Madiseh *The University of British Columbia*

13:00-16:00 December 4 (Tue), 2018

#905 Faculty of Engineering Bldg. I

Organizers: Assoc. Prof. Atsushi Sainoki, IROAST

atsushi_sainoki@kumamoto-u.ac.jp

Prof. Yuzo Obara, FAST



IROAST Seminar Report 15

Organizer	Name	Satoshi Hinokuma		
	Affiliation	Faculty of Advanced Science and Technology / IROAST	Title	Assistant Professor
Seminar Title	43 rd IROAST Seminar–Exploring ammonia as carbon free fuel: A bottom up approach			
Venue	Building-II (Department of Applied Chemistry and Biochemistry) Room #203 (2F, meeting room)			
Time & Date	15:00-17:00, 5th (Wed.), December, 2018			
Speaker's Name/ Title/Affiliation	Dr. Satoshi Hinokuma (Kumamoto University) Title: Catalytic combustion for ammonia as a carbon-free energy source Dr. Debasish Chakraborty (Technical University of Denmark, RenCat) Title: Exploring ammonia as carbon free fuel: A bottom up approach			
Number of Participants	From KU	Faculty: 2 (Int'l participants: 1)	Total	13
		Students: 10 (Int'l participants: 0)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		

1. Seminar Overview

First, Dr. Satoshi Hinokuma made the presentation entitled “Catalytic combustion for ammonia as a carbon-free energy source”. In the introduction, history of NH₃ fuel, micro gas turbine firing NH₃ fuel and comparison with fossil fuel was presented. He talked that we focused on a novel catalytic combustion system and copper oxides catalysts supported on aluminum silicates to overcome NH₃ fuel issues (a high ignition temperature and its use results in the production of N₂O/NO_x). Finally, he proposed a reaction mechanism for catalytic NH₃ combustion. In the time for question and answer, int'l participant asked about the effect of acidity and basicity for the catalysts on catalytic combustion properties.

Next, Dr. Debasish Chakraborty was introduced as a scientific expert of heterogeneous catalyst conversions of NH₃. Dr. Debasish Chakraborty made the presentation entitled “Exploring ammonia as carbon free fuel: A bottom approach”. In his presentation, he exhibited a bottom-up approach to design a novel and high performance core-shell Ru-Cu nanoparticle catalyst for the oxidation of NH₃ to N₂, and also noted that the potentiality of NH₃ fuel as a renewable and carbon-free energy source. In addition, he showed the activities for CEO (RenCat, <http://rencat.net/index.html>), which received Eurostars investment in a €1.25 million project to develop the next generation and more robust NH₃ to H₂ generator. In the time for question and answer, KU students asked about NH₃ potential as a renewable and carbon-free energy source and the activities for CEO. It was considered that his activities of academia and business led to advantages to this seminar for KU students.



2. Seminar Outcomes and Future Plan

Dr. Satoshi Hinokuma is submitting a grant for “Ministry of the Environment” to develop the catalytic NH₃ combustion systems with Dr. Debasish Chakraborty.

3. Others

Dr. Debasish Chakraborty really enjoyed Kumamoto foods and castle.

The 43rd IROAST Seminar

December 5 (Wed), 2018

15:00-17:00

Meeting Room (2F), Engineering Research Tower II, Kurokami South Campus

Speakers

Dr Debasish Chakraborty Technical University of Denmark/ RenCat

"Exploring ammonia as carbon free fuel: A bottom up approach"

Dr Satoshi Hinokuma

Kumamoto University

"Catalytic combustion for ammonia as a carbon-free energy source"

Organizer

Dr Satoshi Hinokuma, FAST/ IROAST, hinokuma@kumamoto-u.ac.jp



IROAST Seminar Report 16

Organizer	Name	Yoshihito Kawamura			
	Affiliation	Magnesium Research Center (MRC)	Title	Professor	
Seminar Title	44 th IROAST Seminar–Enhanced Properties of Biodegradable Magnesium Alloys After Severe Plastic Deformation				
Venue	100th Anniversary Hall of Engineering Faculty				
Time & Date	17:15-18:00, December 6th, 2018				
Speaker's Name/ Title/Affiliation	Alexey VINOGRADOV/ Professor / Norwegian University of Science and Technology				
Number of Participants	From KU	Faculty: 17 (Int'l participants: 2)	Total	85	
		Students: 34 (Int'l participants: 1)			
	From outside KU	Faculty: 25 (Int'l participants: 2)			
		Students: 9 (Int'l participants: 9)			
1.Seminar Overview The seminar was held in continuation of the LPSO-2018 symposium and the Japan-Russian symposium on Magnesium alloys and related phenomena. It was therefore well attended by both students from KU and internationally recognized experts in the field from Japan and other countries. The feedback I received in the form of questions and comments convinces me the topic raised a lot of interest. During the seminar, the motivation for research and well-established results in the area of biodegradable magnesium alloys were reviewed and our most recent findings were delivered to the audience.					
2. Seminar Outcomes and Future Plan I was particularly pleased with many questions and comments received during and after the seminar, both from established academics, young researchers and students. A collaborative research activity related to both in vitro and in vivo testing of innovative Mg-Y-Zn and Mg-Zn-Ca alloys produced by ingot casting and rapid solidification/powder metallurgy methods at Kumamoto University is planned to be implemented in 2019 at NTNU. The results will be disseminated through a common publication in the international peer reviewed journal and common presentations at local and international conferences.					
3. Others					



The 44th IROAST Seminar

**Enhanced Properties of Biodegradable Magnesium Alloys
After Severe Plastic Deformation**

Prof. Alexei Vinogradov
Norwegian University of Science and Technology (NUST)

17:15-18:00, December 6 (Thu), 2018
100th Anniversary Hall of Engineering Faculty



Organizer

Prof. Yoshihito Kawamura, MRC

riverbil@gpo.kumamoto-u.ac.jp

IROAST Seminar Report 17

Organizer	Name	Hamid Hosano		
	Affiliation	IPPS	Title	Professor
Seminar Title	45 th IROAST Seminar–IPPS Lecture & Seminar No. 42			
Venue	#516, Common Building 3			
Time & Date	14:30-16:00, December 11, 2018			
Speaker's Name/ Title/Affiliation	Prof. Konstantinos Kontis Dean for Global Engagement–East Asia & China, Head of Aerospace Sciences Division, University of Glasgow, UK IROAST Distinguished Professor			
Number of Participants	From KU	Faculty: 3 (Int'l participants: 2)	Total	14
		Students: 8 (Int'l participants: 2)		
	From outside KU	Faculty: 3 (Int'l participants: 3)		
		Students: 0 (Int'l participants: 0)		

1. Seminar Overview

Title: Flow Control Techniques in S-shaped Ducts; The presentation gave an overview of the University of Glasgow Aerospace research activities. It discussed the complex flow physics in diffusive, s-shaped airplane engine intake ducts, and flow control methods employed to counteract the onset of separation, swirl formation, and non-uniformity of pressure at the aerodynamic interface plane. Passive, active, and hybrid flow control techniques were presented. The target audience was students.

2. Future Prospects

The lecture to the students enabled fruitful discussions about the potential of plasma systems and energy deposition in applications outside the traditional areas of IROAST, which opens up vast opportunities for multidisciplinary collaboration, knowledge transfer activities and impact generation.

3. Others

The unique technologies of IROAST can be married with a range of engineering applications opening up multidisciplinary opportunities. The seminar can set the foundations for future research activities and attracting potential students for joint research activities and staff exchanges.



- The 45th IROAST Seminar - IPPS Lecture & Seminar No. 42

Title: **Flow Control Techniques in S-Shaped Ducts**

Lecturer: Prof. Konstantinos Kontis

(Dean for Global Engagement – East Asia & China,
Head of Aerospace Sciences Division, University of Glasgow)
IROAST Distinguished Professor, Kumamoto Univ.

Date & Time: Dec. 11, 2018 (Tue.) 14:30~16:00

Venue: Common Building 3, 5th Floor, 516 (Seminar room)

Abstract: The presentation will give an overview of the University of Glasgow Aerospace research activities. It will discuss the complex flow physics in diffusive, s-shaped airplane engine intake ducts, and flow control methods employed to counteract the onset of separation, swirl formation, and non-uniformity of pressure at the aerodynamic interface plane. Passive, active, and hybrid flow control techniques will be presented.

**Supported by Intentional Research Organization
for Advanced Science and Technology (IROAST)**

IROAST Seminar Report 18

Organizer	Name	Hamid Hosano		
	Affiliation	IPPS	Title	Professor
Seminar Title	46 th IROAST Seminar–IPPS Lecture & Seminar No. 43			
Venue	#516, Common Building 3			
Time & Date	14:30-15:30, December 13, 2018			
Speaker's Name/ Title/Affiliation	Prof. Viren Menezes Indian Institute of Technology Bombay, India IROAST Visiting Professor			
Number of Participants	From KU	Faculty: 3 (Int'l participants: 1)	Total	13
		Students: 9 (Int'l participants: 2)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		

- Seminar Overview:**
Delivered a lecture on shock-wave-driven therapeutic devices for localized drug delivery. The discussion included development, validation and ex-vivo testing of drug delivery devices for powder and liquid delivery into human body, with minimal invasion. Development of analytical correlations to predict the performance of the devices was also discussed.
- Future Prospects:**
Future research collaborations will include, development of a prototype and in-vivo testing of a drug delivery device. In addition, a research program on shock waves in porous media will be initiated.
- Others:**
Kumamoto University has a conducive ambiance and infrastructure for advanced research. The visit was productive, with several technical discussions and interactions. Would like to visit again in future.





IPPS Lecture & Seminar No. 43

- The 46th IROAST Seminar -

Title: Shock-wave-driven biolistic devices

Lecturer: Prof. Viren Menezes

(Indian Institute of Technology Bombay)

IROAST Visiting Professor, Kumamoto Univ.

Date & Time: Dec. 13, 2018 (Thu.) 14:30~15:30

Venue: Common Building 3, 5th Floor, 516 (Seminar room)

Abstract: In the shock-driven devices, a shock wave is used as the driver or the propeller for drugs. The drugs could be powder, liquid or colloids. The main objective in this category is to accomplish drug delivery to a controlled depth with minimal damage to the target cells. This presentation will briefly deal with this treatment modality, pertinent to powdered and liquid drug delivery into soft living targets. The device physics, the ballistic delivery of the matter and some ex-vivo and in-vitro results will be presented during the talk.

**Supported by Institute of Pulsed Power Science
(IPPS), Kumamoto University**

IROAST Seminar Report 19

Organizer	Name	Tokio Tani		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	47 th IROAST Seminar–Chemical modification of RNA in control of mammalian gene expression			
Venue	Rm C329, Rigakubu Bldg 1			
Time & Date	11:00-12:00, December 14, 2018			
Speaker’s Name/ Title/Affiliation	Ramesh S. Pillai/ Professor/ Department of Molecular Biology, Faculty of Science, University of Geneva			
Number of Participants	From KU	Faculty: 4 (Int’l participants: 0)	Total	35
		Students: 30 (Int’l participants: 2)		
	From outside KU	Faculty: 1 (Int’l participants: 1)		
		Students: 0 (Int’l participants: 0)		
<p>Dr. Ramesh S. Pillai is a professor in University of Geneva, Department of Molecular Biology, Switzerland. He is a famous scientist working on the small functional noncoding RNAs, microRNAs and piRNAs. He published many excellent research papers in Science, Nature, Molecular Cell, and so on. Prof. Pillai and Tani, an organizer of the seminar, have been conducting a collaborative research on the cellular structure, called Nuage, which relates to the piRNA biogenesis, for 5 years. In this IROAST seminar, Prof. Pillai talked about his recent research project of RNA modification that controls gene expression in mammalian cells. Recently, the research on RNA modification has developed as one of very “hot” fields in molecular biology. The results he presented in the seminar were very interesting to the participants, including young students in GSST.</p> <p>The abstract of the seminar is as follows; <i>N</i>⁶-methyladenosine (<i>m</i>⁶A) is an essential internal RNA modification that is critical for gene expression control in most organisms. They are catalyzed by RNA methyltransferases ‘writers’ on specific targets, while protein ‘readers’ with a YTH domain recognize the <i>m</i>⁶A marks to mediate molecular functions like RNA splicing, mRNA decay and translation control. The functional relevance of these marks is demonstrated by the ability of RNA demethylase ‘erasers’ to remove this mark, pointing to potential reversibility and regulation. Our past work has demonstrated the role of YTH domain-containing 2 (YTHDC2) in the mammalian germline and is essential for male and female fertility in mice. I will present our new research on the role of a writer METTL16 in specifically selecting structured RNAs for <i>m</i>⁶A methylation. We find that METTL16 is essential for regulating levels of its methylation target <i>Mat2a</i> mRNA, which encodes for the methyl-donor SAM. This regulation is essential for viability of mouse embryos around implantation stage. Our latest results on these topics will be presented at this meeting.</p> <p>After the seminar, students in Tani’s laboratory presented their data about proteins involved in the RNA modification system to Prof. Pillai, and discussed intensively on the future collaborative experiments.</p>				




December 14 (Fri)
11:00-12:00
#C329, 3F, Faculty of Science Bldg. 2

The 47th IROAST Seminar

Chemical modifications of RNA in control of mammalian gene expression

Prof. Ramesh S. Pillai
Department of Molecular Biology, University of Geneva, Switzerland

