ICR

Institute for Chemical Research
Kyoto University

2016

Preface

Director
TOKITOH, Norihiro

The Institute for Chemical Research (ICR), launched in 1926 as the first research institute at Kyoto University, will celebrate its 90th anniversary in 2016. However, its factual 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, the ICR has been continuously producing 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, 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 ICR encompasses the fields of chemistry, physics, biology, and informatics. Our core covers chemistry fields including physical chemistry, inorganic chemistry, organic chemistry, materials chemistry and biochemistry. The graduate schools to which our laboratories belong as cooperative ones accepting graduate students cover diverse fields of science, engineering, agriculture, pharmaceutical sciences, medicine, informatics, and human/environmental studies. 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.

The ICR encourages its 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 ICR 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.

The ICR is currently collaborating with domestic/overseas universities and research organizations (with 68 official international collaboration agreements) and is functioning as a Joint Usage/Research Center proclaiming the Frontier and Interdisciplinary Research Core for Deepening Investigation and Promoting Collaboration in Chemistry-oriented Fields supported by MEXT (2nd stage since 2016); these activities for the 1st stage received a high commendation on the final assessment last year. In addition, the 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 the 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.

1926 Institute for Chemical Research (ICR) was chartered with the founding philosophy, to "Excel in the Investigation of Basic Principles of Chemistry and Their Applications."

1929 The Main Building of ICR was constructed in Takatsuki, Osaka.

1949 ICR became the first affiliated institute of Kyoto University.

1962 ICR established graduate schools to offer the advanced education for graduate students.

1964 The Division System was introduced. ICR organization was divided into19 research divisions and 1 satellite facility.

Nuclear Science Research Facility was established in Awataguchi, Sakyo-ku, Kyoto.

1968 High-Voltage Electron Microscopy was located at Gokasho, Uji (Uji Campus).

ICR was moved to Uji Campus.

1971 Low-Temperature Laboratory was established.

1975 Biotechnology Laboratory and Central Computer Facility were established.

1983 Nucleic Acids Laboratory was built.

1985 Biotechnology Laboratory was established.

1988 Nuclear Science Research Facility was moved to Gokasho, Uji.

Accelerator Laboratory and Research Building were completed.

1989 High-Resolution Electron Spectromicroscope was established.

1992 ICR was reorganized into 9 research divisions and 2 satellite facilities.

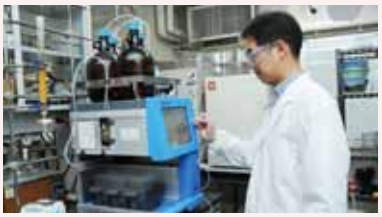
Supercomputer Laboratory was established.

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.



