



Institute for
Chemical Research
Kyoto University

2017

Preface



Director
TOKITOH, Norihiro

The Institute for Chemical Research (ICR), launched in 1926 as the first research institute at Kyoto University, celebrated its 90th anniversary in 2016. However, its actual roots date back to 1915 (Specialized Center for Chemical Research founded at Kyoto Imperial University, College of Science for the study of special medicinal substances, "Salvarsan," that is, arsphenamine, and so on). Our founding vision was to "Excel in the Investigation of Basic Principles of Chemistry and Their Applications." Since then, ICR has continuously produced outstanding research achievements, and we have flourished into a large-scale organization with five research divisions: Synthetic Chemistry, Materials Chemistry, Biochemistry, Environmental Chemistry, and Multidisciplinary Chemistry, and three research centers: Advanced Research Center for Beam Science, International Research Center for Elements Science (IRCELS), and Bioinformatics Center. Currently, about 120 faculty members (including the specially appointed positions), 210 graduate students, and 60 researchers are engaged in research activities in 30 different laboratories in total supervised by full-time professors. Furthermore, we have 5 laboratories supervised by visiting professors.

Research at the institute encompasses the fields of chemistry, physics, biology, and informatics. Our core chemistry fields include physical chemistry, inorganic chemistry, organic chemistry, materials chemistry and biochemistry. The graduate schools to which our laboratories belong, and from which graduate students are accepted, cover diverse fields of science, engineering, agriculture, pharmaceutical sciences, medicine, and informatics. These laboratories are spearheading cutting-edge research, and yielding outstanding results in their own and correlated research areas. The legacy of our founding philosophy continues today and describes the essence of our research activities. With this vision in mind, we have entrusted our scientists to choose and pursue research topics at the forefront of advanced chemistry with bottom-up paradigms. Whether or not the human race maintains sustained growth is a key issue of this century.

At ICR we encourage our members to be actively involved in research projects with bottom-up in mind, and to value the development of unique interdisciplinary research projects, in

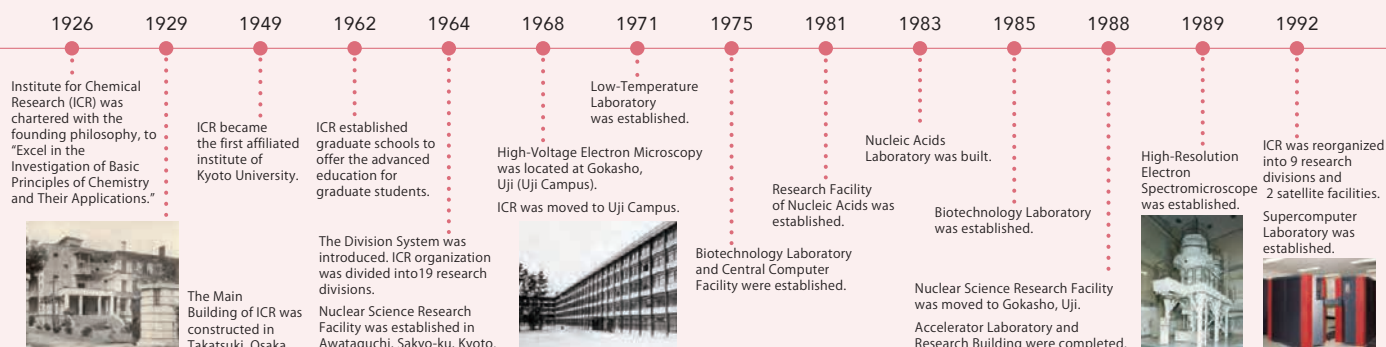
order to create new knowledge as well as to contribute to the future of our society in materials-related fields. Actually, one of our major issues is the creation and development of bio-inspired smart materials from the viewpoint of not only academic interests but also a policy aimed at fabricating a sustainable society, as these will fulfill highly efficient respective functions enabling reduction of the effects/loads on the environment and so on. The Institute for Chemical Research collaborates with the Research Institute for Sustainable Humanosphere and the Institute of Advanced Energy to start the MEXT-supported joint research project on the bio-inspired smart materials as of April 1, 2015.

Our institute is currently collaborating with domestic/overseas universities and research organizations (with 70 official international collaboration agreements) and is functioning as a Joint Usage/Research Center proclaiming the Frontier/Interdisciplinary Research Core for Deepening Investigation and Promoting Cooperation in Chemistry-oriented Fields supported by MEXT (2nd stage since 2016); these activity for the 1st stage received a high commendation on the final assessment in 2015. In addition, ICR, IRCELS in particular, is making a significant contribution to the MEXT Project of Integrated Research Consortium on Chemical Sciences (IRCCS; 2016-2021) as one of four core research institutions from Japanese national universities. Further, we also strive to foster and secure young researchers through these activities as well as the graduate education mentioned above. For instance, in 2012 we restarted an in-house annual grant system named "ICR Grant for Promoting Integrated Research." This strong collaboration basis, which has been constructed in-house thus far, will ensure that ICR serves as a global research core that propels chemistry-oriented fields.

Finally, we appreciate your continued encouragement and support.

History

For over 90 years, ICR has continued the challenge to uncover the basis of chemistry and answer the frontier quests.



Our Mission

The founding philosophy of the Institute for Chemical Research is to “Excel in the Investigation of Basic Principles of Chemistry and Their Applications.” Research is grounded on the core values of freedom, independence, and harmony. As a key part of Kyoto University, the institute is committed to contributing to the harmonious development of the global community by solving fundamental chemical issues.

Research

We regard chemistry as a broad area of the natural sciences, and strive for balanced development: the platform of basic research into the true nature of matter serves as a foothold for more applied studies that strive to be flexible and responsive to the challenges of our global society.