Organizer: Prof. Tokio TANI, FAST
ttani@kumamoto-u.ac.jp



IROAST Seminar Report 20

Organizer 1	Name	Akira Yoshiasa		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Organizer 2	Name	Tadao Nishiyama		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	48 th IROAST Seminar–Chirality in crystallography			
Venue	Kurokami South Campus, Auditorium C226, 2F, Faculty of Science Bldg. C			
Time & Date	17:00-18:00, December 18 (Tue), 2018			
Speaker's Name/ Title/Affiliation	Professor Dr. Massimo Nespolo / Full Professor/ Affiliations: CRM2 UMR - CNRS 7036 Institut Jean Barriol, FR 2843, Université de Lorraine Faculté des Sciences et Technologies BP 70239, Boulevard des Aiguillettes F54506 Vandoeuvre-lès-Nancy cedex France FRANCE Phone: +33(0)3.72.74.56.46 E-mail: massimo.nespolo@univ-lorraine.fr			
Number of Participants	From KU	Faculty: 6 (Int'l participants: 0)	Total	22
		Students: 15 (Int'l participants: 0)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		

The 48th IROAST Seminar was held on December 18(Tue), 2018,. The seminar was organized by Professor Akira Yoshiasa from the Faculty of Advanced Science and Technology (FAST). Chirality is the property of an object of not being superimposable to its mirror image by a handednesspreserving isometry. Objects that contain among their symmetry operations also handedness-reversing isometries are achiral. In the literature the chirality of the object and the chirality of the group are often treated as one and the same thing, resulting in misleading confusion. In particular, the expression “chiral group” is often, but incorrectly, used to indicate the symmetry group of a chiral object. The term “chiral group” means that the group G itself is chiral, i.e. that the distribution in space of the symmetry elements of the group is mapped onto itself only by handedness-preserving isometries. This condition is stricter than that necessary for the object, whose symmetry group is G , to be chiral. In fact, a group is chiral if its normalizer with respect to the suitable group of isometries of the space contains only handedness-preserving isometries. The symmetry group of a molecule is a point group P ; the molecule is chiral if P contains only handednesspreserving isometries. The normalizer of P is defined with respect to the orthogonal group $O(3)$, which contains all the isometries of the three-dimensional Euclidean space that preserve a point fixed. The normalizers of P with respect to $O(3)$ always contain handedness-reversing isometries; therefore, a point group can never be chiral. The symmetry group of a crystal structure is a space group G ; the crystal structure is chiral if G contains only handedness-preserving isometries. The normalizer of G is defined with respect to the Euclidean group $E(3)$, which contains all the isometries of the three-dimensional Euclidean space. Those space groups whose Euclidean normalizer contains only handedness-preserving isometries are chiral space groups.

Among the others, we distinguish those which contain only handedness-preserving isometries and those which contain also handedness-reversing isometries. The following scheme summarizes the classification [1].

Through this international collaborative research, we aim to foster young researchers and publish international collaborative research papers. Experimental and simulation studies are promoted to investigate the structure of condensed matters, and properties under extreme conditions. The experiments are performed in-situ, using technologically advanced equipment. The project aims at the construction of a theory that links nano-scale structures, the unique local structures of ppb-order trace elements in multi-element systems, macroscopic properties and histories. The researches are progressed by the collaboration with the researchers of foreign countries (Université de Lorraine and Université Blaise Pascal (France), Universitaet Bayreuth and RWTH Aachen (German), University of Chicago (USA) and AGH University of Science and Technology (Poland). At, Yoshiasa laboratory, the precise crystal analytical investigations have been carried out by using Synchrotron Radiation facilities to apply for the high pressure research of solids and for earth science.

The University of Lorraine (UL below) and the Kumamoto University (KU below) have an active cooperation in both education and research. With the arrival of Professor Nespolo in this time, we got the result of submitting international collaborative research paper with us. The title of the research paper is “Single crystal structure analysis of petzite, Ag_3AuTe_2 .” and it was submitted to Acta Crystallographica. This crystal has chiral and belongs to the sonke group.

References [1] M. Nespolo, M. I. Aroyo and B. Souvignier, J. Appl. Cryst. 51 1474-1480 (2018).



December 18 (Tue), 2018

17:00-18:00

Auditorium C226, 2F, Faculty of Science Bldg. C

The 48th IROAST Seminar
Chirality in crystallography

Prof. Dr Massimo Nespolo
Université de Lorraine, CNRS, CRM2

Organizer: Prof. Akira Yoshiasa, FAST
yoshiasa@sci.kumamoto-u.ac.jp



IROAST Seminar Report 21

Organizer	Name	Mitsuru Sasaki			
	Affiliation	Institute of Pulsed Power Science	Title	Assoc. Prof.	
Seminar Title	49 th IROAST Seminar–Materials processing with supercritical fluids				
Venue	Rm#212, Engineering Lecture Hall, Kurokami South Campus				
Time & Date	15:00-17:00, January 24 (Thu), 2019				
Speaker’s Name/ Title/Affiliation	[1] Youn-Woo Lee Professor, Seoul National University (Korea) [2] Olivier Boutin Professor, Aix-Marseille University (France)				
Number of Participants	From KU	Faculty: 1 (Int'l participants: 0)	Total	21	
		Students: 11 (Int'l participants: 5)			
	From outside KU	Faculty: 2 (Int'l participants: 2)			
		Students: 7 (Int'l participants: 7)			

1. Seminar Overview

In this seminar, the organizer aimed researchers and students to learn fundamental physical properties and characteristics of "supercritical fluids" called the fourth state, which is the second state after solid, liquid and gas. Secondly, I aimed to allow audiences to understand that various functional materials can be manufactured by using subcritical or supercritical state of water (H₂O) and carbon dioxide (CO₂), which are environmentally friendly solvents.

2. Seminar Outcomes and Future Plan

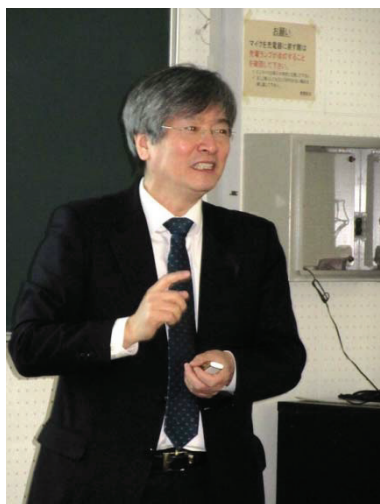
Through this seminar, I believe that the following results were obtained.

- (1) Participants were able to acquire knowledge on basic physical properties and characteristics of supercritical fluids.
- (2) We were able to learn practical processes using supercritical fluids in the worldwide.
- (3) Some students were able to obtain knowledge that can solve the problems in the research they are currently carrying out.

With this interaction as a trigger, we will start international collaborative research, and we will try to activate exchange through dispatch or acceptance of students. For research subjects that are already conducting joint research, we aim to contribute co-authored international peer-review papers.

3. Others

Both professors have strong interests in the FY2019 IROAST Visiting Professor positions, they will apply for the Call for the FY2019 IROAST Visiting Professor.



Prof. Youn-Woo Lee



Prof. Olivier Boutin



Photo during the seminar



Group photo of lecturers and participants

The 49th IROAST Seminar

-Materials processing with supercritical fluids-

January 24 (Thu), 2019
15:00-17:00

#212, Engineering Lecture Hall, Kurokami South Campus

Speakers

Prof. Youn-Woo LEE Seoul National University

"Biorefinery of Plant Oil for Ethylene Metathesis with Supercritical Fluids"

Prof. Olivier Boutin Aix-Marseille University

"Wet air oxidation for waste treatment: from fundamentals to specific applications"

Organizer

Associate Prof. Mitsuru SASAKI, IPPS, msasaki@kumamoto-u.ac.jp



IROAST Seminar Report 22

Organizer	Name	Jun Otani		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	50 th IROAST Seminar “Building a Better Mousetrap–The Continuing Quest for More Reliable Models of Clay Behavior”			
Venue	Rm#905, Engineering Research Building I			
Time & Date	13:00-15:00, January 29, 2019			
Speaker’s Name/ Title/Affiliation	Prof. Andrew J. Whittle Edmund K. Turner Professor Department of Civil and Environmental Engineering Massachusetts Institute of Technology			
Number of Participants	From KU	Faculty: 6 (Int’l participants: 1)	Total	15
		Students: 8 (Int’l participants: 8)		
	From outside KU	Faculty: 1 (Int’l participants: 1)		
		Students: 0 (Int’l participants: 0)		

1. Seminar Overview

Prof. Whittle is a long time friend of Prof. Otani in the same research field which is geotechnical engineering. He visited our university and IROAST from January 26 to January 30 in order to discuss a collaborative research with Prof. Otani and during his stay, he gave us his lecture as the 50th IROAST Seminar. The summary of his lecture was as follows:

Extensive prior research has shown that advances in modeling complex aspects of clay behavior, from non-linear deformation and anisotropic shear properties, can enable more reliable predictions in practical geotechnical applications (from foundations to tunnels). Much of this work has been achieved using the prevailing paradigm of elasto-plasticity and conceptual framework of critical state soil behavior for clay sediments. This lecture compares and contrasts recent research to advance predictive capabilities in modeling the rate-dependent behavior of clays and in simulating the behavior of residual soils:

There are many (often contradictory) observations of the viscous properties of sedimentary clays, and there is a long-standing dilemma regarding the coupling of creep and consolidation processes. We have addressed these issues through a formulation that introduces a physically-based evolution law that attributes the macroscopic viscoplastic strain rate to an internal variable associated with the prior strain rate history. By varying the rate-sensitivity parameter the proposed model provides a unified framework that can describe a wide range of observed time-effects in 1-D compression and shear behavior.

Residual soils are formed through in-situ physical and chemical weathering processes. Our experimental investigations of *Old Alluvium* led to a conceptual model of its complex microstructure and degradation under mechanical stress. Using heuristic reasoning we have described these transitions using Cation Exchange Capacity as an internal state variable and are able to develop a consistent model to explain transitions of engineering properties within the weathered soil profile.

Some of the photos during his lecture are shown below:

2. Seminar Outcomes and Future Plan

Prof. Whittle is one of the leading researchers in the world and he is a Professor at MIT. Since he is interested in the research collaboration with Prof. Otani of Kumamoto University and the use of X-ray CT, it could be a nice start of the collaboration with him and MIT. MIT is the No.1 world ranking university and the collaboration with world top 10 universities is one of the IROAST objectives. Under these circumstances, We will be able to continue our collaboration under the objectives of IROAST.

3. Others

During his stay at this time, he has visited our President, Prof. Harada and the director of IROAST, Prof. Hiyama. In his visit to Prof. Hiyama, they discussed about possibility of his visiting professorship at IROAST. We hope that he will join our IROAST soon.



Photo 1 Prof. Whittle during his lecture



Photo 2 lecture with participants



Photo 3 Prof. Whittle with all participants

13:00-15:00, January 29, 2019
#905, Engineering Research Building I


The 50th IROAST Seminar

**Building a Better Mousetrap – The Continuing Quest
for More Reliable Models of Clay Behavior**

Prof. Andrew J. Whittle
Massachusetts Institute of Technology, USA



Organizer: Prof. Jun Otani, FAST, junotani@kumamoto-u.ac.jp



IROAST Seminar Report 23

Organizer	Name	Shinya Hayami		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	51 st IROAST Seminar–Sol-Gel Ru / SiO ₂ catalysts for Green Chemistry			
Venue	C122, Faculty of Science Building 2			
Time & Date	15:00-16:30, February 1st, 2019			
Speaker's Name/ Title/Affiliation	Martino Di Serio Professor Department of Chemical Sciences Università di Napoli Federico II Email: diserio@unina.it			
Number of Participants	From KU	Faculty: 10 (Int'l participants: 0)	Total	41
		Students: 30 (Int'l participants: 0)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		

1.Seminar Overview

Biomass is the main source for the production of renewable fuels and high-value industrial chemicals. An important reaction class is the hydrogenation, where one of the main problems is linked to the stability of the catalyst. The stability of the catalyst depends on the kind of interaction between the matrix and the metal that, in turn, derives from the adopted immobilization procedure. In this context, in our lab we have proven that Ru nanoparticles (about 3.0 nm in size) can be efficiently immobilized in a Nb2O5-SiO2 matrix by an innovative sol-gel synthesis, giving an active and stable catalyst for the levulinic acid hydrogenation to γ -valerolactone. Following this strategy, also a new (RuO2) 0.038 (SiO2) 0.962 nanomaterial was prepared, which proved to be a self-activating catalyst for glucose hydrogenation. The physico-chemical properties of the catalysts were deeply investigated and the results were linked to their performance in the reactions.

2. Seminar Outcomes and Future Plan

Prof. Martino Di Serio research about catalysis, and he is a world-leading researcher in the research area. And he stayed in Kumamoto University for 3 weeks, and we could discuss about catalysis by using our GO and 2D materials. Furthermore, he has many idea, we also discussed about magnesium research. We will start a collaboration about GO hybrid catalyst. Our collaboration is very strong society and each researcher is also very high level in the world. For some our results, we have submitted and published in top class journals. We will also collaborate in this project each other from now.

3. Others

Finally, I would like to thank IROST for our research collaborations.