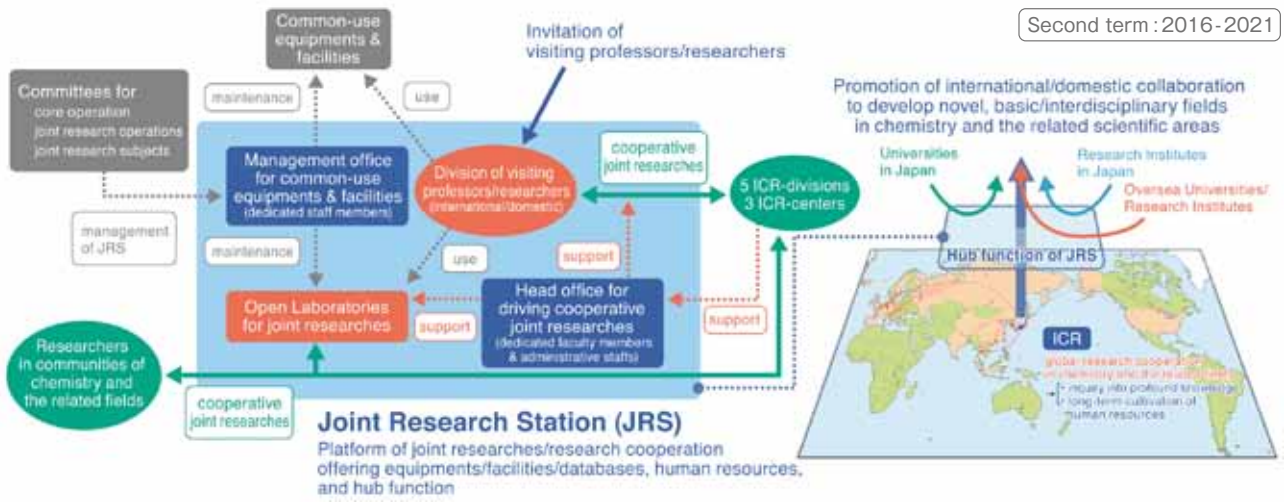
Education

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



1999 Joint Research Laboratory Building was constructed.

2000 Administration Departments of ICR and other institutes in Uji Campus were integrated.

2001 Bioinformatics Center was established.

2002 Laboratory of Proteome Informatics(SGI Japan) was endowed. (Closed in March, 2005.)

2003 ICR was reorganized into 9 research divisions and 3 satellite facilities.

International Research Center for Elements Science was established.

Uji Research Building was constructed.

2004 ICR was reorganized into 5 research divisions and 3 centers.

Advanced Research Center for Beam Science was established.

2005 Laser Science Laboratory was built.

2007 The Alumni Association of ICR “Hekisuikai” was inaugurated.

2009 Laboratory of Water Chemistry Energy (AGC) was endowed. (Closed in March, 2012.)

2010 ICR started to function as a Joint Usage / Research Center.

Seismic Retrofit for the Main Building in Uji Campus had been completed.

2011 Laboratory of Nano-Interface Photonics (SEI Group CSR Foundation) was endowed. (Closed in March, 2015.)

Bioinfomatics Center was reorganized.

Monochromated Atomic Resolution Analytical Electron Microscope was introduced.

2013

2016 Second term of a Joint Usage/ Research Center started.

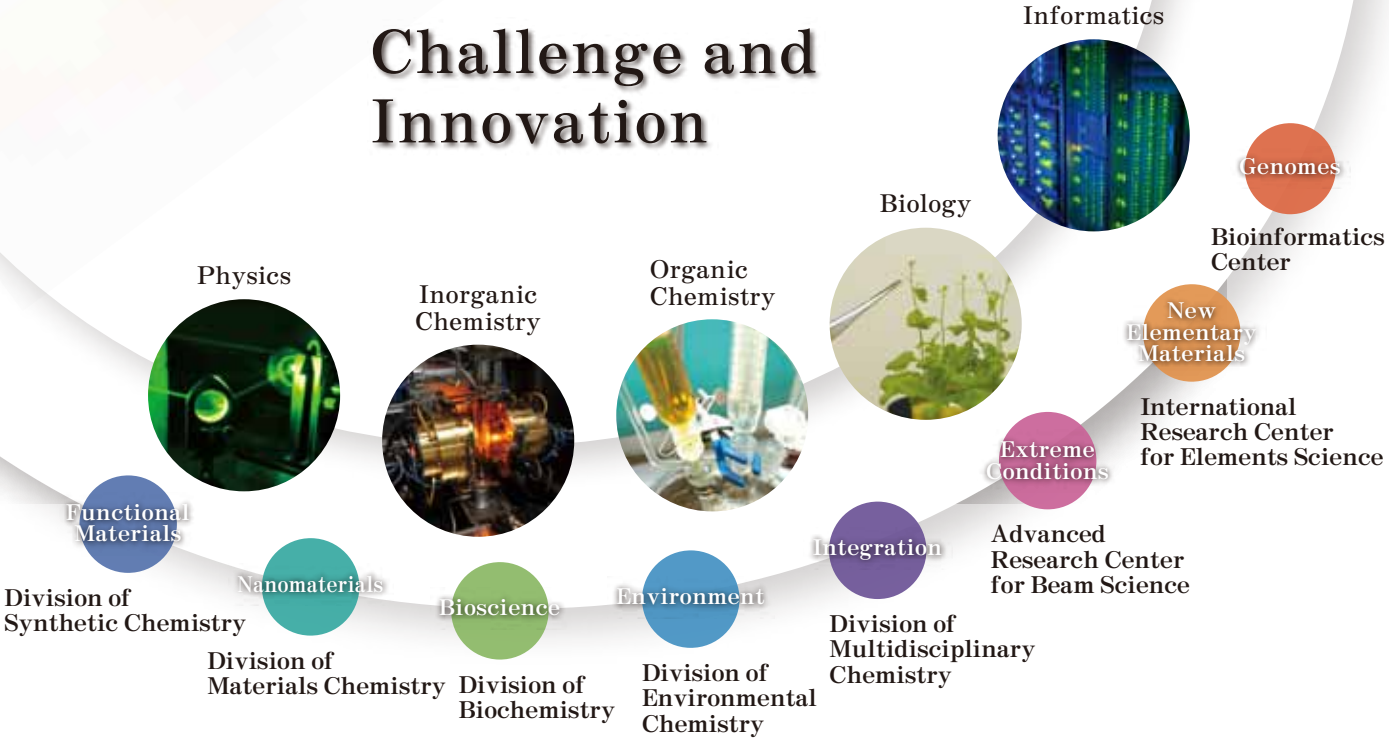
International Research Center for Elements Science was reorganized.