Education

Through research in an integrated environment of world-class laboratories, we aim to train and develop talented people with broad experience and a high level of problem solving skills, capable of providing leadership towards the harmonious development of the global community.

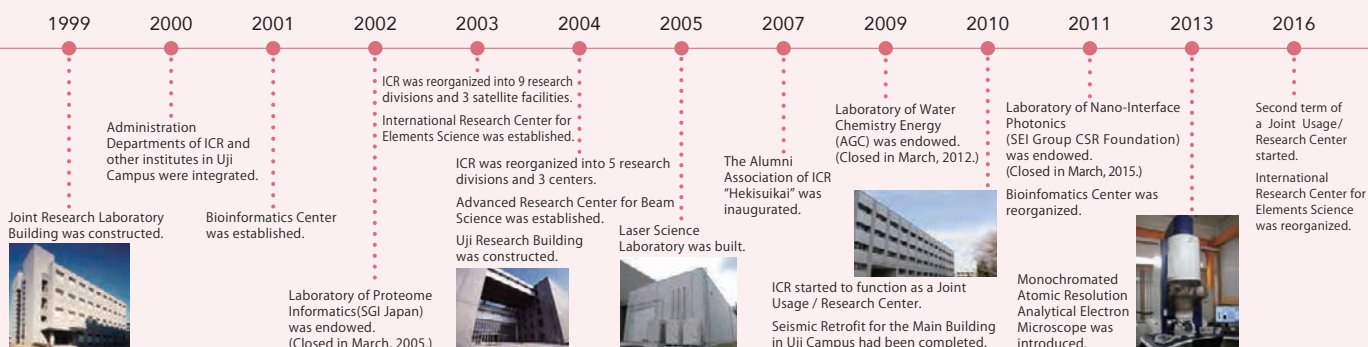
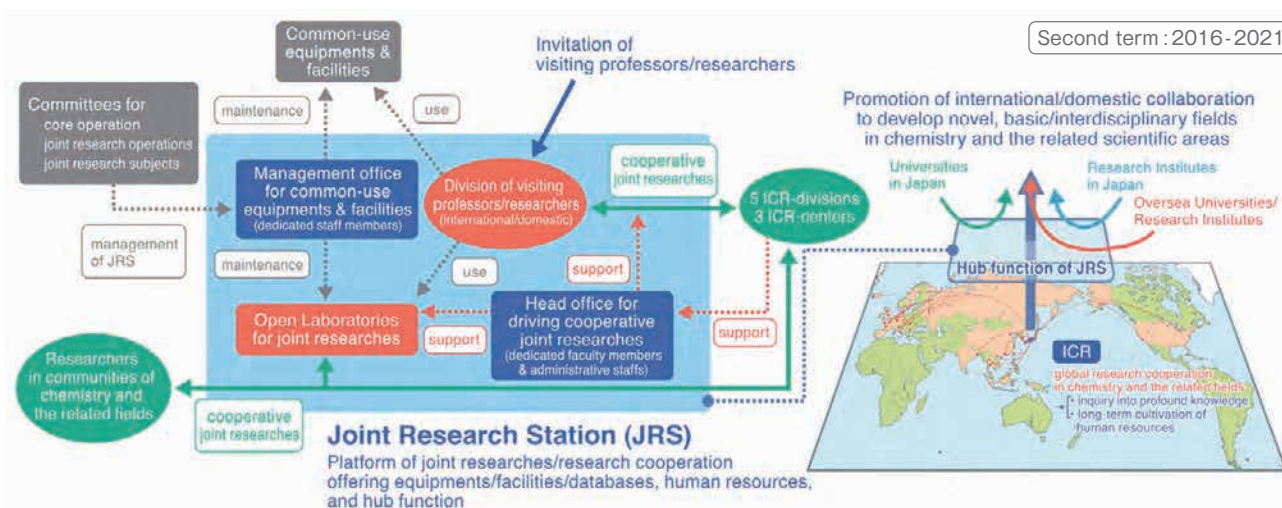


Relationship with Society

As researchers and educators of chemistry, we endeavor to deepen our exchanges with local communities and the Japanese society. We envision contributing to solving global problems through active scientific exchange with international researchers and institutions. Lastly, we commit to our accountability to society through internal review and information disclosure.



Frontier and Interdisciplinary Research Core for Deepening Investigation and Promoting Collaboration in Chemistry-oriented Fields