The 51st IROAST Seminar

Sol-Gel Ru / SiO₂ catalysts for Green Chemistry

February 1 (Fri), 2019

15:00-16:00

#C122, Faculty of Science Bldg. 2

Prof. Martino Di Serio
The University of Naples Federico II, Italy

Organizer

Prof. Shinya HAYAMI, FAST, Hayami@kumamoto-u.ac.jp

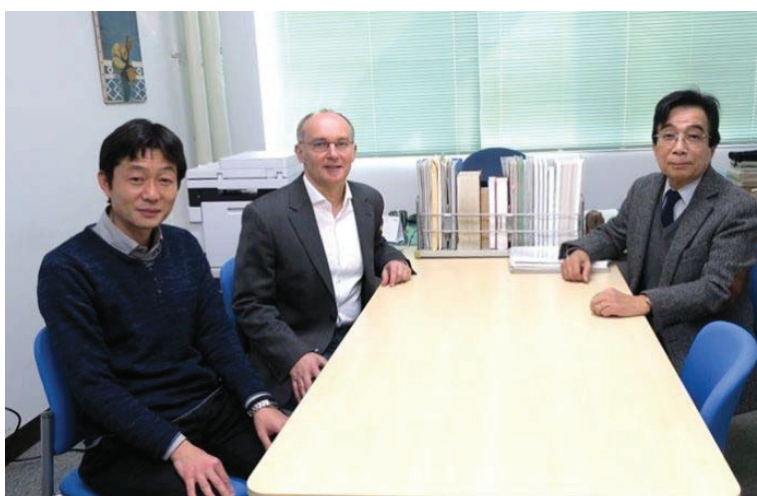


IROAST Seminar Report 24

Organizer	Name	Mitsuhiro Matsuda		
	Affiliation	Faculty of Advanced Science and Technology	Title	Assoc. Prof.
Seminar Title	52 nd IROAST Seminar–Structural and mechanical properties of rejuvenated metallic glasses			
Venue	Kurokami South Campus, #308 Faculty of Engineering Research Bldg.1			
Time & Date	February 21(Thu), 2019, 14:00-15:30			
Speaker's Name/ Title/Affiliation	Christian RENTENBERGER IROAST visiting professor/ Prof. Physics of Nanostructured Materials, University of Vienna, Austria			
Number of Participants	From KU	Faculty: 4 (Int'l participants: 0)	Total	30
		Students: 25 (Int'l participants: 0)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: (Int'l participants: 0)		

Outline: Metallic glasses are materials composed of metal components but lack long-range order. The latter renders metallic glasses unique in mechanical properties such as high hardness combined with high elastic limit. Since they exhibit also a low ductility caused by a very localized plastic deformation it is one of the challenging aims to fully understand the structure-property relationship in order to find ways and processes for improvements. It could be shown that rejuvenation of the disordered atomic structure to a higher energy state can impact the mechanical properties of the processed materials considerably. In order to obtain and control the rejuvenated amorphous structure different routes can be successful e.g. by irradiation or thermomechanical processing. In this lecture I will focus on recent results obtained by electron irradiation and severe plastic deformation. In the case of electron irradiation amorphous thin TiAl films were processed during in-situ TEM tensile straining, whereas CuZr based metallic glasses were rejuvenated as a bulk material via high-pressure torsion. To elucidate the correlation of the mechanical properties and structural state, various experimental methods including transmission electron microscopy, Synchrotron X-ray diffraction, nanoindentation, differential scanning calorimetry and atomic force microscopy were applied to characterize the processed samples. In addition, molecular dynamics simulations facilitate (i) to get deeper insights into the atomic structure and its changes during irradiation and deformation, and (ii) to improve our understanding in the structure-property relationship of amorphous materials.

Seminar Outcomes: During the stay, experimental data obtained by our joint research was thoroughly analyzed for a scientific publication on a severely plastically deformed Co-Zr intermetallic alloy. Another alloy (Co-Zr-Ni) was prepared which is currently investigated at univ. Vienna. There was the opportunity for numerous scientific discussions with faculty members, graduate and undergraduate students of Kumamoto University through this seminar. We made a plan for our future scientific collaboration concerning the severe plastic deformed shape memory alloy and intermetallic compounds.



After the seminar (from the left, Associate Professor Matsuda, Dr Rentenberger, IROAST Director Hiyama)

The 52nd IROAST Seminar

Structural and mechanical properties of
rejuvenated metallic glasses

Prof. Christian RENTENBERGER

Physics of Nanostructured Materials, University of Vienna, Austria

Organizer

Assoc. Prof. Mitsuhiro MATSUDA, FAST
matsuda@alpha.msre.kumamoto-u.ac.jp

February 21 (Thu)
2019
14:00-15:30

#308
Faculty of
Engineering
Research Bldg. 1



IROAST Seminar Report 25

Organizer	Name	Yoshihito Kawamura			
	Affiliation	Magnesium Research Center (MRC)	Title	Professor	
Seminar Title	53 rd IROAST Seminar–What governs the ductility of metals?				
Venue	Multipurpose Hall, MRC				
Time & Date	16:00-17:00, February 21, 2019				
Speaker’s Name/ Title/Affiliation	Alexey VINOGRADOV/ Professor / Norwegian University of Science and Technology				
Number of Participants	From KU	Faculty: 18 (Int'l participants: 1)	Total	33	
		Students: 11 (Int'l participants: 0)			
	From outside KU	Faculty: 4 (Int'l participants: 1)			
		Students: 0 (Int'l participants: 0)			
1.Seminar Overview The seminar title covers a broad topic and an important existing challenge in Materials science related to understanding of inherent reasons of ductility of metals in general and magnesium alloys in particular. The topic is rarely highlighted in regular courses and therefore it is good for students of both undergraduate and graduate levels to have a dedicated lecture.					
2. Seminar Outcomes and Future Plan The seminar was well attended. I am particularly pleased with many questions received during and after the seminar, both from academics and students. I do hope that the ideas expressed during the seminar help the students engaged with Mg research to deepen their knowledge about the mechanical behavior of Mg allots and trigger new thoughts and scientific perspectives for their research,					
3. Others					



Prof. Alexey
Vinogradov

Norwegian University of
Science and Technology (NUST)

February 21 (Thu)
2019

16:00-17:00

@2F, Multipurpose Hall, MRC,
Kumamoto University

The 53rd IROAST Seminar

What governs the ductility of metals?

Organizer
Prof. Yoshito Kawamura, MRC, rivervil@gpo.kumamoto-u.ac.jp



IROAST Seminar Report 26

Organizer	Name	Sadahiro Tsurekawa		
	Affiliation	Faculty of Advanced Science and Technology	Title	Professor
Seminar Title	54 th IROAST Seminar–Recent developments in the study of grain/twin boundary mediated plasticity			
Venue	#308, Faculty of Engineering Research Building I			
Time & Date	13:00-14:15, February 28, 2019			
Speaker's Name/ Title/Affiliation	Dmitri A. Molodov / Professor/Institute of Physical Metallurgy and Metal Physics, RWTH Aachen University, Germany			
Number of Participants	From KU	Faculty: 5 (Int'l participants: 0)	Total	44
		Students: 33 (Int'l participants: 2)		
	From outside KU	Faculty: 6 (Int'l participants: 4)		
		Students: 0 (Int'l participants: 0)		

Prof. D. A. Molodov delivered a special lecture on “*Recent developments in the study of grain/twin boundary mediated plasticity*” on February 28, 2019. More than 40 audiences including academic staffs and graduate students in Kumamoto University attended his lecture (*see photo 1 and 2*). The abstract of his lecture is as follows:

The results of experiments on bicrystals with various grain boundaries moving under mechanical stress will be reviewed. The boundary migration– shear coupling will be discussed. The extended geometric model of boundary migration - shear coupling for evaluating the coupling factor, i.e. the amount of produced shear, for twin and grain boundaries in various crystal structures will be presented. It will be shown that the coupling factors calculated according to the proposed general formula are in excellent agreement with respective experimental and simulation data known from literature. Also, the results of experiments with specifically oriented magnesium single crystals deformed at ambient and elevated temperatures in channel-die plane strain compression will be reported. The formation of anomalous {10-12} extension twins, which had negative Schmid factors and produced a strain opposite to the imposed deformation will be analyzed considering the operating deformation mechanisms and heterogeneities with respect to lattice rotation.



Photo 1



Photo 2

The 54th IROAST Seminar
Recent developments in the study of grain/twin boundary mediated plasticity

Prof. Dmitri A. Molodov
Institute of Physical Metallurgy and Metal Physics,
RWTH Aachen University, Germany

February 28, 2019
13:00-14:00
#308, 3F, Faculty of Engineering Bldg. I

Organizer
Prof. Sadahiro Tsurekawa, FAST
turekawa@kumamoto-u.ac.jp



IROAST Seminar Report 27

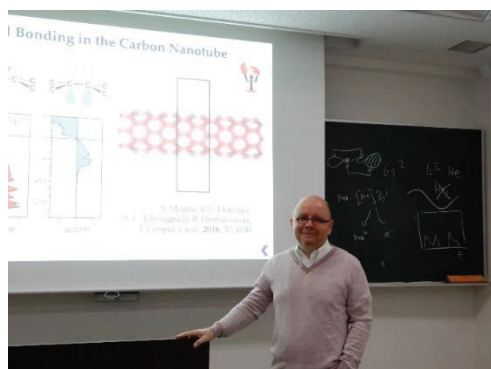
Organizer 1	Name	Akira Yoshiasa		
	Affiliation	Faculty of Advanced Science and Technology	Title	Prof.
Organizer 2	Name	Tadao Nishiyama		
	Affiliation	Faculty of Advanced Science and Technology	Title	Prof.
Seminar Title	55 th IROAST Seminar–New Aspects of Chemical Bonding in Solids using Orbitals and Plane Waves			
Venue	Kurokami South Campus, Auditorium C226, 2F, Faculty of Science Bldg. C			
Time & Date	March 5 (Tue), 2019, 16:30-18:00			
Speaker's Name/ Title/Affiliation	Professor Dr. Richard Dronskowski / Chair of Solid-State and Quantum Chemistry, Inst. of Inorganic Chemistry, RWTH Aachen University, 52056 Aachen, Germany drons@HAL9000.ac.rwth-aachen.de & http://www.ssc.rwth-aachen.de Tel: +49 241 809 3642 Fax: +49 241 809 2642 E-mail: drons@HAL9000.ac.rwth-aachen.de			
Number of Participants	From KU	Faculty: 3 (Int'l participants: 0)	Total	12
		Students: 5 (Int'l participants: 0)		
	From outside KU	Faculty: 4 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		

The 55th IROAST Seminar was held on March 5 (Tue), 2019,. The seminar was organized by Professor Akira Yoshiasa from the Faculty of Advanced Science and Technology (FAST). Population analysis as imagined by Mulliken (1955) has held a prominent place in quantum chemistry for decades already. Likewise, periodic bonding indicators such as COOP (introduced in 1983) and its DFT equivalent COHP (from 1993) have been helpful, the latter carried out using local-basis codes such as TB-LMTO-ASA. COHP analysis has allowed to chemically understand three-dimensional Peierls distortions, spin polarization in itinerant magnets, stoichiometries of phase-change materials, and a lot more. While plane-wave packages such as VASP, ABINIT, Quantum ESPRESSO etc. offer computational advantages compared to LMTO, they lack locality, so the aforementioned chemical concepts were unavailable. Nonetheless, the local COHP information can be analytically reconstructed by transferring PAW pseudopotential data to local bases built from contracted STOs, as implemented in the LOBSTER code (www.cohp.de), and it also allows for other tools like the density-of-energy (DOE) and well-established quantum-chemical descriptors such as Mulliken or Löwdin charges. All that will be illustrated, using essentially non-mathematical reasoning, from recent examples such as carbon (nanotube), 4f hexaborides, Ge₄Se₃Te, In₂Se₃, Pb₂Si₅N₈, and Na₂He.

Through this international collaborative research, we aim to foster young researchers and publish international collaborative research papers. Experimental and simulation studies are promoted to investigate the structure of condensed matters, and properties under extreme conditions. The experiments are performed in-situ, using technologically advanced equipment. The project aims at the construction of a theory that links nano-scale structures, the unique local structures of ppb-order trace elements in multi-element systems, macroscopic properties and histories. The researches are progressed by the collaboration with the researchers of foreign countries (Université de Lorraine and Université Blaise Pascal (France), Universitaet Bayreuth and RWTH Aachen (German), University of Chicago (USA) and AGH University of Science and Technology (Poland). At, Yoshiasa laboratory, the precise crystal

analytical investigations have been carried out by using Synchrotron Radiation facilities to apply for the high pressure research of solids and for earth science.

The Inst. of Inorganic Chemistry, RWTH Aachen University and the FAST, Kumamoto University (KU below) have made plans to promote active cooperation in both education and research. With the arrival of Professor Dronskowski in this time, we made an effort to connect the international joint research paper with us.