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.

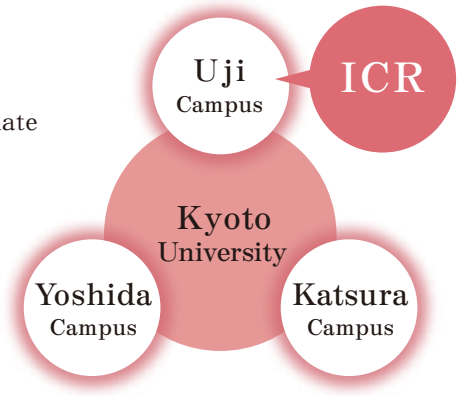
http://www.kuicr.kyoto-u.ac.jp/sites/icr/about/research-organization/

Challenge and Innovation

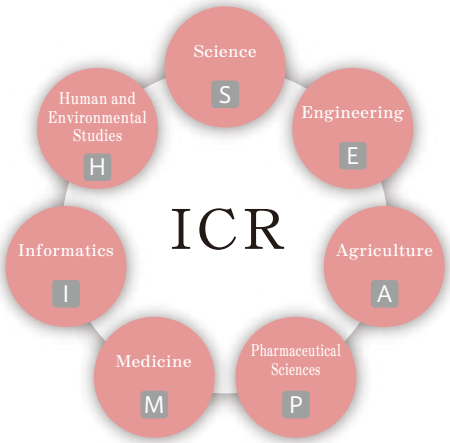


Education

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



3 Campuses of Kyoto University



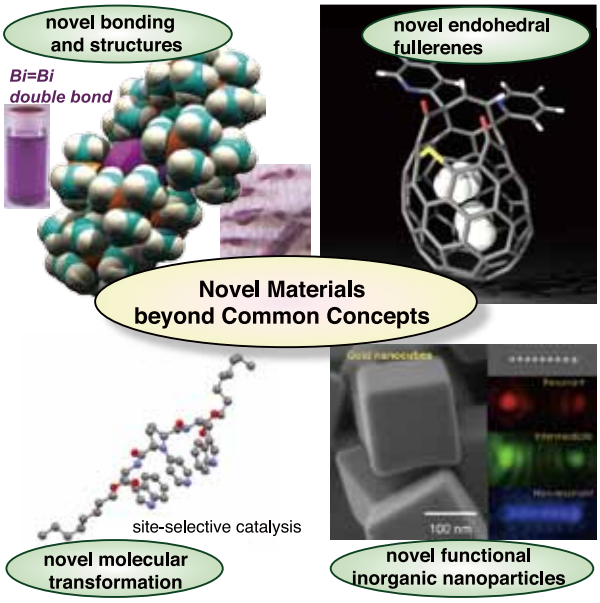
Education collaborating with the Graduate Schools