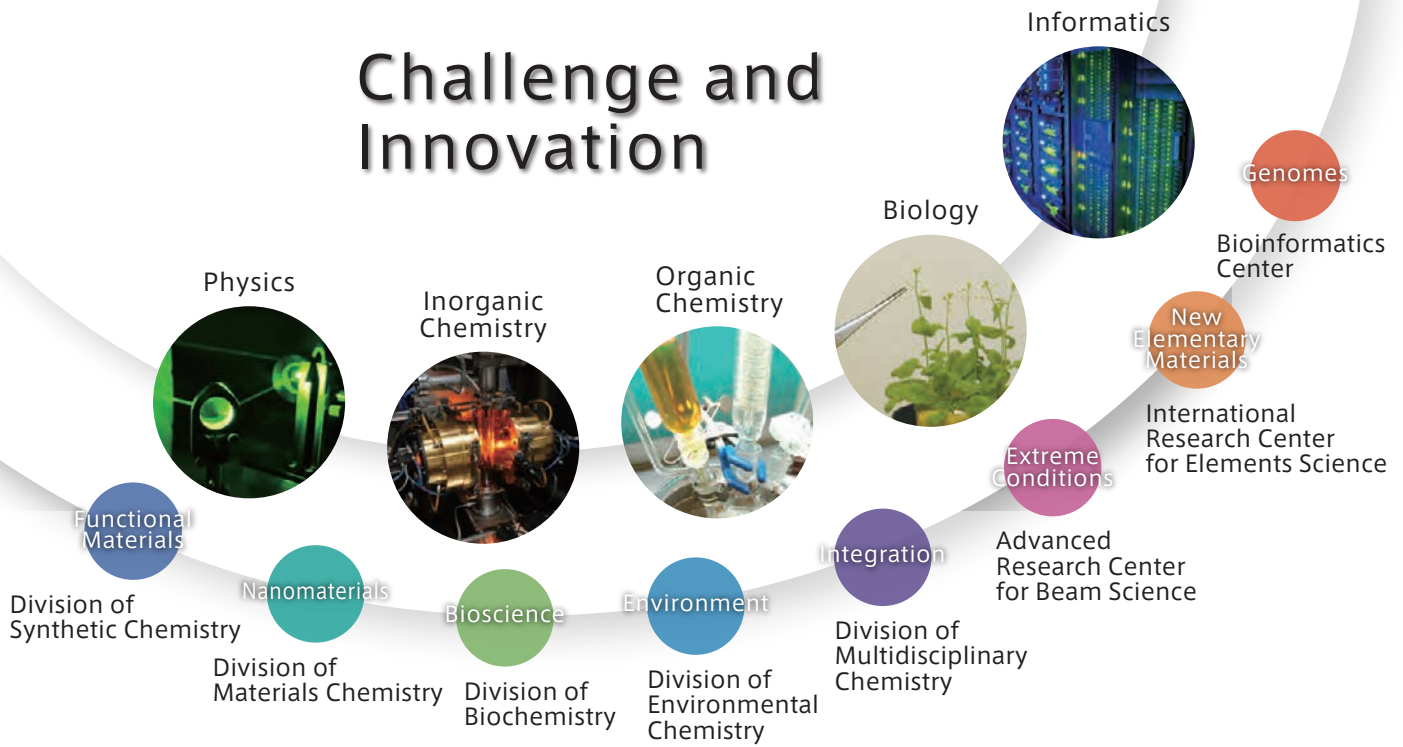


Research

ICR is located in the Uji Campus of Kyoto University.
 30 Laboratories constitute the system of
 "5 Research Divisions and 3 Research Centers"
 and more than 100 faculty and many researchers are engaged
 in various scientific research themes.

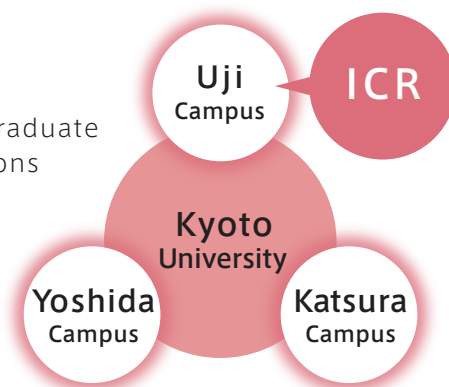
<https://www.kuicr.kyoto-u.ac.jp/sites/icr/about/research-organization/>

Challenge and Innovation

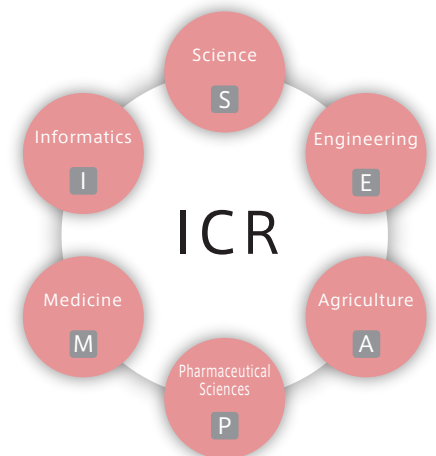


Education

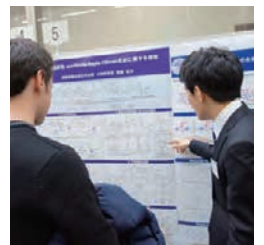
Every laboratory in ICR is affiliated with one of the Graduate Schools and has contributions to education.



3 Campuses of Kyoto University



Education collaborating with the Graduate Schools



Functional Materials

Division of Synthetic Chemistry

Research is conducted to create "Novel Materials" in order to clarify their structures, functions, and properties regardless of chemistry discipline.

Original research is conducted in individual laboratories across scientific disciplines toward the creation of novel materials beyond common concepts. Clarification of the structures and intrinsic properties of novel materials have impact in many scientific fields including material science, synthetic organic and inorganic chemistry.

Organoelement Chemistry **S**

Prof. TOKITOH, Norihiro (D.Sc.)
 Assist. Prof. MIZUHATA, Yoshiyuki (D.Sc.)
 Techn. Staff HIRANO, Toshiko



Structural Organic Chemistry **E**

Prof. MURATA, Yasujiro (D.Eng.)
 Assoc. Prof. WAKAMIYA, Atsushi (D.Eng.)
 Assist. Prof. HASHIKAWA, Yoshifumi



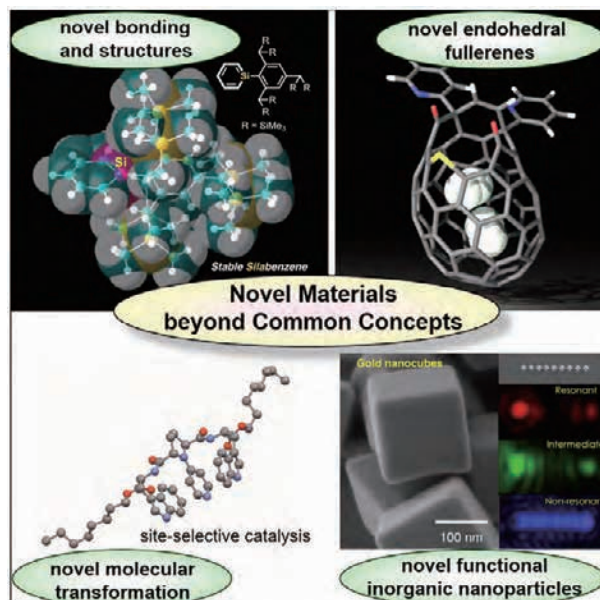
Synthetic Organic Chemistry **P**

Prof. KAWABATA, Takeo (D.Pharm.Sc.)
 Assoc. Prof. FURUTA, Takumi (D.Pharm.Sc.)
 Assist. Prof. UEDA, Yoshihiro (D.Pharm.Sc.)
 Program-Specific Assist. Prof. IMAYOSHI, Ayumi (D.Pharm.Sc.)
 Techn. Staff FUJIHASHI, Akiko