March 5 (Tue), 2019

16:30-17:30

#C226 Auditorium, Science Bldg. C, Kumamoto University

Prof. Richard Dronskowski

RWTH Aachen University, Aachen, Germany

**THE 55TH
IROAST
SEMINAR**

*New Aspects of
Chemical Bonding
in Solids using Orbitals
and Plane Waves*

Organizer: Prof. Akira Yoshiasa, FAST, yoshiasa@kumamoto-u.ac.jp



IROAST Seminar Report 28

Organizer	Name	Hamid Hosano		
	Affiliation	IPPS	Title	Professor
Seminar Title	56 th IROAST Seminar–IPPS Lecture & Seminar No. 48			
Venue	#516, Common Building 3			
Time & Date	11:00-12:30, March 14, 2019			
Speaker's Name/ Title/Affiliation	Prof. Hamid Ghandehari Director of Utah Center for Nanomedicine, Professor of Department of Pharmaceutics and Pharmaceutical Chemistry and Bioengineering, University of Utah, USA Editor in Chief, Advanced Drug Delivery Reviews IROAST Visiting Professor, Kumamoto Univ.			
Number of Participants	From KU	Faculty: 7 (Int'l participants: 3)	Total	25
		Students: 17 (Int'l participants: 4)		
	From outside KU	Faculty: 1 (Int'l participants: 1)		
		Students: 0 (Int'l participants: 0)		

1. Seminar Overview

Title: Safety assessment of inorganic and dendritic nanoparticles.

Engineered nanomaterials provide fundamental building blocks in nanomedicine applications such as biosensing, drug delivery, imaging and detection of circulating tumor cells. Successful clinical translation of these constructs requires a detailed understanding of the influence of their physicochemical properties on their biological fate. In this talk our lab's efforts on the investigation of the influence of factors such as size, charge, density, porosity, geometry, chemical composition and surface functionality of poly(amido amine) (PAMAM) dendrimers and silica nanoparticles on their mechanism and extent of cellular uptake, cytotoxicity, biodistribution and in vivo toxicity were discussed

2. Future Prospects

This lecture provided opportunities for IROAST colleagues and students at Kumamoto University to explore potential toxicity of nanoparticles for other applications as well as utility of silica nanoparticles for potential collaborative projects.

3. Others

Interdisciplinary research at the interface of engineering and medicine using nanoparticulate carriers was discussed.





- The 56th IROAST Seminar IPPS Lecture & Seminar No. 48

TITLE

Safety assessment of inorganic and dendritic nanoparticles

Speaker: Prof. Hamid Ghandehari
(Director of Utah Center for Nanomedicine,
Utah University, USA
Editor in Chief, Advanced Drug Delivery Reviews
IROAST Visiting Professor, Kumamoto Univ.)

Date & Time: March 14, 2019 (Thu.) 11:00~12:00

Venue: Common Building 3, 5th Floor, 516 (Seminar room)

Organizer: Hamid Hosano (IPPS)

Supported by Intentional Research Organization
for Advanced Science and Technology (IROAST)

Agreements

No.	Kumamoto University	Partner University/Institute	Date of Conclusion
1	FAST GSST Faculty of Science IROAST	University of Lausanne, through its School of Biology, Faculty of Biology and Medicine, Switzerland	06/07/2018
2	FAST IROAST	College of Health Science and Institute of Biomedical Engineering, Yonsei University at Wonju, Republic of Korea	10/25/2018

Memorandums of Understanding

No.	IROAST Members	Partner University/Institute	Date of Conclusion
3	Jun Otani X-Earth Center, Faculty of Engineering	Director Gioacchino Viggiani Laboratoire 3SR, Université Grenoble Alpes, France	06/13/2018
4	Toshitaka Yamakawa Dr. Yamakawa's Research Group	Dr. Rajendra Acharya Dr. Acharyas's Research Group, Ngee Ann Polytechnic, Singapore	09/07/2018
5	Jun Otani X-Earth Center, Faculty of Engineering	Head Professor Pierre Breul Groupe MSMG of Institut Pascal, Université Clermont Auvergne, France	01/16/2019
6	Atsushi Sainoki Associate Professor Sainoki's Laboratory	Director Stanisław Prusek Główny Instytut Górnictwa, Poland	03/14/2019

GSST: Graduate School of Science and Technology, Kumamoto University

Agreement on Academic Exchange
Between

KUMAMOTO UNIVERSITY
FACULTY OF ADVANCED SCIENCE AND TECHNOLOGY,
GRADUATE SCHOOL OF SCIENCE AND TECHNOLOGY,
FACULTY OF SCIENCE, and
INTERNATIONAL RESEARCH ORGANIZATION FOR
ADVANCED SCIENCE AND TECHNOLOGY
Kumamoto, Japan

AND

UNIVERSITY OF LAUSANNE
THROUGH ITS SCHOOL OF BIOLOGY,
FACULTY OF BIOLOGY AND MEDICINE
Lausanne, Switzerland

Faculty of Advanced Science and Technology (FAST), Graduate School of Science and Technology (GSST), Faculty of Science, and International Research Organization for Advanced Science and Technology (IROAST) at Kumamoto University (KU) and the University of Lausanne, Switzerland, through its School of Biology, Faculty of Biology and Medicine, are signing this Agreement in order to promote friendship and academic exchanges.

- 1) Both parties agree to an academic exchange in education and research in the field of Biology. This Agreement shall not be constructed as any transfer, assignment or infringement of any intellectual property rights between two parties.
- 2) Both parties will make an effort to exchange professors, researchers, administrative and professional personnel and students, and also exchange research materials and publications.
- 3) Both parties will make an effort to promote the exchange but will respect the independence of opinion to their mutual benefits. If necessary, specific details of any activity shall be set forth in a written addendum. The parties acknowledge that in the absence of any provision to the contrary, all expenses of salary, travel, accommodation, health and accident insurances, living and related costs will be the responsibility of the visitor himself or herself.
- 4) This Agreement will remain effective for five years from the date of its last signature. It may be renewed before expiry by written mutual consent, if proposed by either party.

- 5) This Agreement may be amended or terminated by mutual consent, if proposed by either party, by giving at least six months notice in writing to the other party. The termination of this agreement entails the termination of the related addendum.
- 6) In the event of termination or non-renewal of this Agreement, all activities and exchanges approved earlier shall be allowed to proceed to their natural conclusion.
- 7) This Agreement is written in English and signed in duplicate by both parties. It may be translated into other languages for reference purposes.

Kumamoto University, Japan



Prof. Tsuyoshi Usagawa, Dean
Faculty of Advanced Science and Technology

Date: April 16, 2018

University of Lausanne, Switzerland



Prof. Nicolas Mermod, Director
School of Biology

Date: June 4, 2018



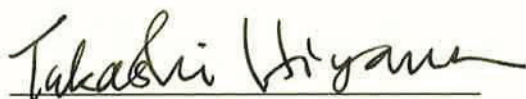
Prof. Fusao Ichikawa, Dean
Graduate School of Science and Technology
Faculty of Science

Date: April 16, 2018



Prof. Jean-Daniel Tissot, Dean
Faculty of Biology and Medicine

Date: 06/06/2018



Prof. Takashi Hiyama, Director
International Research Science Organization
for Advanced Science and Technology

Date: April 16, 2018



Prof. Nouria Hernandez, Rector
University of Lausanne

Date: June 7, 2018



연세대학교
YONSEI UNIVERSITY



熊本大学
Kumamoto University

Memorandum of Understanding

Between

**College of Health Science and Institute of Biomedical Engineering,
Yonsei University at Wonju, Republic of Korea**

And

**Faculty of Advanced Science and Technology,
International Research Organization for Advanced Science and Technology
Kumamoto University, Japan**

(Regarding institutional research collaboration)

This Memorandum of Understanding ("MOU") is made between College of Health Science and Institute of Biomedical Engineering, Yonsei University at Wonju, Republic of Korea, and the Faculty of Advanced Science and Technology, and the International Research Organization for Advanced Science and Technology, Kumamoto University, Japan

Purpose

College of Health Science and Institute of Biomedical Engineering, Yonsei University at Wonju, Republic of Korea and the Faculty of Advanced Science and Technology, and the International Research Organization for Advanced Science and Technology, Kumamoto University, Japan (hereinafter referred to as "both Universities") have a mutual interest in promoting training, research and publication through joint activities. This agreement is designed to facilitate collaboration and cooperation between both Universities in areas of mutual interest for the purpose of enhancing their contribution to higher education internationally. Each University would like to learn from each other, in spirit of friendship, equality and mutual interest.

Scope

Both Universities agree to collaborate on the development and implementation of joint activities that fall within the scope of their respective organizational missions. Possible areas include:

- (1) Faculty exchange
- (2) Joint research and program
- (3) Exchange of materials, articles and other publications

(4) Other such activities as may be mutually agreed upon

Intellectual Property Rights

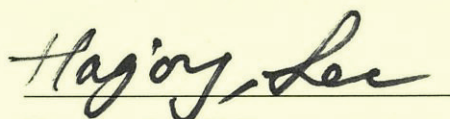
This agreement shall not be construed as any transfer, assignment or infringement of any intellectual property rights between both Universities.

Modification or Termination

This agreement becomes effective upon its signing by both Universities and will expire in five years from the date of its execution. Both Universities shall review the status of this agreement at least six months before the end of the five-year period to determine whether it wishes the agreement to continue and, if so, any modifications that might be necessary. This agreement may be amended or terminated by mutual consent, if proposed by either university, by giving at least six months' notice in writing to the other University.

This agreement is written in English and signed in duplicate by both Universities. It may be translated into other languages for reference purposes.

For
College of Health Science,
Yonsei University at Wonju



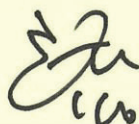
Hae-Jong Lee, Ph.D.

Dean

Oct. 25. 2018

Date

Institute of Biomedical Engineering,
Yonsei University at Wonju



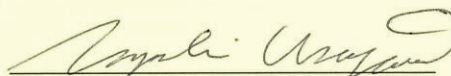
Sang Woo Lee, Ph.D.

Director

Oct. 25. 2018

Date

For
Faculty of Advanced Science and
Technology, Kumamoto University



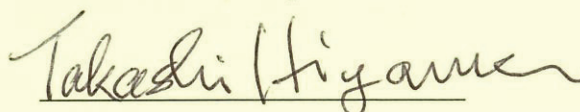
Tsuyoshi Usagawa, Ph.D.

Dean

Oct. 25, 2018

Date

International Research Organization
for Advanced Science and Technology,
Kumamoto University



Takashi Hiyama, Ph.D.

Director

October 25, 2018

Date

MEMORANDUM OF UNDERSTANDING
between
X-Earth Center, Faculty of Engineering, Kumamoto University,
Japan
and
Laboratoire 3SR, Université Grenoble Alpes, France

Following the academic agreement between Faculty of Engineering, Graduate School of Science and Technology and Faculty of Advanced Science and Technology, Kumamoto University, Japan and Polytech Grenoble and L'UFR PhITEM, Université Grenoble Alpes, France, **X-Earth Center, Faculty of Engineering, Kumamoto University, Japan** and **Laboratoire 3SR, Université Grenoble Alpes, France** and are both signing this Memorandum of Understanding (MOU) to establish a mutually beneficial cooperative relationship for the following items between two parties.

1. Exchange of Research Personnel

Both parties agree to exchange research personnel. The purpose, timing, duration of the exchange and other details shall be decided on a case basis through mutual consultation.

2. Exchange of Technical Information and Materials

Both parties agree to exchange technical information and materials such as publication, journals and other relevant references where possible and appropriate.

3. Promotion of Joint Research

Both parties agree to promote and conduct joint research activities when it is found mutually beneficial. The subject, content and conditions of each activity will be decided through mutual consultation.

4. Copyright Information

Copyright information used by either party should remain the property of the originator, or the party offering the materials.

5. Confidentiality

Both parties shall not disclose any confidential information of the other party or of mutual activities to any third party. If a party wishes to disclose information considered to be confidential or proprietary, it shall do so only after consultation of other party.

6. Duration of MOU

This MOU is effective from the date of signing, and remains effective until the expiration of the academic agreement between Faculty of Engineering, Graduate School of Science and Technology and Faculty of Advanced Science and Technology, Kumamoto University, Japan and Polytech Grenoble and L'UFR PhITEM, Université Grenoble Alpes, France, concluded in 2016.

7. Amendment/Termination

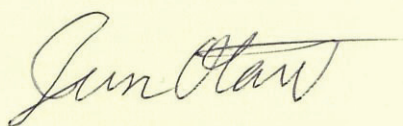
This MOU may be modified or terminated by mutual consent, if proposed by either party, upon 6 months prior written notice to other party.

8. Language

This MOU is written in English and signed in duplicate by both parties. It may be translated into other languages for reference purposes.

Partner A-1
X-Earth Center
Faculty of Engineering
Kumamoto University, Japan

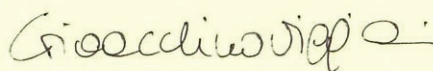
Head Professor Jun Otani



Date: June 13, 2018

Partner B-1
Laboratoire 3SR
Universite Grenoble Alpes, France

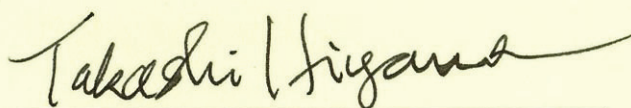
Director Gioacchino Viggiani



Date: June 13, 2018

Partner A-2 (Witness)
Kumamoto University

Director of IROAST
Professor Takashi Hiyama



Date: June 13, 2018

MEMORANDUM OF UNDERSTANDING

between

Dr. Yamakawa's Research Group, Kumamoto University

and

Dr. Acharya's Research Group, Ngee Ann Polytechnic

Dr. Toshitaka Yamakawa, Kumamoto University and Dr. Rajendra Acharya, Ngee Ann Polytechnic are both signing this Memorandum of Understanding (MOU) to establish a mutually beneficial cooperative relationship for the following items between two research parties.