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)
Assoc Prof
SASAMORI, Takahiro (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
MURATA, Michihisa (D Eng)

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
YOSHIDA, Keisuke (D Pharm Sc)
Techn Staff
FUJIHASHI, Akiko

Advanced Inorganic Synthesis S

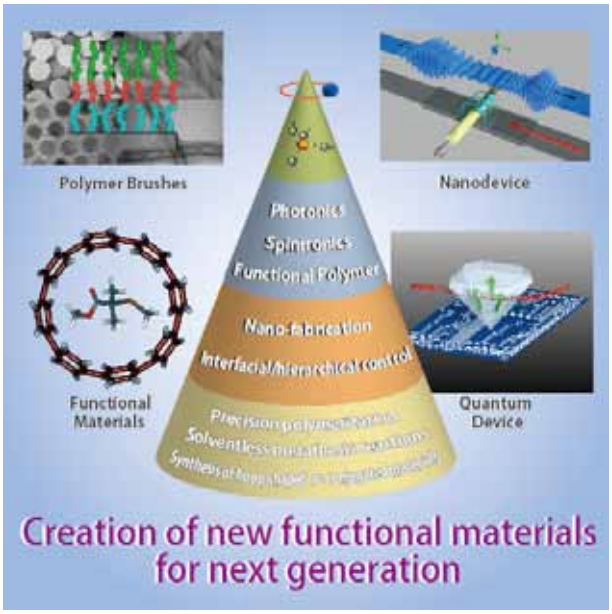
Prof
TERANISHI, Toshiharu (D Eng)
Assoc Prof
SAKAMOTO, Masanori (D Eng)
Assist Prof
SATO, Ryota (D Sc)
Program-Specific Assist Prof
SARUYAMA, Masaki (D Sc)
Program-Specific Assist Prof
TRINH, Thang Thuy (D Materials Science)

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)
Program-Specific Assoc Prof
NAKAMURA, Yasuyuki (D Sc)

Inorganic Photonics Materials E

Prof
MIZUOCHI, Norikazu (D Sc)
Assist Prof
MASAI, Hirokazu (D Eng)
Assist Prof
MORISHITA, Hiroki (D Eng)
Program-Specific Assist Prof
FUJIWARA, Masanori (D Sc)

Nanospintronics S

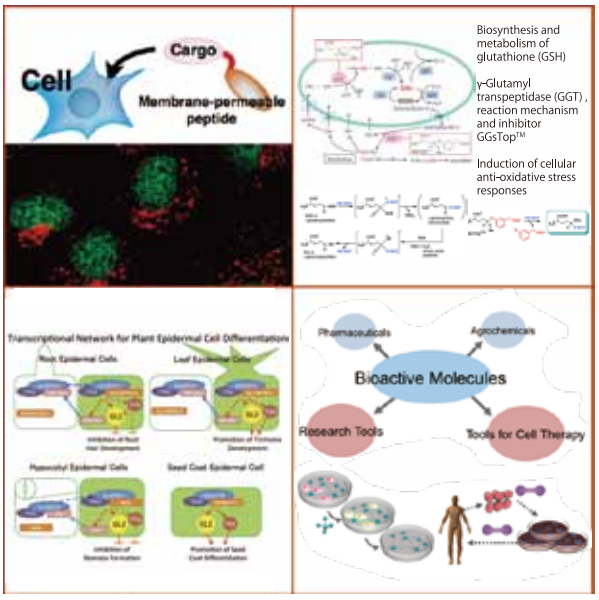
Prof
ONO, Teruo (D Sc)
Assoc Prof
MORIYAMA, Takahiro (Ph D)
Assist Prof
KIM, Kab-Jin (Ph D)
Techn Staff
KUSUDA, Toshiyuki

Bioscience

Division of Biochemistry

Biology meets chemistry; this division elucidates the mechanisms behind intra/inter-cellular recognition, stimuli response, and biomolecular synthesis in living organisms, leading to the development of pioneering novel materials.