Advanced Inorganic Synthesis **S**

Prof. TERANISHI, Toshiharu (D.Eng.)
 Assoc. Prof. SAKAMOTO, Masanori (D.Eng.)
 Assist. Prof. SATO, Ryota (D.Sc.)
 Program-Specific Assist. Prof. SARUYAMA, Masaki (D.Sc.)
 Program-Specific Assist. Prof. TRINH, Thang Thuy (D.Materials.Science)



Nanomaterials

Division of Materials Chemistry

Creation of next-generation functional materials by hybridization, conjugation, and integration of different materials and by nano-miniaturization.

The aim of this research area is to develop a controlled synthetic method for nano-sized macromolecules. Novel precision fabrication of polymeric materials are also investigated. This area also emphasizes the creation and development of new functional materials by controlling electronic, photonic, and spin states through hybridization of organic-inorganic materials, creation of novel surfaces with high-density polymer brushes, development of nano-fabrication of artificial multi-layers, and the utilization of size- and quantum effects.

Chemistry of Polymer Materials **E**

Prof. TSUJII, Yoshinobu (D.Eng.)
 Assoc. Prof. OHNO, Kohji (D.Eng.)
 Assist. Prof. SAKAKIBARA, Keita (D.Agr.)



Polymer Controlled Synthesis **E**

Prof. YAMAGO, Shigeru (D.Sc.)
 Assoc. Prof. TOSAKA, Masatoshi (D.Eng.)
 Assist. Prof. KAYAHARA, Eiichi (D.Eng.)
 Assist. Prof. HASHIMOTO, Sigma (D.Eng.)



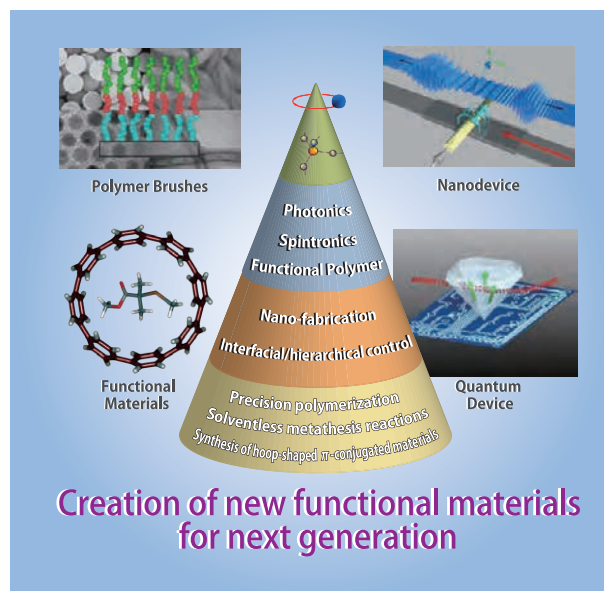
Inorganic Photonics Materials **E**

Prof. MIZUOCHI, Norikazu (D.Sc.)
 Assist. Prof. MORISHITA, Hiroki (D.Eng.)
 Assist. Prof. FUJIWARA, Masanori (D.Sc.)



Nanospintronics **S**

Prof. ONO, Teruo (D.Sc.)
 Assoc. Prof. MORIYAMA, Takahiro (Ph.D.)
 Assist. Prof. SHIOTA, Yoichi (D.Eng.)
 Techn. Staff KUSUDA, Toshiyuki



Bioscience

Division of Biochemistry

Biology meets chemistry: this division employs chemical approaches to understanding biological events, translating the gained knowledge back into creating pioneering materials.

The goals of this division are (i) Design and creation of bioactive peptides/proteins controlling cellular and gene functions, (ii) Unveiling the framework of regulatory network between genetic programs and environmental stimulus responses in higher plants, and (iii) Discovery of new bioactive organic molecules and their new use.

Biofunctional Design-Chemistry **P**

Prof. FUTAKI, Shiroh (D.Pharm.Sc.)
 Senior Lect. IMANISHI, Miki (D.Pharm.Sc.)
 Assist. Prof. KAWANO, Kenichi (D.Pharm.Sc.)



Chemistry of Molecular Biocatalysts **A**

Assist. Prof. WATANABE, Bunta (D.Agr.)

