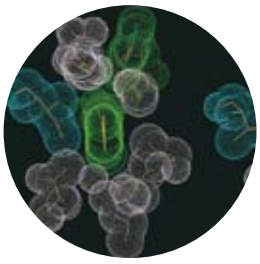
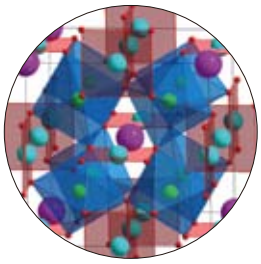
京都大学化学研究所

ICR

Institute for Chemical Research, Kyoto University

2009


Division of Synthetic Chemistry
Division of Materials Chemistry
Division of Biochemistry
Division of Environmental Chemistry
Division of Multidisciplinary Chemistry
Advanced Research Center for Beam Science
International Research Center for Elements Science
Bioinformatics Center

Our Goal Is to Create Novel Fields of Research by Integrating the Wisdom in Our Various Research Fields. ICR at Kyoto University Continues Its Challenge to Reveal Novel Findings for the Human Society.

Preface

Director

TOKITOH, Norihiro

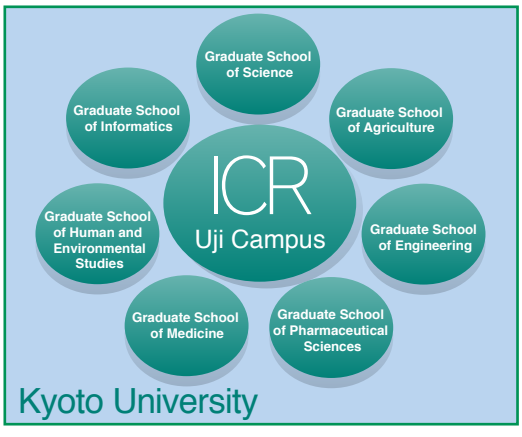
Institute for Chemical Research, launched in 1926 as the first research institute at Kyoto University, will celebrate its 83rd anniversary in 2008, but its true roots date back to 1915 (Special Institute of Chemical Research founded at Kyoto Imperial University College of Science for the study of special medicinal substances, "Salvarsans"). In 2004, we have reached the current large-scale organization of five research divisions and three centers. Currently, 104 faculty members and 240 graduate students are engaged in research activities in 31 laboratories supervised by full-time professors and 5 laboratories supervised by visiting professors.

The research within the Institute encompasses the fields of chemistry, physics, biology, and informatics. The chemical studies core covers fields including physical chemistry, inorganic chemistry, organic chemistry, materials chemistry, and biochemistry. The graduate schools to which our laboratories belong cover diverse fields of science, engineering, pharmaceutical sciences, agriculture, medicine, informatics, and human/environmental studies.

The labs at the graduate schools are spearheading leading-edge research, and yielding outstanding results in their own research areas. Our founding vision is to "Excel in the investigation of basic principles of chemistry and chemical applications." This legacy continues to the present day 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; this has resulted in substantial contributions to the development of scientific technology. Such accomplishments are proof of our vision of freedom and a bottom-up approach in chemical research. Whether or not the human race can generate sustainable growth is a key issue of the 21st century. In order to contribute to the future of our society, we encourage our scientists to be actively involved in research projects with bottom-up approach in mind, and to value the emergence of unique interdisciplinary research projects.

The Institute is currently collaborating with domestic/oversea universities and research organizations (with 43 official international collaboration agreements) and is going to function as a Joint Usage/Research Center supported by MEXT (sicne 2010). The strong collaboration basis so far constructed in-house and also with outside ensures the institute to serve as the core of global research propellers in chemistry-oriented fields.

Finally, we appreciate your continued encouragement and support.



Education

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

History

1915	Specialized Center for Chemical Research, a predecessor of Institute for Chemical Research was founded.
1926	Institute for Chemical Research (ICR) was chartered with the founding philosophy, to "Excel in the investigation of basic principles of chemistry and chemical applications."

The first ICR building in Takatsuki

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 into 19 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.
1983	Nucleic Acids Laboratory was built.
1985	Biotechnology Laboratory was established.