1. Exchange of Research Personnel

Both parties agree to exchange research personnel. The purpose, timing, duration of the exchange and other details shall be decided on a case basis through mutual consultation.

2. Exchange of Technical Information and Materials

Both parties agree to exchange technical information and materials such as publication, journals and other relevant references where possible and appropriate.

3. Promotion of Joint Research

Both parties agree to promote and conduct joint research activities when it is found mutually beneficial. The subject, content and conditions of each activity will be decided through mutual consultation.

4. Copyright Information

Copyright information used by either party should remain the property of the originator, or the party offering the materials.

5. Confidentiality

Both parties shall not disclose any confidential information of the other party or of mutual activities to any third party. If a party wishes to disclose information considers to be confidential or proprietary, it shall do so only after consultation of other party.

6. Duration of MOU

This MOU shall be effective for a period of two years from the date of signing. It may be renewed by mutual consent, if proposed by either party.

7. Amendment/Termination

This MOU may be modified or terminated by mutual consent, if proposed by either party, upon one month prior written notice to other party.

8. Language

This MOU is written in English and signed in duplicate by both parties. It may be translated into other languages for reference purposes.

IROAST(International Research Organization
for Advanced Science & Technology)
Kumamoto University

Ngee Ann Polytechnic

Dr. Toshitaka Yamakawa

Dr. Rajendra Acharya

Signature:

Signature:

Witness:

Director of IROAST
Prof. Takashi Hiyama

Witness:

Senior Director
Andrew T Sabaratnam

Signature:

Signature:

Date: 7 September 2018

Date: 7 September 2018

MEMORANDUM OF UNDERSTANDING
between
X-Earth Center, Faculty of Engineering, Kumamoto University,
Japan
and
Groupe MSMG of Institut Pascal, Université Clermont Auvergne,
France

Following the academic agreement between Université Clermont Auvergne, France and Kumamoto University, Japan, **X-Earth Center, Faculty of Engineering, Kumamoto University, Japan** and **Groupe MSMG (Mécanique des Sols et Milieux Granulaires) of Institut Pascal, Université Clermont Auvergne, France** are both signing this Memorandum of Understanding (MOU) to establish a mutually beneficial cooperative relationship for the following items between two parties.

1. Exchange of Research Personnel

Both parties agree to exchange research personnel. The purpose, timing, duration of the exchange and other details shall be decided on a case basis through mutual consultation.

2. Exchange of Technical Information and Materials

Both parties agree to exchange technical information and materials such as publication, journals and other relevant references where possible and appropriate.

3. Promotion of Joint Research

Both parties agree to promote and conduct joint research activities when it is found mutually beneficial. The subject, content and conditions of each activity will be decided through mutual consultation.

4. Copyright Information

Copyright information used by either party should remain the property of the originator, or the party offering the materials.

5. Confidentiality

Both parties shall not disclose any confidential information of the other party or of mutual activities to any third party. If a party wishes to disclose information considered to be confidential or proprietary, it shall do so only after consultation of other party.

6. Duration of MOU

This MOU is effective from the date of signing, and remains effective until the expiration of the academic agreement between Kumamoto University, Japan and Université Clermont Auvergne, France, concluded in 2017.

7. Amendment/Termination

This MOU may be modified or terminated by mutual consent, if proposed by either party, upon 6 months prior written notice to other party.

8. Language

This MOU is written in English and signed in duplicate by both parties. It may be translated into other languages for reference purposes.



Partner A-1
X-Earth Center
Faculty of Engineering
Kumamoto University, Japan

Partner B-1
Groupe MSMG of Institut Pascal
Université Clermont Auvergne, France

Head Professor Jun Otani

Head Professor Pierre Breul

Date: January 8, 2019

Date: 16/01/19

Partner A-2 (Witness)
Kumamoto University

Director of IROAST
Professor Takashi Hiyama

Date: January 8, 2019

MEMORANDUM OF UNDERSTANDING between *Prof. Sainoki's laboratory and Główny Instytut Górnictwa*

Prof. Sainoki's laboratory, International Research Organization for Advanced Science and Technology (IROAST), Kumamoto University, represented by Professor Atsushi Sainoki and

Główny Instytut Górnictwa (GIG) of Plac Gwarków 1, 40-166 Katowice, Poland, in the District Court in Katowice, VIII Commercial Department of National Court under the number KRS 0000090660 represented by Professor Stanisław Prusek - Director

are both signing this Memorandum of Understanding (MOU) to establish a mutually beneficial cooperative relationship for the following items between two parties.

1. Exchange of Research Personnel

Both parties agree to exchange research personnel. The purpose, timing, duration of the exchange and other details shall be decided on a case basis through mutual consultation.

2. Exchange of Technical Information and Materials

Both parties agree to exchange technical information and materials such as publication, journals and other relevant references where possible and appropriate.

3. Promotion and Joint Research collaboration

Both parties agree to promote and conduct joint research activities when it is found mutually beneficial. The subject, content and conditions of each activity will be decided through mutual agreement.

4. Copyright Information

Copyright information used by either party should remain the property of the originator, or the party offering the materials.

5. Confidentiality

Both parties shall not disclose any confidential information of the other party or of mutual activities to any third party. If a party wishes to disclose information considers to be confidential or proprietary, it shall do so only after consent of other party.

6. Finances

Each Party shall bear its own costs and costs of its advisors related to this MOU.

7. Duration of MOU

This MOU shall be effective for a period of (3) three years from the date of signing. It may be renewed by mutual consent, if proposed by either party.

8. Amendment/Termination

All changes and modifications to this MOU require mutual consent of Parties expressed in the form of a signed annex, otherwise any changes or modifications shall be null and void.

This MOU may be terminated by mutual consent, if proposed by either party, upon (2) two months prior written notice to other party.

9. Language

This MOU is written in English and signed in duplicate by both parties. It may be translated into other languages for reference purposes.

Affiliation: IROAST, Kumamoto University

Title: Associate Professor

Name: Atsushi Sainoki

Signature: *Atsushi Sainoki*

Date: 14.03.2019

Affiliation: Główny Instytut Górnictwa

Title: Director

Name: Professor Stanisław Prusek

Signature: *[Signature]*

Date: 14.03.2019

IROAST Researcher Publications

László Pusztai

I.Bakó, I.Pethes, Sz.Pothoczki, L.Pusztai, “Temperature dependent network stability in simple alcohols and pure water: The evolution of Laplace spectra,” *Journal of Molecular Liquids*, 273, 670-675, 2019.

Szilvia Pothoczki, László Pusztai, Imre Bakó, “Temperature dependent dynamics in water-ethanol liquid mixtures,” *Journal of Molecular Liquids*, 271, 571-579, 2018.

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Takumi Higaki

Kae Akita, Takumi Higaki, “An induction system for clustered stomata by sugar solution immersion treatment in *Arabidopsis thaliana* seedlings,” *Journal of Visualized Experiments*, 144, e58951, 2019.

Yusuke Kimata, Takehide Kato, Takumi Higaki, Daisuke Kurihara, Tomomi Yamada, Shoji Segami, Miyo Terao Morita, Masayoshi Maeshima, Seiichiro Hasezawa, Tetsuya Higashiyama, Masao Tasaka, Minako Ueda, “Polar vacuolar distribution is essential for accurate asymmetric division of *Arabidopsis* zygotes,” *Proc Natl Acad Sci U S A*, 116, 2338-2343, 2019.

Saori Misyohi, Seisuke Kimura, Ryo Ootsuki, Takumi Higaki, Akiko Nakamasu, “Developmental analyses of divarications in leaves of an aquatic fern *Microsorium pteropus* and its varieties,” *PLOS ONE* 14, e0210141, 2019.

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Allen Yi-Lun Tsai, Takumi Higaki, Chinh-Nghia Nguyen, Laetitia Perfus-Barbeoch, Brun Favery, Shinichiro Sawa, “Regulation of root-Knot nematode behavior by seed-coat mucilage-derived attractants,” *Molecular Plant*, 12, 99-112, 2019.

Ayumi Nagashima, Takumi Higaki, Takao Koeduka, Ken Ishigami, Satoko Hosokawa, Hidenori Watanabe, Kenji Matsui, Seiichiro Hasezawa, Kazushige Touhara, “Transcriptional regulators involved in responses to volatile organic compounds in plants,” *Journal of Biological Chemistry*, 294, 2256-2266, 2018.

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Takashi Ishida

Luosha Zhang, Xiong Shi, Yutao Zhang, Jiajing Wang, Jingwei Yang, Takashi Ishida, Wenqian Jiang, Xiangyu Han, Jingke Kang, Xuening Wang, Lixia Pan, Shuo Lv, Bing Cao, Yonghong Zhang, Jinbin Wu, Huibin Han, Zhubing Hu, Langjun Cui, Shinichiro Sawa, Junmin He, Guodong Wang, “CLE9 peptide-induced stomatal closure is mediated by abscisic acid, hydrogen peroxide, and nitric oxide in *Arabidopsis thaliana*,” *Plant, Cell & Environment*, 42(3), 1033-1044, 2019.

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Akiko Nakamasu

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Minwoo Kim

Min Woo Kim, Hwa Yeon Jeong, Seong Jae Kang, In Ho Jeong, Moon Jung Choi, Young Myoung You, Chan Su Im, In Ho Song, Tae Sup Lee, Jin Suk Lee, Aeju Lee and Yong Serk Park, "Anti-EGF receptor aptamer-guided co-delivery of anti-cancer siRNAs and quantum dots for theranostics of triple-negative breast cancer," Theranostics, 9(3), 837-852, 2019.

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Satoshi Hinokuma

Saaya Kiritoshi, Takeshi Iwasa, Kento Araki, Yusuke Kawabata, Tetsuya Taketsugu, Satoshi Hinokuma and Masato Machida, "Supported binary CuOx–Pt catalysts with high activity and thermal stability for the combustion of NH₃ as a carbon-free energy source," RSC Adv., 8, 41491-41498, 2018.

Satoshi Hinokuma, Geir Wiker, Takuya Suganuma, Atul Bansode, Dragos Stoian, Silvia Caminero Huertas, Sonia Molina, Alexandr Shafir, Magnus Rønning, Wouter van Beek, Atsushi Urakawa, "Versatile IR spectroscopy combined with synchrotron XAS-XRD: Chemical, electronic and structural insights during thermal treatment of MOF materials," European Journal of Inorganic Chemistry, 2018(17), 1847-1853, 2018.

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Martino Di Serio

Serena Esposito, Brigida Silvestri, Vincenzo Russo, Barbara Bonelli, Maela Manzoli, Fabio A. Deorsola, Alessandro Vergara, Antonio Aronne, and Martino Di Serio, "Self-Activating Catalyst for Glucose Hydrogenation in the Aqueous Phase under Mild Conditions," ACS Catalysis, 9(4), 3426-3436, 2019.

R. Turco, R. Tesser, M. E. Cucciolito, M. Fagnano, L. Ottaiano, S. Mallardo, M. Malinconico, G. Santagata, M. Di Serio, “Cynara cardunculus Biomass Recovery: An Eco-Sustainable, Nonedible Resource of Vegetable Oil for the Production of Poly (lactic acid) Bioplasticizers,” ACS Sustainable Chem. Eng., 7(4), 4069-4077, 2019.

Russo, V., Santacesaria, E., Tesser, R., Turco, R., Vitiello, R., Di Serio, M., “Validation of the kinetics of the hydrogen peroxide propene oxide process in a dynamic continuous stirred tank reactor,” Industrial and Engineering Chemistry Research, 57(48), 16201-16208, 2018.

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from IROAST Visiting Professors and their Host Professors

Maria Jose Cocero & Tetsuya Kida

Elaine G. Mission, Armando T. Quitain, Yudai Hirano, Mitsuru Sasaki, Maria Jose Cocero and Tetsuya Kida, “Integrating reduced graphene oxide with microwave-subcritical water for cellulose depolymerization,” *Catalysis Science and Technology*, 8 (21), 5434-5444, 2018.

Jens Hartmann & Takahiro Hosono

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Yang Kim & Shinya Hayami

Asami Tsukiashi, Manabu Nakaya, Fumiya Kobayashi, Ryo Ohtani, Masaaki Nakamura, Jack M. Harrowfield, Yang Kim, and Shinya Hayami, “Intermolecular Interaction Tuning of Spin-Crossover Iron(III) Complexes with Aromatic Counteranions,” *Inorganic Chemistry* 57 (5), 52834-2842, 2018.

Kusumoto, S., Kobayashi, F., Ohtani, R., Zhang, Y., Harrowfield, J., Kim, Y., Hayami, S., Nakamura, M., “Creating capsules with cubanes,” *Dalton Transactions* 47 (29), 2018, 9575-9578.

Pavel Lejček & Sadahiro Tsurekawa

Aifantis, K.E., Deng, H., Shibata, H., Tsurekawa, S., Lejček, P., Hackney, S.A., “Interpreting slip transmission through mechanically induced interface energies: a Fe–3%Si case study,” *Journal of Materials Science* 54 (2), 1831-1843, 2019.

Viren Ivor Menezes & Hamid Hosano (Hosseini)

K. Irimpan, V. Menezes, K. Srinivasan, H. Hosseini (Hosano), “Nose-tip Transition Control by Surface Roughness on a Hypersonic Sphere,” *Journal of Flow Control, Measurement & Visualization*, 6: 125-135, 2018.