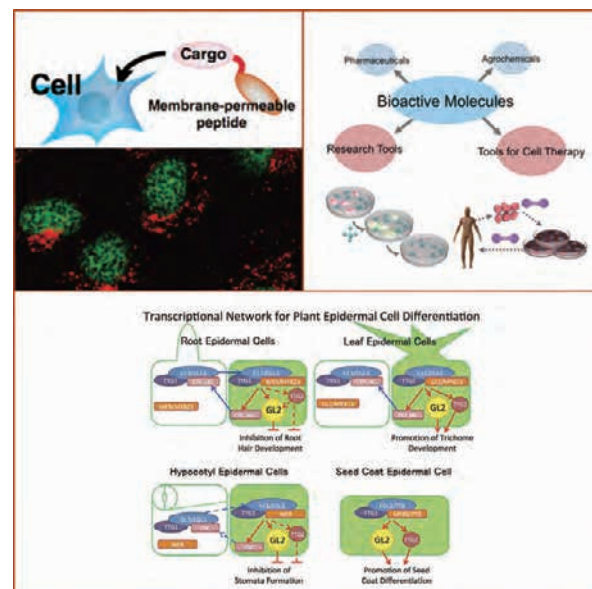
Molecular Biology **S**

Prof. AOYAMA, Takashi (D.Sc.)
 Assoc. Prof. TSUGE, Tomohiko (D.Sc.)
 Assist. Prof. KATO, Mariko (D.Agr.)
 Techn. Staff YASUDA, Keiko



Chemical Biology **M**

Prof. UESUGI, Motonari (D.Pharm.Sc.)
 Assoc. Prof. SATO, Shinichi (D.Eng.)
 Senior Lect. PERRON, Amelie (Ph.D.)
 Assist. Prof. TAKEMOTO, Yasushi (D.Eng.)



Environment

Division of Environmental Chemistry

This division aims to contribute to the development of a sustainable society through fundamental studies such as fabrication and characterization of environmentally-friendly organic devices, biogeochemistry in the hydrosphere, and biotechnology of enzymes and microorganisms.

The main research subjects are as follows: (1) Design and fabrication of novel organic LEDs and organic solar-cells. Clarification of relationship between structure and performance of the devices by solid-state NMR. (2) Biogeochemistry of trace elements in the hydrosphere, ion recognition. (3) Study of molecular mechanism to exhibit a material character at an interface using vibrational spectroscopy. (4) Physiology of extremophilic microorganisms and their applications to production of useful compounds and bioremediations. Analysis of reaction mechanisms of enzymes and their applications.

Molecular Materials Chemistry E

Prof. **KAJI, Hironori** (D Eng)
 Assist Prof. **SHIZU, Katsuyuki** (D Eng)
 Assist Prof. **SUZUKI, Katsuki** (D Human & Environmtl. Studies)
 Techn Staff **OHMINE, Kyoko**
 Techn Staff **MAENO, Ayaka**



Hydrospheric Environment Analytical Chemistry S

Prof. **SOHRIN, Yoshiki** (D Sc)
 Assoc Prof. **UMETANI, Shigeo** (D Sc)
 Assist Prof. **TAKANO, Shotaro** (D Sc)
 Techn Staff **MINAMI, Tomoharu** (D Eng)



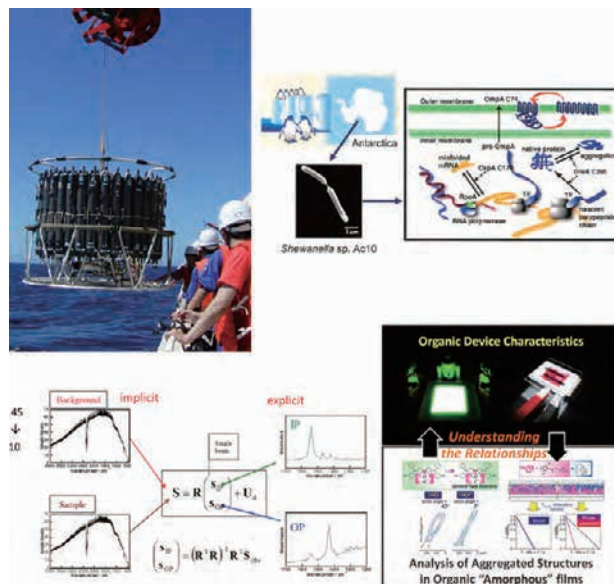
Chemistry for Functionalized Surfaces S

Prof. **HASEGAWA, Takeshi** (D Sc)
 Assist Prof. **SHIMOAKA, Takafumi** (D Sc)



Molecular Microbial Science A

Prof. **KURIHARA, Tatsuo** (D Eng)
 Assist Prof. **KAWAMOTO, Jun** (D Agr)
 Assist Prof. **OGAWA, Takuya** (D Agr)



Integration

Division of Multidisciplinary Chemistry

Integrating viewpoints of science and engineering, we aim at developing basis in the interdisciplinary area between chemistry and physics. We carry out fundamental and exploratory research through cooperation with other divisions/centers in ICR to establish a novel aspect of the advanced materials science.

This division performs basic research that aims to achieve molecular understanding of various phenomena of natural/artificial materials, develop an interdisciplinary integration view of natural science based on chemistry, and establish a new aspect of material science. The research is being conducted with a multidisciplinary methodology through collaboration within this division as well as with the other divisions/centers in ICR.

Polymer Materials Science E

Prof. **TAKENAKA, Mikihiro** (D Eng)
 Assist Prof. **OGAWA, Hiroki** (D Eng)



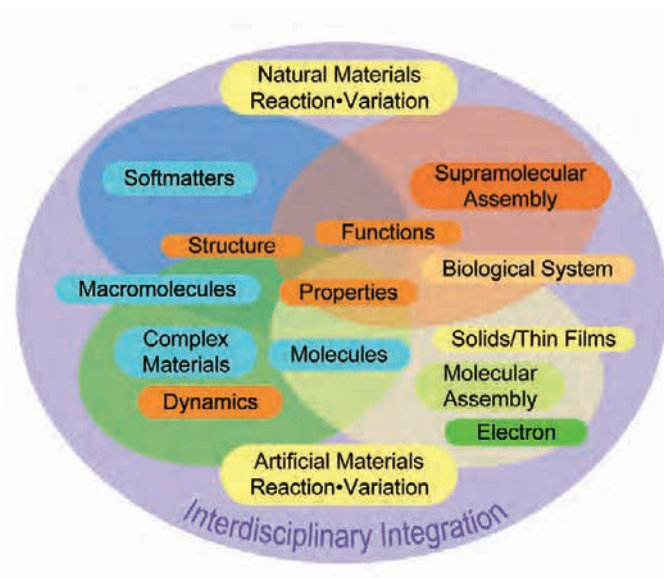
Molecular Rheology E

Prof. **WATANABE, Hiroshi** (D Sc)
 Assoc Prof. **MATSUMIYA, Yumi** (D Eng)
 Program-Specific Assist Prof. **DOI, Yuya** (D Eng)



Molecular Aggregation Analysis S

Assist Prof. **MURDEY, Richard** (Ph D)



Extreme Conditions

Advanced Research Center for Beam Science

Our research is performed to develop new capabilities using combinations of various beams, to develop new methods for space-time analysis with extreme resolution, to multidimensionally analyze functional chemical materials oriented for applications, and to establish a collaborative research system.