The goals of this division are (i) Design and creation of bioactive peptides/proteins controlling cellular and gene functions, (ii) Chemical understanding of the reaction mechanisms and physiological significance of biocatalysts, (iii) Unveiling the framework of regulatory network between genetic programs and environmental stimulus responses in higher plants, and (iv) 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

Prof
HIRATAKE, Jun (D Agr)
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
OHKANDA, Junko (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 chemical roles of minute water and molecular complex involved in a functionalized polymer and a solution 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
FUKUSHIMA, Tatsuya (D Eng)
Assist Prof
SHIZU, Katsuyuki (D Eng)
Techn Staff
OHMINE, Kyoko
Techn Staff
MAENO, Ayaka

Hydrospheric Environment Analytical Chemistry S

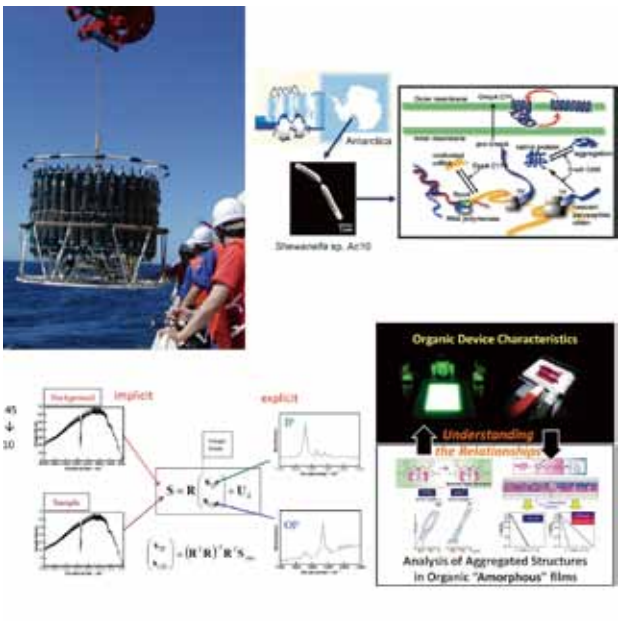
Prof
SOHRIN, Yoshiki (D Sc)
Assoc Prof
UMETANI, Shigeo (D Sc)
Assist Prof
TAKANO, Shotaro (D Sc)
Techn Staff
MINAMI, Tomoharu (D Eng)

Solution and Interface Chemistry 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

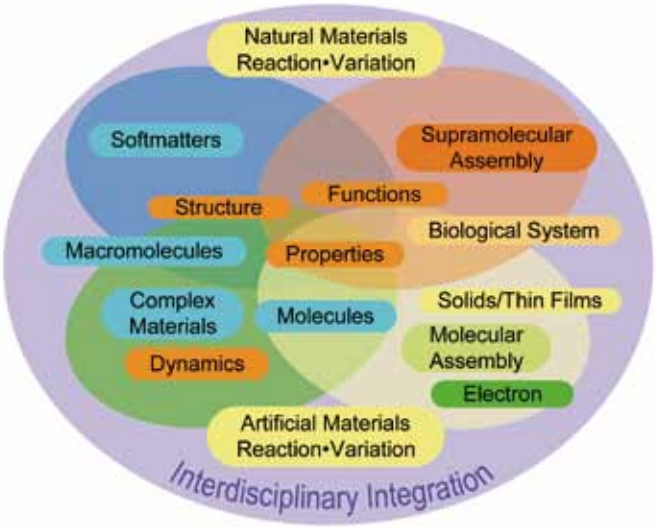
Assoc Prof
NISHIDA, Koji (D Eng)
Assist Prof
OGAWA, Hiroki (D Eng)