The first ICR building in Uji

1987	The Division System was revised. ICR organization became 19 research divisions and 2 satellite facilities.
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.
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.
2003	ICR was reorganized into 9 research divisions and 3 satellite facilities. International Research Center for Elements Science was established.
2004	ICR was reorganized into 5 research divisions and 3 centers. Advanced Research Center for Beam Science was established. Uji Research Building was constructed.
2005	Laser Science Laboratory was built.
2007	The Alumni Assosiation of ICR "Hekisuikai" was inaugurated.

Starting Celemony of "Hekisuikai"

2009	Water Chemistry Energy(AGC) was endowed.

Research

Challenge and Innovation

Division of Environmental Chemistry
Environment

Division of Biochemistry
Bioscience

Division of Synthetic Chemistry
Functional Materials

Bioinformatics Center
Genome

Material Control for the Development of Society

International Research Center for Elements Science
New Elementary Materials

Division of Materials Chemistry
Nanomaterials

Division of Multidisciplinary Chemistry
Unification

Advanced Research Center for Beam Science
Extreme Conditions

Basic Research for the Development of Science and Technology

Diverse Research Fields

Organic Chemistry | Inorganic Chemistry | Biology | Physics | Informatics



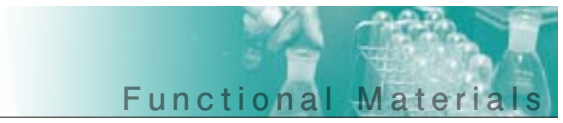


ICR = Spring of Wisdom

To Excel in the Investigation of Basic Principles of Chemistry and Chemical Applications (since 1926)

Division of Synthetic Chemistry

Research is conducted for the creation of "Novel Materials" from viewpoints irrespective of disciplines of organic and inorganic chemistry and for clarification of their structures, functions, and properties.



Original research is conducted in individual laboratories across scientific disciplines toward the creation of novel materials beyond common concepts. Clarification of structures and intrinsic properties of the novel materials are expected to provide impact in the 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)
Technician HIRANO, Toshiko

Structural Organic Chemistry

E Prof MURATA, Yasujiro (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 YOSHIMURA, Tomoyuki (D Pharm Sc)
Technician FUJIHASHI, Akiko

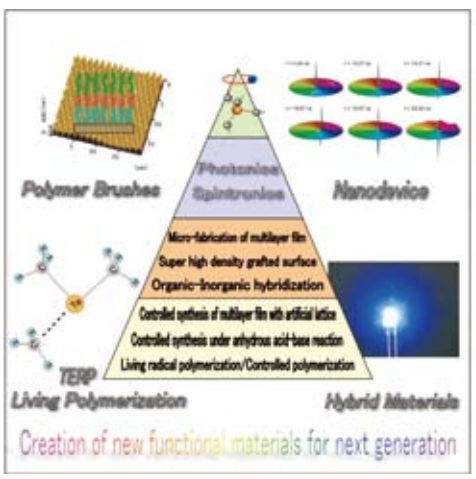
Advanced Inorganic Synthesis

S

Division of Materials Chemistry

Creation of new functional materials for next generation 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 and its applications to novel precision fabrication of polymeric materials. This area also emphasizes 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 utilization of size- and quantum effects.



Chemistry of Polymer Materials

E Prof TSUJII, Yoshinobu (D Eng)

Assoc Prof OHNO, Kohji (D Eng)
Assist Prof GOTO, Atsushi (D Eng)

Polymer Controlled Synthesis

E Prof YAMAGO, Shigeru (D Sc)

Assoc Prof TSUJI, Masaki (D Eng)
Assist Prof TOSAKA, Masatoshi (D Eng)
NAKAMURA, Yasuyuki (D Sc)

Inorganic Photonics Materials

E Prof YOKO, Toshinobu (D Eng)

Assist Prof TOKUDA, Yomei (D Eng)

Nanospintronics

S Prof ONO, Teruo (D Sc)

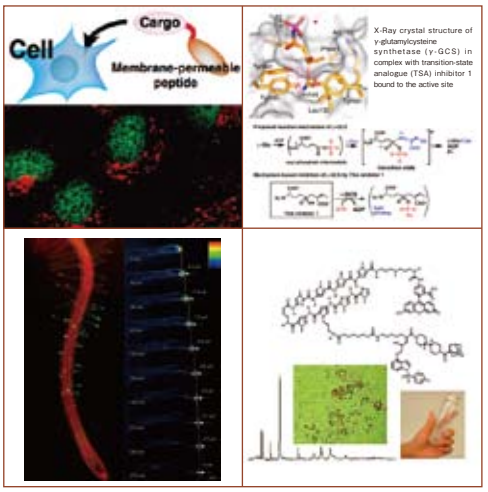
Assoc Prof KOBAYASHI, Kensuke (D Sc)
Assist Prof CHIBA, Daichi (D Sc)
Technician KUSUDA, Toshiyuki

Institute for Chemical Research, Kyoto

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.