The Advanced Research Center aims to create advanced material science in nanoscale space/time by combining various beams (particle, laser, electron and X-ray beams) to understand and control nanospace/time phenomena from physical, chemical and biological aspects. The current topics include dynamics and handling of particle beams and improvement of their characteristics, physics of intense short pulse laser-matter interactions and its applications, high-resolution dynamical structure visualization of nano-materials, analysis of chemical reaction pathways, and dynamical analysis of vital phenomena based on molecular structures.

Particle Beam Science S

Assoc Prof. **IWASHITA, Yoshihisa** (D Sc)
 Techn Staff **TONGU, Hiromu**

Laser Matter Interaction Science S

Prof. **SAKABE, Shuji** (D Eng)
 Assoc Prof. **HASHIDA, Masaki** (D Eng)
 Assist Prof. **INOUE, Shunsuke** (D Sc)



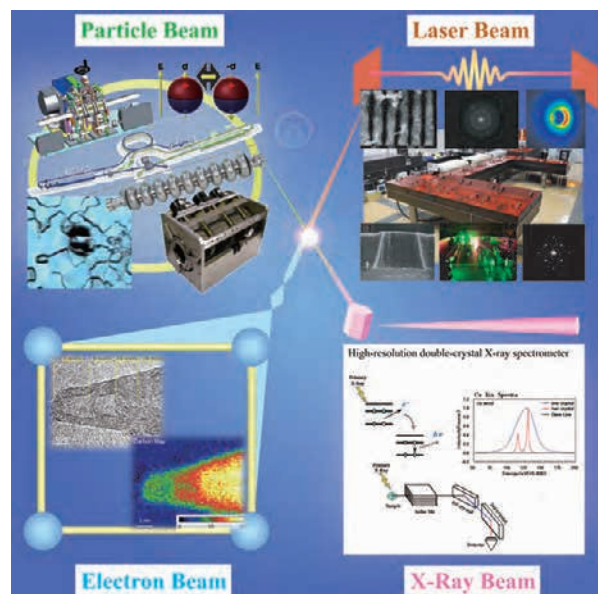
Electron Microscopy and Crystal Chemistry S

Prof. **KURATA, Hiroki** (D Sc)
 Assist Prof. **NEMOTO, Takashi** (D Sc)
 Assist Prof. **HARUTA, Mitsutaka** (D Sc)



Atomic and Molecular Structures S

Assoc Prof. **ITO, Yoshiaki** (D Sc)
 Assist Prof. **FUJII, Tomomi** (D Sc)



New Elementary Materials

International Research Center for Elements Science

Our aim is to develop a guideline for the creation of novel elementary materials through uncovering the role of key elements which determine the functions of materials.

Our research interests are centered on the development of Elements Science for creation of new functional materials and innovative chemical transformations. We are trying to design and synthesize new inorganic and organic compounds and to seek for their new functionalities from the viewpoints of fundamental science and industrial applications.

Synthetic Organotransformation **E**

Prof. NAKAMURA, Masaharu (D.Sc.)
Assoc. Prof. TAKAYA, Hikaru (D.Eng.)
Assist. Prof. ISOZAKI, Katsuhiko (D.Eng.)
Assist. Prof. IWAMOTO, Takahiro (D.Eng.)



Advanced Solid State Chemistry **S**

Prof. SHIMAKAWA, Yuichi (D.Sc.)
Assoc. Prof. KAN, Daisuke (D.Sc.)
Assist. Prof. SAITO, Takashi (D.Sc.)
Techn. Staff. ICHIKAWA, Noriya (D.Eng.)



Organometallic Chemistry **E**

Prof. OZAWA, Fumiyuki (D.Eng.)
Assist. Prof. WAKIOKA, Masayuki (D.Eng.)
Assist. Prof. TAKEUCHI, Katsuhiko (D.Sc.)



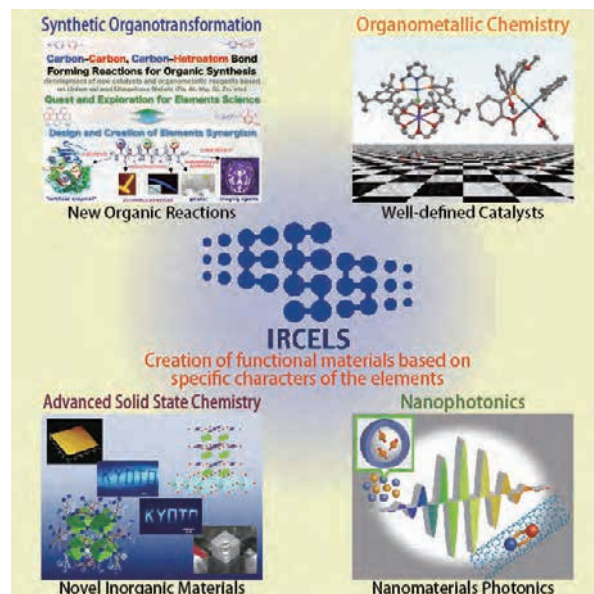
Nanophotonics **S**

Prof. KANEMITSU, Yoshihiko (D.Eng.)
Assist. Prof. TAHARA, Hirokazu (D.Sc.)