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

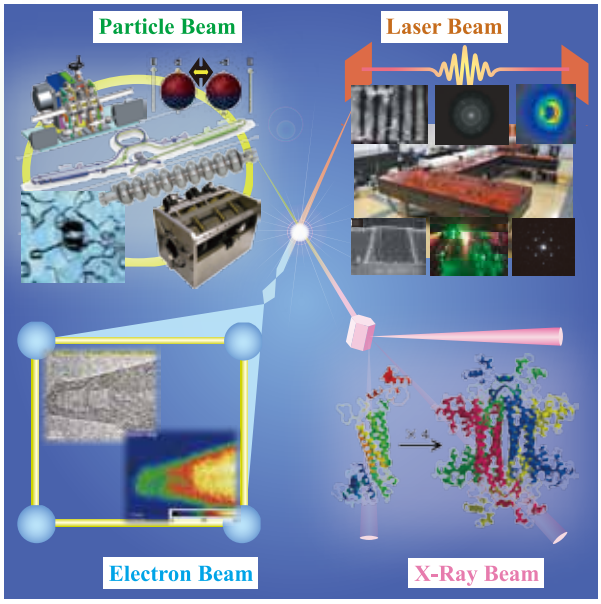
Prof
SAKABE, Shuji (D Eng)
Assoc Prof
HASHIDA, Masaki (D Eng)
Assist Prof
INOUE, Shunsuke (D Sc)

Electron Microscopy and Crystal Chemistry S

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

Structural Molecular Biology S H

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

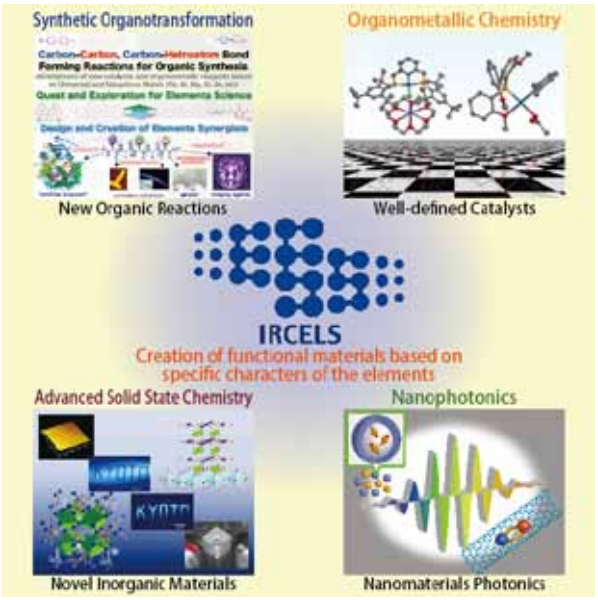


New Elementary Materials

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, Katsuhiro (D Eng)
Program-Specific Assist Prof IWAMOTO, Takahiro (D Eng)
Program-Specific Assist Prof ADAK, Laksmikanta (Ph D)

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 IHARA, Toshiyuki (D Sc)
Assist Prof TAHARA, Hirokazu (D Sc)

Structural Organic Chemistry

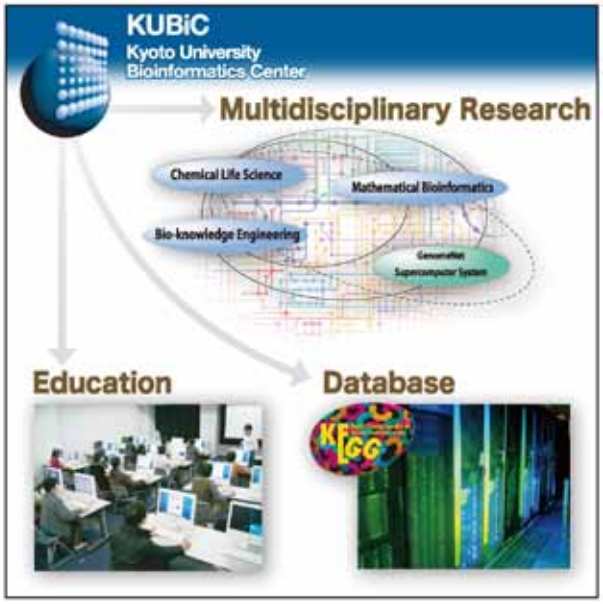
Biofunctional Design-Chemistry

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)
Assoc Prof GOTO, Susumu (D Eng)
Assist Prof BLANC-MATHIEU, Romain (D Sc)