This division sets its goal on (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 bioactive small organic molecules and their use in biomedical research.



Biofunctional Design-Chemistry

P — Prof FUTAKI, Shiroh (D Pharm Sc)

Assist Prof IMANISHI, Miki (D Pharm Sc)
NAKASE, Ikuhiko (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 SUGISAKI, Hiroyuki (D Sc)
Assist Prof TSUGE, Tomohiko (D Sc)
Technician YASUDA, Keiko

Chemical Biology

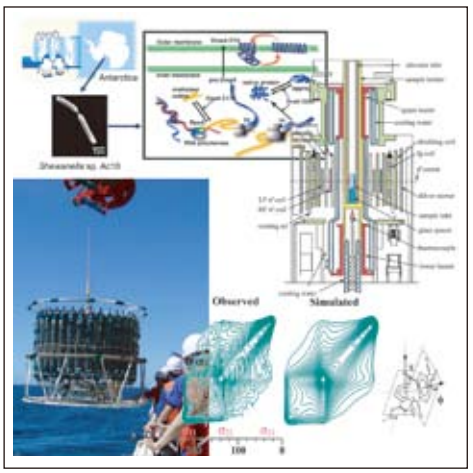
M — Prof UESUGI, Motonari (D Pharm Sc)

Assist Prof KAWAZOE, Yoshinori (D Med Sc)
SHIMOGAWA, Hiroki (D Sc)

Division of Environmental Chemistry

This research group aims to contribute to the development of a sustainable society through fundamental studies such as structural characterization and dynamics of solutions and polymers, in particular under extreme conditions, biogeochemistry in the hydrosphere, and biotechnology with useful enzymes and microorganisms.

Main research subjects are as follows: (1) Structure and functionality for well-organized polymer materials, organic EL devices, and native-cellulose nanomaterials. (2) Biogeochemistry of trace elements in the hydrosphere, Ion recognition. (3) Properties and reactions of ionic liquids and supercritical water and drug binding into membrane. (4) Physiology of extremophilic microorganisms and their applications to production of useful compounds and bioremediations. Biochemistry of trace elements.



Molecular Materials Chemistry

E — Prof KAJI, Hironori (D Eng)

Assist Prof HIRAI, Asako (D Eng)
Technician OHMINE, Kyoko

Hydrospheric Environment Analytical Chemistry

S — Prof SOHRIN, Yoshiki (D Sc)

Assoc Prof UMETANI, Shigeo (D Sc)
Assist Prof NORISUYE, Kazuhiro (D Sc)
FIRDAUS, Mochamad Lutfi (D Sc)
Technician MINAMI, Tomoharu (D Eng)

Solution and Interface Chemistry

S

Assoc Prof MATUBAYASI, Nobuyuki (Ph D)
Assist Prof WAKAI, Chihiro (D Sc)

Molecular Microbial Science

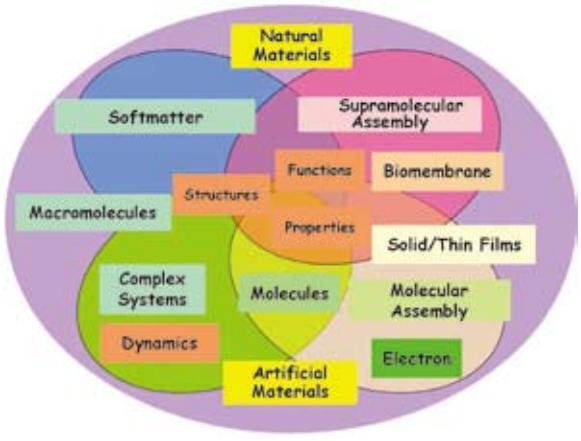
A

Assoc Prof KURIHARA, Tatsuo (D Eng)
Assist Prof KAWAMOTO, Jun (D Agr)

Division of Multidisciplinary Chemistry

By exploring viewpoints aiming at merging science with engineering, we are going to upgrade the paradigm of our research in the boundary region among chemistry, physics and biology. In cooperation with other divisions and centers in our institute, we will develop exploratory basic researches for founding advanced materials science.