Structural Organic Chemistry

Biofunctional Design-Chemistry



Genomes

Bioinformatics Center

Our laboratories promote research in bioinformatics and the development of the foundation for an integrated and extensive resource for the bioscience.

In order to understand and utilize the information encoded in the genome, a blueprint of life, it is necessary to develop both state-of-the-art informatics technologies and excellent human resources. The Bioinformatics Center is involved in basic research on the analysis of genomic and molecular information towards understanding design principles of the biological systems, applications of bioinformatics methods to pharmaceutical and medical sciences, development of databases for deciphering the genome, and bioinformatics education and training of young scientists.

Chemical Life Science **S P**

Prof. OGATA, Hiroyuki (D.Sc.)
Assist. Prof. BLANC-MATHIEU, Romain (D.Sc.)
Assist. Prof. ENDO, Hisashi (D. Environmental Science)



Mathematical Bioinformatics **I**

Prof. AKUTSU, Tatsuya (D.Eng.)
Assist. Prof. TAMURA, Takeyuki (D. Inf.)



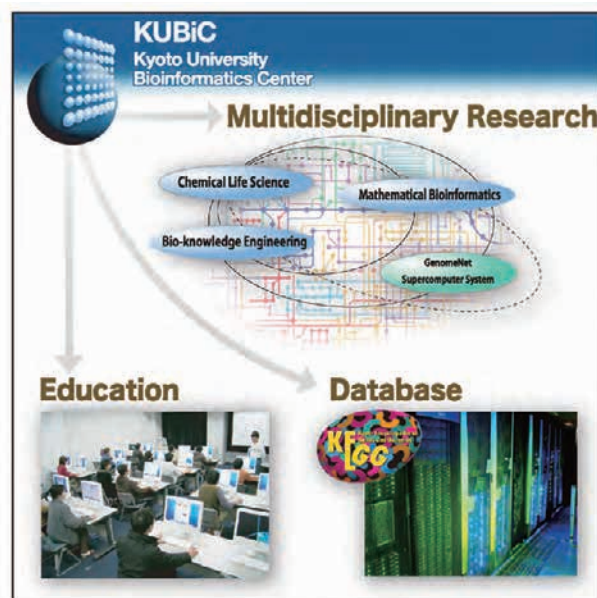
Bio-knowledge Engineering **P**

Prof. MAMITSUKA, Hiroshi (D.Sc.)
Assist. Prof. NGUYEN, Hao Canh (D. Knowledge Science)



GenomeNet Project Management Office

Prof. AKUTSU, Tatsuya (D.Eng.)



Visiting Professors

Division of Synthetic Chemistry

Prof. TANAKA, Kentaro Professor, Graduate School of Science, Nagoya University

Division of Biochemistry

Prof. FUKUYAMA, Tohru Specially-appointed Professor, Graduate School of Pharmaceutical Sciences, Nagoya University

Division of Multidisciplinary Chemistry

Prof. SAKURAI, Shinichi Professor, Kyoto Institute of Technology

International Research Center for Elements Science

Prof. TANASE, Tomoaki Professor, Faculty of Science, Nara Women's University

Division of Materials Chemistry

Assoc. Prof. MATSUZAKI, Yuichiro Senior Researcher, NTT Basic Research Laboratories

Division of Environmental Chemistry

Assoc. Prof. ENAMI, Shinichi Senior Researcher, National Institute for Environmental Studies

Advanced Research Center for Beam Science

Assoc. Prof. MIZOGUCHI, Teruyasu Associate Professor, Institute of Industrial Science, The University of Tokyo

Bioinformatics Center

Assoc. Prof. SESE, Jun Team Leader, Machine Learning Research Team, The Artificial Intelligence Research Center, National Institute of Advanced Industrial Science and Technology