Mathematical Bioinformatics I

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

Bio-knowledge Engineering P

Prof MAMITSUKA, Hiroshi (D Sc)
Assist Prof NGUYEN, Hao Canh (D Knowledge Science)
Assist Prof YAMADA, Makoto (D Statistical Science)

GenomeNet Project Management Office

Prof OGATA, Hiroyuki (D Sc)

Visiting Professors

Division of Materials Chemistry
Prof MATSUO, Yutaka — Professor, University of Science and Technology of China / Project Professor, School of Engineering, The University of Tokyo

Division of Environmental Chemistry
Prof MURAYAMA, Masafumi — Professor, Center for Advanced Marine Core Research, Kochi University

Advanced Research Center for Beam Science
Prof SUGIOKA, Koji — Unit Leader, RIKEN-SIOM Joint Research Unit, RIKEN

Bioinformatics Center
Prof AKIYAMA, Yutaka — Professor, School of Computing, Tokyo Institute of Technology

Division of Synthetic Chemistry
Assoc Prof FURUKAWA, Ko — Associate Professor, Center for Instrumental Analysis, Institute for Reserch Promotion, Niigata University

Division of Biochemistry
Assoc Prof KAWANO, Ryuji — Tenure-Track Associate Professor, Institute of Engineering, Tokyo University of Agriculture and Technology

Division of Multidisciplinary Chemistry
Assoc Prof TAKAHASHI, Yoshiaki — Associate Professor, Institute for Materials Chemistry and Engineering, Kyushu University

International Research Center for Elements Science
Assoc Prof OGAWA, Yoshihiro — Associate Professor, Graduate School of Education, Joetsu University of Education

International Visiting Professors

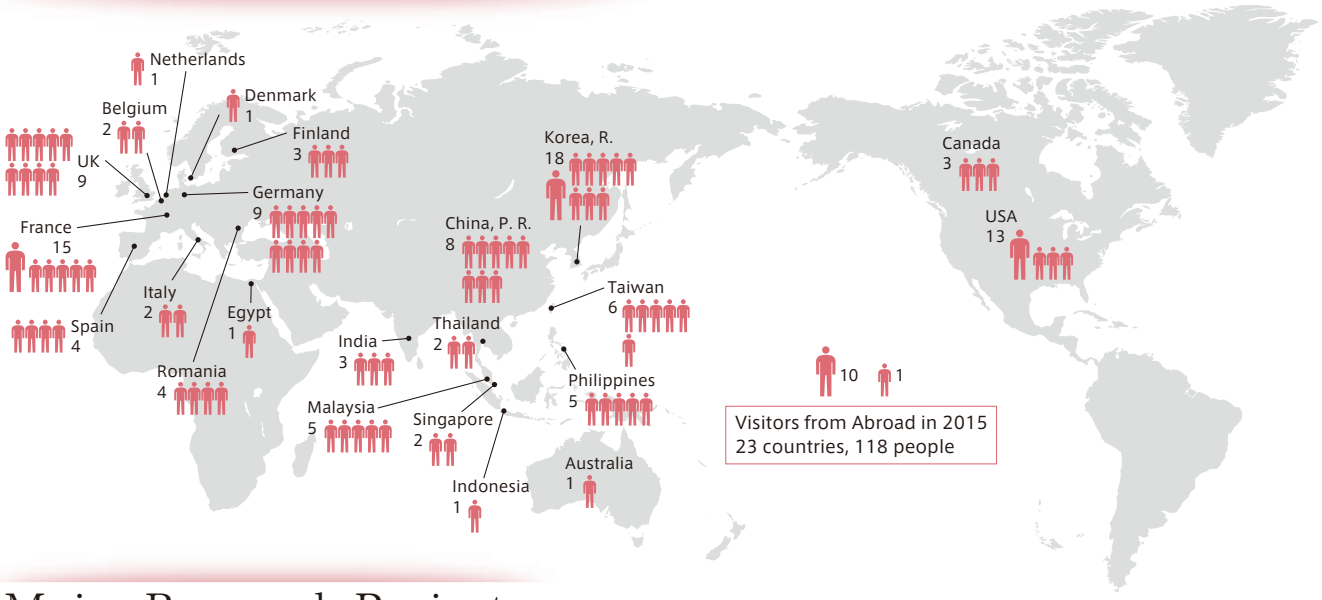
Bioinformatics Center
Prof DE LA HIGUERA, Colin Manuel
Professor, University of Nantes 【January – June, 2016】