This division makes basic researches that aim to achieve molecular understanding of various phenomena of natural/artificial materials, develop an interdisciplinary view of natural science based on chemistry, and establish a new aspect of material science. The researches are 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 KANAYA, Toshiji (D Eng)

Assoc Prof NISHIDA, Koji (D Eng)
Assist Prof INOUE, Rintaro (D Eng)

Molecular Rheology

E Prof WATANABE, Hiroshi (D Sc)

Assoc Prof MASUBUCHI, Yuichi (D Eng)
Assist Prof MATSUMIYA, Yumi (D Eng)
Program-Specific Assist Prof UNEYAMA, Takashi (D Eng)
Technician OKADA, Shinichi

Molecular Aggregation Analysis

S Prof SATO, Naoki (D Sc)

Assoc Prof ASAMI, Koji (D Sc)
Assist Prof YOSHIDA, Hiroyuki (D Sc)

Supramolecular Biology

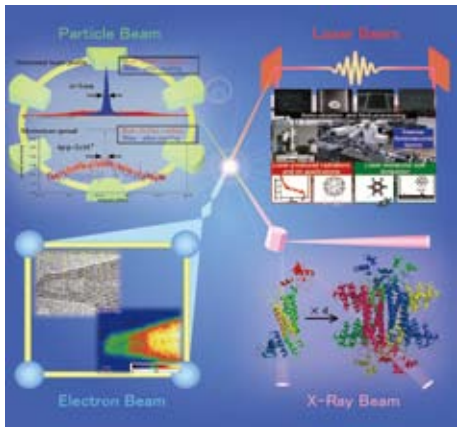
S Prof UMEDA, Masato (D Pharm Sc)

Assoc Prof IKENOUCHI, Junichi (D Med Sc)
Assist Prof KATO, Utako (D Sc)

Advanced Research Center for Beam Science

Development of new capabilities with combination of various beams, Development of new methods for space-time analysis with extreme resolution, Multidimensional analysis of functional chemical materials oriented for application, and Preparation for collaborative research scheme.

The Advanced Research Center aims at creation of advanced material science in nano space/time scale by combining various beams (particle, laser, electron and X-ray beams) to understand and control nano-space/time phenomena from physical, chemical and biological aspects. The present subjects are researches on dynamics 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 Prof NODA, Akira (D Sc)

Assoc Prof IWASHITA, Yoshihisa (D Sc)
Assist Prof SOUDA, Hikaru
Technician TONGU, Hiromu

Laser Matter Interaction Science

S Prof SAKABE, Shuji (D Eng)

Assoc Prof HASHIDA, Masaki (D Eng)
Assist Prof TOKITA, Shigeki (D Eng)

Electron Microscopy and Crystal Chemistry

S Prof ISODA, Seiji (D Sc)

Assoc Prof KURATA, Hiroki (D Sc)
Assist Prof OGAWA, Tetsuya (D Sc)
NEMOTO, Takashi (D Sc)
Res Associate MORIGUCHI, Sakumi (D Sc)

Structural Molecular Biology

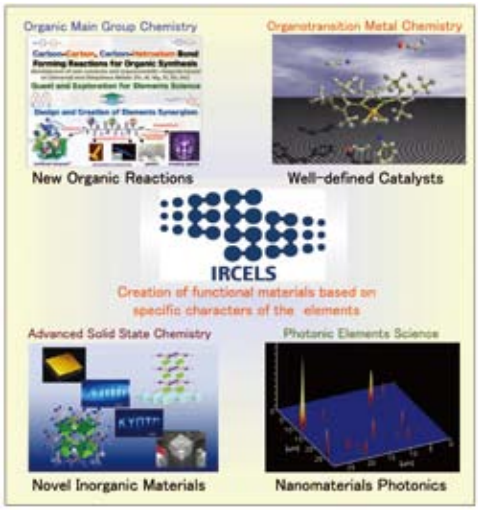
H Prof HATA, Yasuo (D Sc)

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

International Research Center for Elements Science

Proposal of 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.