Reiko Oda & Hirotaka Ihara

Oishi, H., Yoshida, K., Kuwahara, Y., Takafuji, M., Oda, R., Ihara, H., “Generation of strong circularly polarized luminescence induced by chiral organogel based on L-glutamide,” *Journal of the Taiwan Institute of Chemical Engineers*, 92, 58-62, 2018.

Okazaki, Y., Ryu, N., Buffeteau, T., Pathan, S., Nagaoka, S., Pouget, E., Nlate, S., Ihara, H., Oda, R., “Induced circular dichroism of monoatomic anions: silica-assisted the transfer of chiral environment from molecular assembled nanohelices to halide ions,” *Chemical Communications*, 54, 73, 10244-10247, 2018.

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Novak, N., Borovinšek, M., Vesenjak, M., Wormser, M., Körner, C., Tanaka, S., Hokamoto, K., Ren, Z., “Crushing Behavior of Graded Auxetic Structures Built from Inverted Tetrapods under Impact,” *Physica Status Solidi (B) Basic Research* 256 (1), Article number 1800040, 2019.

Novak, N., Hokamoto, K., Vesenjak, M., Ren, Z., “Mechanical behaviour of auxetic cellular structures built from inverted tetrapods at high strain rates,” *International Journal of Impact Engineering* 122, 83-90, 2018.

External Funds

Name	Fund	Funder	Amount (x1,000 JPY) FY2018	Amount (x1,000 JPY) (Total funding FYs)
Toshiyuki Tosha	Donated Fund	Mitsui Mineral Development Engineering Co., Ltd.	600	—
	Donated Fund	Hakuei Sangyo Co., Ltd.	500	—
	Donated Fund	West Japan Engineering Consultants, Inc.	1,000	—
	Contracted Research	New Energy and Industrial Technology Development Organization (NEDO)	6,862	—
Mitsuhiro Aida	Grant-in-Aid for Scientific Research on Innovative Areas (Research in a proposed research area)	JSPS	4,810	9,490 (2018-2019)
	Research Fund	Yamada Science Foundation	2,000	—
	Grant-in-Aid for Scientific Research (C)	JSPS	910	5,070 (2016-2018)
Takumi Higaki	Grant-in-Aid for Scientific Research on Innovative Areas	JSPS	11,570	57,460 (2018-2022)
	Grant-in-Aid for Challenging Exploratory Research	JSPS	3,250	6,500 (2017-2018)
	"Creation of Industrial Infrastructure"	The Canon Foundation	6,000	13,000 (2017-2018)

	Research Grant Program			
	Grant-in-Aid for Scientific Research on Innovative Areas (Co-investigator)	JSPS	4,000*	2,445,300 (2016-2021)
Atsushi Sainoki	Grant-in-Aid for Research Activity Start-up	JSPS	910	—
	Research Fund	Japan Anchor Association	500	—
	Research Fund	Limestone Association of Japan	1,000	—

JSPS: Japan Society for the Promotion of Science

*Amount granted to the co-investigator

Publications Supported by IROAST Publication Support Program

*Proofreading/**Publishing Expenses Support

No.	Name	Publication Information
1 **	Mitsuyo Kishida FAST	Zulvikar Syambani Ulhaq and Mitsuyo Kishida, “Brain Aromatase Modulates Serotonergic Neuron by Regulating Serotonin Levels in Zebrafish Embryos and Larvae,” <i>Front. Endocrinol. (Lausanne)</i> , 9, 230, 2018.
2 *	Satoshi Hinokuma FAST/IROAST	Satoshi Hinokuma, Kento Araki, Takeshi Iwasa, Saaya Kiritoshi, Yusuke Kawabata, Tetsuya Taketsugu, Masato Machida, “Ammonia-rich combustion and ammonia combustive decomposition properties of various supported catalysts,” <i>Catalysis Communications</i> , 123, 64-68, 2019.
3 */**	Shinji Koide FAST	Shinji Koide and Tomoki Imamura, “Dynamic Process of Spontaneous Energy Radiation from Spinning Black Holes through Force-free Magnetic Field,” <i>The Astrophysical Journal</i> , 864(2), 173, 2018.
4 *	Tetsuya Kida FAST	T. Kida, Y. Kuwaki, A. Miyamoto, N. L. Hamidah, K. Hatakeyama, A. T. Quitain, M. Sasaki, A. Urakawa, “Water vapor electrolysis with proton-conducting graphene oxide nanosheets,” <i>ACS Sustainable Chemistry & Engineering</i> , 6(9), 11753-11758, 2018.
5 **	Soichiro Yoshimoto FAST	Sakura Origuchi, Mai Kishimoto, Dr. Michito Yoshizawa, Dr. Soichiro Yoshimoto, “A Supramolecular Approach to the Preparation of Nanographene Adlayers Using Water - Soluble Molecular Capsules,” <i>Angewandte Chemie International Edition in English</i> , 57(47), 15481-15485, 2018.
6 **	Shinya Hayami FAST	Asami Tsukiashi, Kil Sik Min, Hikaru Kitayama, Hiroaki Terasawa, Sosuke Yoshinaga, Mitsuhiro Takeda, Leonard F. Lindoy & Shinya Hayami, “Application of spin-crossover water soluble nanoparticles for use as MRI contrast agents,” <i>Scientific Reports</i> 8(1), 14911, 2018.
7 **	Shinya Hayami FAST	Hiroshi Takehira, Mohammad Razaul Karim, Yuta Shudo, Masahiro Fukuda, Tsutomu Mashimo & Shinya Hayami, “Modulating the Work Function of Graphene by Pulsed Plasma Aided Controlled Chlorination,” <i>Scientific Reports</i> 8(1), 17392, 2018.
8 **	Satoshi Hinokuma FAST/IROAST	Saaya Kiritoshi, Takeshi Iwasa, Kento Araki, Yusuke Kawabata, Tetsuya Taketsugu, Satoshi Hinokuma and Masato Machida, “Supported binary CuO _x -Pt catalysts with high activity and thermal stability for the combustion of NH ₃ as a carbon-free energy source,” <i>RSC Advances</i> , 8(72), 41491-41498, 2018.

9 **	Ruda (Aeju) Lee IROAST	Min Woo Kim, Seung-Hae Kwon, Jung Hoon Choi and Aeju Lee, “A Promising Biocompatible Platform: Lipid-Based and Bio-Inspired Smart Drug Delivery Systems for Cancer Therapy,” International Journal of Molecular Sciences, 19(12), 3859, 2018.
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Regulations, Guidelines and Rules of IROAST

No.	Title
1	Regulations of the Kumamoto University International Research Organization for Advanced Science and Technology
2	Internal Rules for Selection of Tenure-track Professors and Associate Professors at the Kumamoto University International Research Organization for Advanced Science and Technology (IROAST)
3	Agreement on Procedures for Selection of Tenure-track Professors and Associate Professors at the Kumamoto University International Research Organization for Advanced Science and Technology (IROAST)
4	Guidelines for Interim Evaluation of Tenure-track Professors and Associate Professors at the International Research Organization for Advanced Science and Technology (IROAST)
5	Guidelines for Tenure Review of Tenure-track Professors and Associate Professors at the International Research Organization for Advanced Science and Technology (IROAST)
6	Visiting Professor Agreement of the International Research Organization for Advanced Science and Technology (IROAST)
7	Rules for Granting the Title of “Visiting Professor” in the International Research Organization for Advanced Science and Technology (IROAST)
8	Agreement of the International Research Organization for Advanced Science and Technology (IROAST) for Distinguished Professors
9	Rules for Selecting Distinguished Professors for the International Research Organization for Advanced Science and Technology (IROAST)
10	Outline of International Advisory Board of International Research Organization for Advanced Science and Technology (IROAST)
11	Guidelines for Implementing the Internship Researchers Acceptance Program of the Kumamoto University International Research Organization for Advanced Science and Technology (IROAST)

Regulations of the Kumamoto University
International Research Organization for Advanced Science and Technology

(Regulation No. 19 of February 24, 2016)

Revision Regulations No. 176 of March 31, 2017) Regulations No. 183 of April 7, 2017)

Article 1 (Aims)

These Regulations shall provide for necessary matters concerning the Kumamoto University International Research Organization for Advanced Science and Technology (“IROAST”) in accordance with the provisions of Article 8-7, Paragraph 2 of Kumamoto University Regulations (established April 1, 2004).

Article 2 (Objective of Establishment)

The objectives of IROAST shall be to perform internationalized advanced science and technology research, discovery and development of human resources, in collaboration with the Faculty of Advanced Science and Technology, the Institute of Pulsed Power Science, the Center for Water Cycle, Marine Environment, and Disaster Management, and the Magnesium Research Center (the “science and technology research organizations”), thus to ensure improvement of basic research and applied research in science and technology fields at Kumamoto University, as well as internationalized level research and educational capabilities.

Article 3 (Operations)

IROAST shall perform the following operations:

- (1) Operations with respect to implementation of international advanced science and technology research,
- (2) Operations with respect to promotion of international joint research,
- (3) Operations with respect to discovery and development of pioneering research personnel, and
- (4) Any other operation necessary for achievement of the objectives of IROAST.

Article 4 (Organization)

IROAST shall consist of the following persons:

- (1) Director,
- (2) Vice Director,
- (3) Full-Time Teacher,
- (4) Young Faculty Members for International Joint Research,
- (5) Professors, Associate Professors, Lecturers and Assistant Professors
- (6) Visiting Professors, Visiting Associate Professors, and
- (7) Other persons judged necessary by the Director.

Article 5 (Director)

1. The Director shall be selected by the President.
2. The Director shall administer management and operations of IROAST.
3. The term of office of a Director shall be two (2) years, and the Director may be re-elected.
4. The term of office of a substitute Director in the case of vacancy of the position of the Director shall be the remaining term of office of his/her predecessor, notwithstanding the provisions of the preceding paragraph.
5. Matters necessary for election of the Director shall be separately provided.

Article 6 (Vice Director)

1. A Vice Director shall be appointed out of the full-time professors of science and technology research organizations designated by the Director.
2. The Vice Director shall assist in the duties of the Director.
3. The term of office of the Vice Director shall be two (2) years, and the Vice Director may be re-elected. However, the term of office of the Vice Director shall end before the last day of the term of office of the Director who designated the relevant Vice Director.

Article 7 (Full-Time Teacher)

The President shall select Full-Time Teacher upon recommendation of the Director.

Article 8 (Young Faculty Members for International Joint Research)

1. Young Faculty Members for International Joint Research shall be established at IROAST aiming at ensuring improvement of international research capabilities in science and technology fields at the University.
2. Young Faculty Members for International Joint Research as referred to in the preceding paragraph shall be appointed by the President upon recommendation by the Director.
3. The Director shall, upon making recommendations as referred to in the preceding paragraph, conduct public advertising targeting science and technology research organizations, and decide on candidates for Young Faculty Members for International Joint Research out of the faculty recommended by the heads of the organizations.
4. Terms of office for Young Faculty Members for International Joint Research shall be three (3) years, in principle. However, if the Director judges it necessary, the term of office may be assigned to up to four (4) years.

Article 9 (Steering Committee)

1. The Kumamoto University International Research Organization for Advanced Science and Technology Steering Committee (the “Committee”) shall be established at IROAST, and consist of the Director, Vice Director, heads of the science and technology research organizations, and Assistant Dean of the Faculty of Advanced Science and Technology.
2. The Committee shall adopt resolutions in making decisions on the following matters indicated by the Director.
 - (1) Important matters with respect to management of IROAST,
 - (2) Other matters judged necessary by the Director.
3. The Committee shall exchange opinions with regard to future plans of science and technology research organizations, in addition to the provisions of the preceding paragraph.

Article 10 (Chairperson)

1. The Committee shall have a chairperson, and the Director shall serve as the chairperson.
2. The Chairperson shall call Committee meetings and chair the meetings.
3. If the chairperson is unable to act as the chairperson, the Vice Director shall perform the duties by delegation.

Article 11 (Proceedings)

1. Resolutions in proceedings may not be adopted unless a majority of Committee members is present.
2. Resolutions in proceedings of Committee meetings shall be adopted by a majority of Committee members present, and if the numbers of votes for and against are the same, the chairperson shall have the deciding vote.

Article 12 (Hearing of Views)

The chairperson may have persons other than Committee members attend Committee meetings and hear their views when necessary.

Article 13 (Administrative Affairs)

The administrative affairs of IROAST and the Committee shall be handled by the Administrative Division of the Science and Technology of Research/Education Affairs Department.

Article 14 (Miscellaneous Rules)

In addition to the matters provided in these Regulations, matters necessary for IROAST shall be separately provided.

Supplementary Provisions

These Regulations shall come into effect on April 1, 2016.

Supplementary Provisions (Regulations No. 176 of March 31, 2017)

These Regulations shall come into effect on April 1, 2017.

Supplementary Provisions (Regulations No. 183 of April 7, 2017)

1. These Regulations shall come into effect on April 7, 2017, and the provisions of Article 8, Paragraph 4 after revision shall be applicable on and after April 1, 2017 (the “Effective Date”).
2. For the terms of office of the persons appointed as Young Faculty Member for International Joint Research before the Effective Date, notwithstanding the provisions of Article 8, Paragraph 4 after revision under these Regulations, the provisions then in force shall remain applicable.