Bioinformatics Center
Assoc Prof ZHU, Shanfeng
Associate Professor, Fudan University 【July - November, 2016】

Hakubi Project to Foster and Support Young Researchers, Kyoto University

Algorithmic Graph Theory with Applications to Bioinformatics — Program-Specific Assoc Prof JANSSON, Jesper

Visitors from Abroad in 2015



Major Research Projects

As of May 2016

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	18	2	38	9	1	7	11	112	22	41	63	175
(5)	(4)							(9)				(9)

* PS : Program Specific ** Including Researchers from Abroad As of May 1, 2016

Researchers(PD) from Abroad

Austria	1	Belgium	1	China, P.R.	3	India	4	Total	15
Indonesia	1	Korea, R.	3	Taiwan	1	Vietnam	1		

As of May 1, 2016

Research Students, Fellows and Associates

Research Student	Research Fellow	Postdoctoral Fellow of JSPS	Research Associate	Total
4	0	1	7	12

As of May 1, 2016

Graduate Students

Numbers in ( ) Represent Students from Abroad.

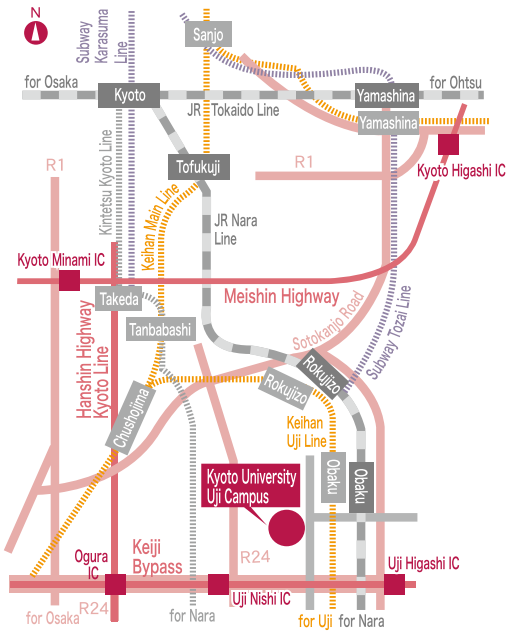
	Science	Engineering	Agriculture	Pharmaceutical Sc.	Medicine	Informatics	Human & Envirnmntl. Studies	Total
Master's Course	38 (2)	43 (4)	16 (2)	20 (1)	7 (3)	3 (1)	0	127 (13)
Doctoral Course	37 (9)	22 (7)	6 (1)	12 (1)	6 (4)	2 (2)	0	85 (24)
Total	75 (11)	65 (11)	22 (3)	32 (2)	13 (7)	5 (3)	0	212 (37)

As of May 1, 2016

Graduate Students from Abroad

China, P. R.	24	Korea, R.	4	Malaysia	1	Philippines	4	Total	37
Taiwan	2	Thailand	1	Vietnam	1				

As of May 1, 2016



● 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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