International Visiting Professors

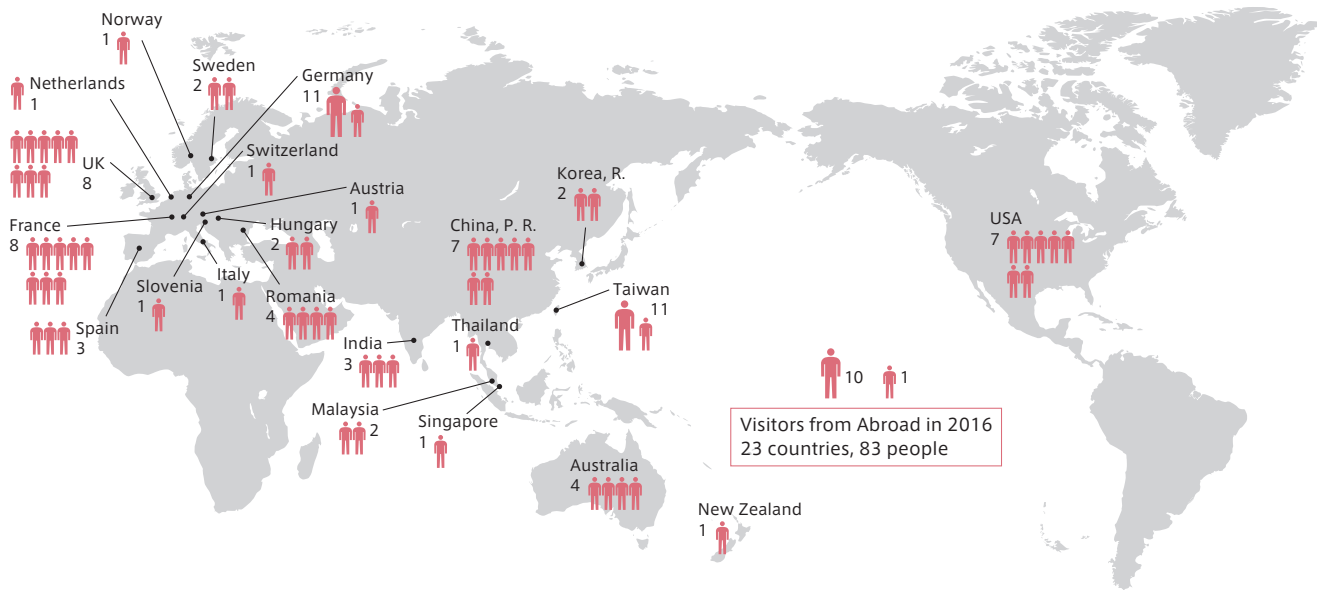
Bioinformatics Center

Prof. WICKER, Nicolas Professor, University of Lille 1 [April – July, 2017]

Division of Materials Chemistry

Prof. YANG, Jye-Shane Professor, National Taiwan University [November 2017 – February 2018]

Visitors from Abroad in 2016



Major Research Projects As of May 2017

Research and Education Funding

Joint Usage / Research Center: Frontier and Interdisciplinary Research Core for Deepening Investigation and Promoting Collaboration in Chemistry-oriented Fields

Representative from ICR TOKITOH, Norihiro / Term 2016-2021

MEXT Project of Integrated Research Consortium on Chemical Sciences

Joint Project with ICAT (Hokkaido Univ), RCMS (Nagoya Univ), IMCE (Kyushu Univ)

Representative from ICR SHIMAKAWA, Yuichi / Term 2016-2021

MEXT Project of Creative Research on Highly Efficient Smart Materials for Green Innovation

Joint Project with Institute of Advanced Energy (Kyoto Univ), Research Institute for Sustainable Humanosphere (Kyoto Univ)

Representative from ICR TOKITOH, Norihiro / Term 2015-2020

JST Strategic Basic Research Programs (ACCEL)

Reinforcement of Resiliency of Concentrated Polymer Brushes and Its Tribological Applications — Development of Novel "Soft and Resilient Tribology (SRT)" System

Research Leader TSUJII, Yoshinobu WATANABE, Hiroshi

Term 2015-2019

Data Mining-based Evaluation and Design of Materials for Concentrated Polymer Brushes (CPB)

Research Leader MAMITSUKA, Hiroshi / Term 2015-2019



Human Resource in ICR

Faculty

Numbers in () Represent Visiting Professors.

Professor	Associate Professor	Senior Lecturer	Assistant Professor	Technical Staff	PS* Associate Professor	PS* Assistant Professor	PS* Researcher	Sub-total	Researcher**	Other Staff	Sub-total	Total
26	16	2	36	9	1	3	11	104	26	45	71	175
(5)	(4)							(9)				(9)

* PS: Program Specific ** Including Researchers from Abroad As of May 1, 2017

Researchers(PD) from Abroad

Australia	1	Belgium	1	China, P.R.	4	Germany	1	Total	19
India	2	Indonesia	1	Korea, R.	5	Mexico	1		
Taiwan	1	Thailand	1	Vietnam	1				

As of May 1, 2017

Research Students, Fellows and Associates

Research Student	Research Fellow	Postdoctoral Fellow of JSPS	Research Associate	Total
4	0	6	16	26

As of May 1, 2017

Graduate Students

Numbers in () Represent Students from Abroad.

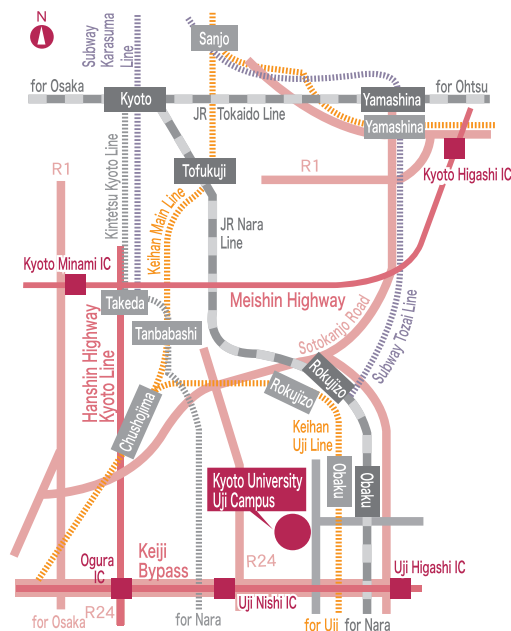
	Science	Engineering	Agriculture	Pharmaceutical Sc.	Medicine	Informatics	Total
Master's Course	44 (5)	47 (3)	10 (2)	24 (3)	6 (2)	3 (2)	134 (17)
Doctoral Course	38 (9)	17 (5)	6 (1)	9	4 (3)	3 (3)	77 (21)
Total	82 (14)	64 (8)	16 (3)	33 (3)	10 (5)	6 (5)	211 (38)

As of May 1, 2017

Graduate Students from Abroad

Austria	1	China, P.R.	24	Korea, R.	4	Philippines	4	Total	38
Taiwan	2	Thailand	1	USA	1	Vietnam	1		

As of May 1, 2017



Access

From Obaku Station on the JR Nara Line: 7 min by walk (from Kyoto Station to Obaku Station: 20 min)

From Obaku Station on the Keihan Uji Line: 10 min by walk (from Chushojima Station to Obaku Station: 10 min)

From Kyoto-Minami IC: 20 min by car

From Uji-Higashi IC: 10 min by car / From Uji-Nishi IC: 10 min by car



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The latest information of ICR is on the web
<https://www.kuicr.kyoto-u.ac.jp/sites/icr/>