Internal Rules for Selection of Tenure-track Professors and Associate Professors at the Kumamoto University International Research Organization for Advanced Science and Technology (IROAST)

June 10, 2016

Approved by the IROAST Steering Committee

Article 1 (Aims)

These Internal Rules shall provide for necessary matters concerning selection of Tenure-track Professors and Associate Professors at the Kumamoto University International Research Organization for Advanced Science and Technology (“IROAST”).

Article 2 (Establishment of Screening Committee)

The Director of the International Research Organization for Advanced Science and Technology (the “Director”) shall, when it is necessary to select faculty, carry out document screening in the Steering Committee of the International Research Organization for Advanced Science and Technology, etc., and then later establish a Screening Committee for Faculty of the International Research Organization for Advanced Science and Technology (the “Screening Committee”).

Article 3 (Organization of Screening Committee)

The Screening Committee shall consist of the following persons:

- (1) Director,
- (2) Vice Director of the IROAST (the “Vice Director”),
- (3) Heads of science and technology research organizations,
- (4) Assistant Dean of the Faculty of Advanced Science and Technology,
- (5) A few other professors in related fields judged necessary by the Director.

Article 4 (Chairperson)

The Committee shall have a chairperson, and the Director shall serve as the chairperson.

- (1) The Chairperson shall call Committee meetings and chair the meetings.
- (2) If the chairperson is unable to act as the chairperson, the Vice Director shall perform the duties by delegation.

Article 5 (Quorum)

A Screening Committee meeting shall be established when two-thirds or more Committee members are present at the meeting.

Article 6 (Duties)

The Screening Committee shall conduct the following matters:

(1) Matters concerning selection of final candidates of Tenure-track Professors and Associate Professors at IROAST, and

(2) Other matters judged necessary by the Director with respect to selection of the relevant professors.

Article 7 (Terms of Office)

The terms of office of Committee members as specified in Article 3, Item 5 shall be the meeting period of the respective Screening Committee meetings.

Article 8 (Administrative Affairs)

Administrative affairs of the Committee shall be handled by the Administrative Division of the Science and Technology of Research/Education Affairs Department.

Article 9 (Miscellaneous Rules)

In addition to the matters provided in these Internal Rules, matters necessary for selection of faculty at IROAST shall be separately provided.

Supplementary Provisions

These Internal Rules shall come into effect on June 10, 2016.

**Agreement on Procedures for Selection of Tenure-track Professors and Associate Professors at the
Kumamoto University International Research Organization for Advanced Science and Technology
(IROAST)**

June 10, 2016

Approved by the IROAST Steering Committee

Procedures concerning selection of Tenure-track Professors and Associate Professors at the International Research Organization for Advanced Science and Technology shall be provided as follows.

1. First stage document screening

The Director of the International Research Organization for Advanced Science and Technology (the “Director”) and the Vice Director of the International Research Organization for Advanced Science and Technology shall select persons subject to second stage document screening out of the persons who submit applications to an international recruitment.

The Director shall report to the Steering Committee about the screening standards for the first stage document screening and the results of screening.

2. Second stage document screening

The Director shall hold Steering Committee meetings, and out of the persons eligible for second stage document screening, select the persons eligible for third stage document screening (inquiries to the respective Departments of Science and Technology)

3. Third stage document screening (inquiries to the respective Departments of Science and Technology)

The Director shall inquire with the respective Departments of Science and Technology with a list of persons eligible for third stage document screening about whether or not they desire to hire Tenure-track Professors and Associate Professors. In addition, upon request from the respective Departments of Science and Technology, application documents shall be provided.

4. Establishment of Screening Committee

The Director shall hold Steering Committee meetings and establish a Screening Committee.

5. Final document screening

The Chairperson of the Screening Committee (the “Chairperson”) shall hold Screening Committee meetings, and determine applicants eligible for interviews based on answers from the respective Departments of Science and Technology.

6. Screening by interview

The Chairperson shall hold Screening Committee meetings, and conduct interviews of persons who pass the final document screening. Committee members except for the Chairperson shall submit to the Chairperson in writing the results of evaluation in interviews based on the set of application documents submitted by the persons who pass the final document screening and interview.

7. Selection of final candidates

The Chairperson shall select the final candidates using the results of evaluation submitted by Committee members pursuant to Paragraph 6 above as reference.

8. Report of final candidates

The Chairperson shall report to the President with documents in which are stated the final candidates and the reasons for selection, and the results of evaluation submitted by Committee members pursuant to Paragraph 6 above.

Supplementary Provisions

This Agreement shall come into effect on June 10, 2016.

**Guidelines for Interim Evaluation of Tenure-track Professors and Associate Professors
at the International Research Organization for Advanced Science and Technology (IROAST)**

October 25, 2016

Approved by the IROAST Steering Committee

1. Aims

These Guidelines shall provide for necessary matters with respect to interim evaluation of Tenure-track Professors and Associate Professors of the International Research Organization for Advanced Science and Technology.

2. Objectives

Interim evaluation shall be conducted for the purpose of confirmation and evaluation of the status of progress and future research potential of Tenure-track Professors and Associate Professors and for giving necessary advice as a first principle.

3. Implementation

- (1) The Director of the International Research Organization for Advanced Science and Technology (the “Director”) shall, in the conduct of an interim evaluation, entrust the interim evaluation to the departments relating to the research field of the Tenure-track Professor (the “related departments”), as it is necessary to have expert knowledge in the research fields.
- (2) The heads of the related departments shall, in the conduct of interim evaluation, establish a review committee in the related departments, and conduct an interim evaluation based on these Guidelines and Tenure Review Standards indicated in advance of hiring the Tenure-track Professor, then notify the Tenure-track Professors and Associate Professors of the results of evaluation, and report to the Director on the results of the interim evaluation. In such instance, if interim evaluation standards are separately provided by the related departments, the interim evaluation shall be carried out based on those standards.
- (3) The Director shall report to the International Research Organization for Advanced Science and Technology Steering Committee (the “Steering Committee”) on the results of reports received under the preceding item.

4. Timing

An interim evaluation shall be performed after the elapse of three (3) years from the day when the Tenure-track Professor was assigned, within three (3) months of that date.

5. Exclusion of stakeholders

The following persons shall be deemed to be stakeholders, and may not participate in the interim evaluation of the Tenure-track Professor. Provided that, upon request by the heads of the related departments, they may state their views on the interim evaluation.

(1) Mentors of the Tenure-track Professor,

(2) When the person judges by himself/herself that any of following items is applicable in a relationship with the Tenure-track Professor.

a. Relative or person with a close individual relationship of the same degree,

b. Relationship in which close joint research is conducted

(e.g., execution of joint project, co-authorship of research thesis, or having a close relationship with study group members with the same objectives),

c. Affiliation in the same research unit (researchers under the same professorship, etc.),

d. Close teacher and student relationship,

e. Confrontational relationship or competitive relationship where there is a possibility that the assessment may be deemed to be linked to the direct interests of the assessors, etc.

6. Other

Matters necessary for interim evaluation other than matters provided in these Guidelines shall be provided by the Steering Committee.

Supplementary Provisions

These Internal Rules shall come into effect on October 25, 2016.

**Guidelines for Tenure Review of Tenure-track Professors and Associate Professors
at the International Research Organization for Advanced Science and Technology (IROAST)**

October 25, 2016

Approved by the IROAST Steering Committee

1. Aims

These Guidelines shall provide for necessary matters with respect to tenure review of Tenure-track Professors and Associate Professors at the International Research Organization for Advanced Science and Technology.

2. Objectives

Tenure review shall be performed in order to evaluate the status of achievement of research by Tenure-track Professors and Associate Professors and the future potential, etc., thereof, and whether or not they possess the qualities required for grant of tenure.

3. Implementation

- (1) The Director of the International Research Organization for Advanced Science and Technology (the “Director”) shall, in the conduct of tenure review, entrust tenure review to the department that is related to the research field of the Tenure-track Professor (the “related departments”) as it is necessary to have expert knowledge in the research fields.
- (2) The heads of the related departments that accept entrustment pursuant to the provisions of the preceding item shall promptly prepare Tenure Review Standards and report these to the Director. The Director shall indicate the reported Tenure Review Standards before hiring the Tenure-track Professors and Associate Professors.
- (3) The Heads of the related departments shall, in the conduct of tenure review, establish a Tenure Review Committee in the related departments, and, based on these Guidelines and Tenure Review Standards provided in the preceding item, conduct a review on an absolute scale of the research achievement status and future potential, etc. of the Tenure-track Professor, then notify the Director of the results of review.
- (4) The Director shall obtain the approval of the International Research Organization for Advanced Science and Technology Steering Committee (the “Steering Committee”) upon receiving the results of review under the preceding item for grant of tenure relating to the Tenure-track Professor and report to the President, as well as notify the Tenure-track Professor and the heads of the related departments.
- (5) The Director and the Steering Committee shall bear responsibility relating to the grant of tenure.

4. Timing

- (1) Tenure review shall be performed after the elapse of four (4) years from the day when the Tenure-track Professor was assigned, within four (4) months of that date.
- (2) When early tenure review is desired, notwithstanding the provisions of the preceding item, the heads of the related departments shall make such a request of the Director, based on the results of an interim evaluation provided separately.

5. Exclusion of stakeholders

The following persons shall be deemed to be stakeholders, and may not participate in the tenure review of the Tenure-track Professor. Provided that, upon request by the heads of the related departments, they may state their views about the tenure review.

- (1) Mentors of the Tenure-track Professor,
- (2) When the person judges by himself/herself that any of following items is applicable to a relationship with the Tenure-track Professor.
 - a. Relative or person with a close individual relationship of the same degree,
 - b. Relationship in which close joint research is conducted
(e.g., execution of joint project, co-authorship of research thesis, or having a close relationship with study group members with the same objectives),
 - c. Affiliation in the same research unit (researchers under the same professorship, etc.),
 - d. Close teacher and student relationship,
 - e. Confrontational relationship or competitive relationship where there is a possibility that the review may be deemed to be linked to the direct interests of the assessors, etc.

6. Other

Matters necessary for tenure review other than matters provided in these Guidelines shall be provided by the Steering Committee.

Supplementary Provisions

These Internal Rules shall come into effect on October 25, 2016.

Visiting Professor Agreement of the International Research Organization for Advanced Science and Technology (IROAST)

Partially amended on November 21, 2018

September 25, 2017

Approved by the IROAST Steering Committee

The agreement between the International Research Organization for Advanced Science and Technology (hereinafter referred to as “IROAST”) and visiting professors is as follows. A ‘host professor’ is a faculty member in the science and technology fields of Kumamoto University who recommends an IROAST Visiting Professor candidate who fully meets the requirements of the IROAST Visiting Professorship. The host professor supports and cooperates with the candidate as he or she performs duties as an IROAST Visiting Professor.

(Requirements)

A visiting professor must be:

1. An internationally distinguished researcher or a researcher with distinguished achievements.
2. A researcher who can be expected to contribute to the promotion and expansion of Kumamoto University’s research activities internationally.

(Duties)

The main tasks of a visiting professor are as follows:

1. Hold international seminars. When he/she is at Kumamoto University, he/she must hold at least one seminar that offers advanced knowledge and new insights on the topic in which he/she is an expert.
2. Use the IROAST name as one of his/her affiliations in any paper written during their time as a visiting professor at Kumamoto University. (Written fully as “The International Research Organization for Advanced Science and Technology, Kumamoto University, Kumamoto, Japan.”)
3. Conclude a memorandum of understanding (MOU) with research groups associated with IROAST regarding his/her international research collaborations.
4. Promote academic and student exchanges between his/her home university/institute and Kumamoto University.
5. Apply for research grant programs, such as the Japan Society for the Promotion of Science’s “Bilateral Programs” grant, in collaboration with his/her host professor.

(Research Space)

In principle, the IROAST host professor will provide an office and/or laboratory for the visiting professor while he/she stays at Kumamoto University.

(Period of Entitlement)

The title of Visiting Professor is given for a period of one year, with the possibility for extension available.

(Procedures for Entitlement)

The title of Visiting Professor is given with the approval of the IROAST steering committee.

(Report on Activities at Kumamoto University)

The visiting professor should submit an “IROAST Visiting Professor Activities Report,” after receiving approval from his/her host professor, to the IROAST director within one month of returning home. The report may be posted on the IROAST website with the consent of the visiting professor.

**Rules for Granting the Title of "Visiting Professor" in the
International Research Organization for Advanced Science and Technology (IROAST)**

Partially amended on November 21, 2018

February 9, 2018

Approved by the IROAST Steering Committee

1. Aim and subject persons

The title of "Visiting Professor" shall be granted, based on the recommendation by faculty members in the science and technology area, to people who are world-level top researchers, who belong to other organizations (including Japanese researchers employed by Japanese organizations), and for whom it can be expected that internationally excellent pioneering research is strengthened and made more visible through international joint research with researchers of Kumamoto University.

A 'host professor' is a faculty member who recommends an IROAST Visiting Professor candidate who fully meets the requirements of the IROAST Visiting Professorship. The host professor supports and cooperates with the candidate as he or she performs duties as an IROAST Visiting Professor.

2. Selection

The title of "Visiting Professor" shall be granted by the University President from among recommended candidates after deliberation by the IROAST Steering Committee.

3. Title period

The title of "Visiting Professor" shall be granted from April 1 to March 31 of the following year of each fiscal year.

If the title is granted in the middle of a fiscal year, the title grant period shall begin a month after the month the title paperwork was submitted until March 31st of the following fiscal year. However, if the time for recommendation and time required for office tasks is shorter than three months, the title shall be granted in the next fiscal year.

4. Renewal

Title renewal shall be determined, in principle, on or before the last day of January of each fiscal year by each host professor.

If a host professor desires title renewal based on activities during the fiscal year, he/she must obtain the consent of the visiting professor and make a request to the Director of IROAST for renewal.

The Director of IROAST shall examine the request from the recommending host professor and, if renewal is appropriate, shall request title renewal from the University President.

The Director of IROAST shall report the names of renewed visiting professors at the IROAST Steering Committee meeting, which is held the beginning each fiscal year.

5. Host professor replacement

When a host professor is not able to host the Visiting Professor in the following fiscal year due to retirement or other exceptional reasons, and he/she wishes IROAST to continue collaborating with the Visiting Professor for the benefit of Kumamoto University and the formation of internationally advanced research hubs, the host professor can make a request to the Director of IROAST through following procedures:

- (1) The host professor gains approval from a professor who wishes to become the replacement and from the Visiting Professor.
- (2) The host professor makes a request to the Director of IROAST regarding the replacement by submitting the “Host researcher replacement form.”

6. Restriction on renewal periods

Title renewals shall not be extended beyond March 31st, 2021 (the end of the first-phase period of the Research Organization).

(Host researcher replacement form)

Date: yyyy-mm-dd

To the Director of IROAST,

RE: Request for host professor replacement of an IROAST Visiting Professor and extension of the Visiting Professor

I would like to request the replacement of my position as the host professor of an IROAST Visiting Professor.

Following Article 5-(1) of the “Rules for Granting the Title of "Visiting Professor" for the International Research Organization for Advanced Science and Technology (IROAST),” I have gained approval from the professors written below to be replaced as a host professor due to (reasons for the replacement, e.g. my retirement).

Replacement professor: Name

IROAST Visiting Professor: Name

Sincerely,

Name, Professor

Affiliation

Agreement of the International Research Organization for Advanced Science and Technology (IROAST) for Distinguished Professors

Partially amended on November 21, 2018

Partially amended on February 9, 2018

Partially amended on June 21, 2017

April 21, 2017

Approved by the IROAST Steering Committee

The aims of employment of a Distinguished Professor in the International Research Organization for Advanced Science and Technology (hereinafter referred to as “IROAST”) are to enhance and develop research in the fields of science and technology at Kumamoto University, to participate in international research collaborations, and to discover and foster young researchers with world-class abilities.

A ‘host professor’ is a faculty member who recommends an IROAST Distinguished Professor candidate who fully meets the requirements of the IROAST Distinguished Professorship. The host professor supports and cooperates with the candidate as he or she performs duties as an IROAST Distinguished Professor.

1. The Director of IROAST selects Distinguished Professors based on the “Selecting Distinguished Professors for the International Research Organization for Advanced Science and Technology (IROAST)” approved by the IROAST Steering Committee on February 9, 2018.
2. The main tasks of a Distinguished Professor are as follows:
 - (1) Make suggestions from an international perspective to strengthen and promote world-leading research in the fields of science and technology at Kumamoto University.
 - (2) Perform and promote international joint research with his/her host professor and group, and expand international networks.
 - (3) Hold seminars and provide guidance on research projects and papers that meet international standards to graduate students.
 - (4) Hold basic seminars for undergraduate students.
 - (5) Promote academic and student exchanges between his/her home university/institute and Kumamoto University.
3. The Distinguished Professor should follow the “IROAST Distinguished Professor Activities Plan” (Form 3), which he/she submitted to IROAST at the time of application, to perform his/her duties in cooperation with his/her host professor. Those who were employed prior to the partial amendment of this agreement must submit the “IROAST Distinguished Professor Activities Plan” (Form 3) before each of his/her working periods of the 2017 fiscal year. When the professor wishes to make changes in the “IROAST Distinguished Professor Activities Plan”, he/she needs to gain prior approval from the Director by submitting an “IROAST Distinguished Professor Activities Change Plan” (Form 5).

4. Research and education expense approvals, including travel expenses, are made at the discretion of the Director who determines the need for a budget on a case by case basis from applications submitted by the professors.
5. In principle, the host professor provides an office and/or laboratory for the Distinguished Professor while he/she stays at Kumamoto University.
6. The Distinguished Professor should submit to the Director the “IROAST Distinguished Professor Activities Report” (Form 4) by the end of January of each fiscal year of his/her contract after gaining approval from his/her host professor. The report may be posted on the IROAST website with the professor’s consent.
7. The Director will evaluate the “IROAST Distinguished Professor Activities Report” and will determine the renewal of the professor’s contract for the following fiscal year based on this evaluation.

**Rules for Selecting Distinguished Professors for the International Research Organization for
Advanced Science and Technology (IROAST)**

Partially amended on November 21, 2018

February 9, 2018

Approved by the IROAST Steering Committee

(Subject)

1. Distinguished Professors shall be top world-class researchers who have the necessary capabilities to promote and strengthen research competence in the science and technology areas of the University, to participate in international joint researches and to develop and nurture internationally acceptable young researchers. A 'host professor' is a faculty member who recommends an IROAST Distinguished Professor candidate who fully meets the requirements of the IROAST Distinguished Professorship. The host professor supports and cooperates with the candidate as he or she performs duties as an IROAST Distinguished Professor.

(Candidate recommendations)

2. Suitable candidates shall be recommended by faculty members in science and technology areas (host professors). The recommendation is desirably made by two or more host professors.

(Documents to be submitted)

3. When recommending a suitable candidate, host professors shall submit the following documents:
 - (1) Application form (Form 1);
 - (2) Letter of Acceptance by Host Professor (Form 2);
 - (3) Distinguished Professor Candidate Invitation Guidelines and Activity Plan (Form 3); and
 - (4) Curriculum vitae

(Method of selection)

4. Distinguished Professors shall be selected by the Director of IROAST by taking into account characteristics of the research area and by hearing the opinions of the Steering Committee of IROAST based on the following assessment items. The opinions of recommending persons, et al. may be heard if necessary.

[Assessment items]

The candidate shall be excellent in the following assessment items compared with the selection standard for professors in the area in question.

○ Research achievements

< Reference index >

- Number of papers
- Number of cited papers
- FWCI (Field Weighted Citation Impact)
- Percentage of Top 10% papers
- Percentage of international joint authorship

○ Activities in academic societies

< Reference index >

- Number of invited lectures
- Number of invited papers
- Record of prizes received
- Achievement in holding international conferences, etc.

○ Activities in his/her organization and research group

< Reference index >

- Activity record as the head or group leader in his/her organization or research group
- Situation of acquiring external research funds
- Number of academic degrees granted, etc.

**Outline of International Advisory Board
of International Research Organization for Advanced Science and Technology (IROAST)**

September 25, 2017

Approved by the IROAST Steering Committee

(Purpose)

Article 1

With an aim to make use of guidance provided in international viewpoints for the management of the International Research Organization for Advanced Science and Technology (hereinafter referred to as “IROAST”), IROAST shall manage the IROAST International Advisory Board (hereinafter referred to as “the Advisory Board”).

(Duties)

Article 2

The Advisory Board shall provide guidance regarding the following:

- (1) Strengthening and sharpening the internationally distinguished leading research in the science and technology fields of Kumamoto University
- (2) Promoting international research collaboration and expanding international research networks
- (3) Finding and developing human resources in advanced research fields
- (4) Other activities necessary for the achievement of IROAST’s goals

(Organization)

Article 3

a. The Advisory Board shall consist of the following members:

- (1) Director of IROAST (hereinafter referred to as “the Director”)
- (2) Vice Director of IROAST
- (3) A few Distinguished Professors of IROAST
- (4) A few external academics
- (5) Other persons deemed necessary by the Director

b. The personnel described in (3), (4) and (5) of the preceding provision shall fall under at least one of the following, and be commissioned by the Director.

- (1) A person who thoroughly understands the affairs in academia and research inside and outside Japan, and who is highly knowledgeable
- (2) A person who brings diverse experience in academia

(Chairperson)

Article 4

a. The Advisory Board shall have a chairperson, and the Director shall be assigned to that post.

b. The chairperson shall call and chair the Advisory Board.

- c. In the event that the chairperson is unable to attend to his/her duties, a board member (assigned by the chairperson in advance) shall perform duties on behalf of the chairperson.

(Administrative Work)

Article 5

Administrative work of the Advisory Board is to be undertaken by the Administrative Division of Science and Technology, Research/Education Affairs Department.

(Miscellaneous Provision)

Article 6

Essential details concerning the Advisory Board that are not specified in this outline shall be determined by the Director separately.

**Guidelines for Implementing the Internship Researchers Acceptance Program
of the Kumamoto University International Research Organization
for Advanced Science and Technology (IROAST)**

Date: February 9, 2018

Approved by: IROAST Steering Committee

(Principle)

1. These Guidelines shall specify necessary matters for the Program that accepts students, et al. enrolled in universities in foreign countries in the International Research Organization for Advanced Science and Technology (hereinafter, "IROAST") for a short period mainly for performing research guidance.

(Purpose)

2. The purpose of this Program shall be to provide students, et al. enrolled in universities in foreign countries who desire to learn advanced science and technology with opportunities of internship, to contribute to the development of global human resources and thereby ensure the improvement of capabilities of international research in science and technology areas and of internationally accepted teaching methods of the University.

(Name)

3. Students, et al. who participate in the Program shall be called "IROAST Young Internship Researchers" (hereinafter, the "Internship Researchers").

(Acceptance period)

4. The acceptance period for the Internship Researchers shall be two (2) to eight (8) weeks, in principle.

(Host researchers)

5. Researchers who accept Internship Researchers (hereinafter, the "Host Researchers") shall be researchers who belong to IROAST, in principle.

(Application procedure)

6. Host Researchers shall contact students, et al. enrolled in universities in foreign countries who desire to be the Internship Researchers in advance shall file an application with the Director of the International Research Organization for Advanced Science and Technology (hereinafter, "the

Director of IROAST”) one (1) month or before the desired date of starting acceptance using a separately prescribed form.

(Selection)

7. Internship Researchers shall be selected by the Director of IROAST and the Vice Director of IROAST based on the opinions of the Host Researchers who have expressed the desire to take care of them.

(Acceptance permission)

8. The Director of IROAST shall permit the acceptance of Internship Researchers who are selected in item 7 and for whom prescribed procedures are taken.

(Program contents)

9. The contents of the Program for the Internship Researchers shall be decided by the Director of IROAST and the Host Researchers who guide them based on the contents of applications by the Internship Researchers.

(Issuance of certificate of completion)

10. Research activities by the Internship Researchers shall be evaluated by the Host Researchers who guide them based on their reports, daily activities, etc. and, if it is considered that they have been completed, the Director of IROAST shall issue a certificate of completion.

(Internship Program participation fee)

11. An Internship Program participation fee shall not be collected.

(Expenses incurred for implementing the internship)

12. Expenses for machinery, equipment, reagents, or other items connected with the implementing the internship shall be borne by the Host Researchers.

(Research space)

13. Space needed for research during the period in which the Internship Researchers stay at the University shall be arranged by the Host Researchers, in principle.

(Aid for travel expenses, etc.)

14. The Director of IROAST shall provide aid for travel and living expenses of the Internship Researchers in whole or in part.

(Obligation of compensation, etc.)

15. If the Internship Researchers lose or damage facilities, machinery, equipment, etc. of the University during the acceptance period due to their willful misconduct or gross negligence, they shall repair them or compensate for the damage promptly.

(Compliance matters)

16. Internship Researchers shall procure travel insurance, etc. on their own expense.
 - (2) Internship Researchers shall not disclose or divulge any information to any third party on research that they could come to know.
 - (3) The Director of IROAST may request the Internship Researchers to attend a "research ethics course" designated by the University.
 - (4) If Internship Researchers intend to connect information equipment (including their own private devices) to the University's network, they shall comply with the information security policy of the University. The Director of IROAST may request that the Internship Researchers attend an "e-learning training" conducted by the University implements for students each year.
 - (5) If Internship Researchers use software in research rooms, etc., they shall submit an "Affirmation of Compliance with Copyright Laws."
 - (6) Beyond what is specified in these Guidelines, the Internship Researchers shall comply with all regulations of the University and abide by all instructions of the Host Researchers.
 - (7) If a student is judged to be inappropriate as an Internship Researcher, the University shall cancel the Program and not permit subsequent acceptance of the student.

(Office tasks)

17. Office tasks for implementing the internship researchers' acceptance Program shall be handled by the Administrative Division of Science and Technology of the Research/Education Affairs Department.

(Handling by other departments of science and technology)

18. If researchers who belong to the Faculty of Advanced Science and Technology, the Institute of Pulsed Power Science, the Center for Water Cycle, Marine Environment, and Disaster Management, or the Magnesium Research Center express a desire to accept the Internship Researchers, the Director of IROAST and the dean/director of the department where the researcher in question belongs (including the Advisor to the Dean in the case of the Faculty of Advanced Science and Technology) shall consult and decide.

(Miscellaneous provisions)

19. Beyond what is specified in these Guidelines, other necessary matters for the Program shall be specified by the Director of IROAST separately.

Supplementary provisions

These Guidelines shall come into force from April 1, 2018.



International Research Organization for
Advanced Science and Technology

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