Organic Main Group Chemistry

E Prof NAKAMURA, Masaharu (D Sc)

Assoc Prof TAKAYA, Hikaru (D Eng)
Assist Prof HATAKEYAMA, Takuji (D Sc)

Advanced Solid State Chemistry

S Prof SHIMAKAWA, Yuichi (D Sc)

Assoc Prof AZUMA, Masaki (D Sc)
Assist Prof SAITOH, Takashi (D Sc)
Program-Specific Assist Prof ICHIKAWA, Noriya (D Eng)

Organotransition Metal Chemistry

E Prof OZAWA, Fumiyuki (D Eng)

Assist Prof TAKITA, Ryo (D Pharm Sc)
Program-Specific Assist Prof NAKAJIMA, Yumiko (D Eng)

Photonic Elements Science

S Prof KANEMITSU, Yoshihiko (D Eng)

Assoc Prof MATSUDA, Kazunari (D Eng)
Assist Prof TAYAGAKI, Takeshi (D Sc)
Program-Specific Assist Prof YAMADA, Yasuhiro (D Sc)

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 the KEGG database for deciphering the genome, and bioinformatics education and training of young scientists.

Bioknowledge Systems

S P Prof KANEHISA, Minoru (D Sc)

Assoc Prof GOTO, Susumu (D Eng)
Assist Prof HATTORI, Masahiro (D Sc)
Program-Specific Assist Prof TOKIMATSU, Toshiaki (D Agr)
KOTERA,Masaaki (D Sc)

Biological Information Networks

I Prof AKUTSU, Tatsuya (D Eng)

Assist Prof HAYASHIDA, Morihiro (D Inf)
TAMURA, Takeyuki (D Inf)

Pathway Engineering

P Prof MAMITSUKA, Hiroshi (D Sc)

Assist Prof TAKIGAWA, Ichigaku (D Eng)
SHIGA, Motoki (D Eng)

*Graduate School of S Science, M Medicine, P Pharmaceutical Sc., E Engineering, A Agriculture, H Human and Environmental Studies, I Informatics

Endowed Research Section

The new laboratory, The Division of Water Chemistry Energy (AGC), has been opened in April, 2009, donated by Asahi Glass Co., Ltd. (AGC).

The research aim is to develop new earth-friendly technology in order to reduce the green-house gas CO_2 emission that can induce some climate changes. Hydrogen is an ultimately clean fuel needed for efficient fuel cells. However, the drawback of the hydrogen fuel arises from the low liquefaction temperature. This results in a high cost and delays the realization of the clean hydrogen age. Fuel compactness and fluidity, as attained in the liquid state, are necessary for the low-cost transportation and storage. This can be overcome by taking advantage of formic acid that is found as an intermediate in the well-known water-gas shift reaction: $CO + H_2O \Leftrightarrow HCOOH \Leftrightarrow CO_2 + H_2$. The group engaged in this mission consists of Masaru Nakahara (visiting professor), Yasuo Tsujino, (specially assigned assistant professor) and Toshiyuki Tanaka (visiting researcher from AGC).

Water Chemistry Energy (AGC)

Prof NAKAHARA, Masaru (D Sc)

Program-Specific Assist Prof TSUJINO, Yasuo

Projects

● Global COE Programs

International Center for Integrated Research and Advanced Education in Materials Science

Joint Program with Graduate School of Graduate Science and School of Engineering/Program Leader : SAWAMOTO, Mitsuo (Graduate School of Engineering)

Representative from ICR : TOKITOH, Norihiro／Term : 2007～2011

Based on the recognition that traditionally trained narrow experts can no longer cope with such complex and multifaceted problems as global sustainability and environment, this COE Program sets the following principal objectives: a new paradigm in research and a new breed of scientists via education.

Laboratories participating from ICR : Organoelement Chemistry, Nanospintronics, Biofunctional Design-Chemistry, Chemical Biology, Organotransition Metal Chemistry, and others

Center of Excellence for Education and Research on Photonics and Electronics Science and Engineering

Joint Program with Graduate School of Engineering, Graduate School of Informatics and KU-IIC/Program Leader : NODA, Susumu (Graduate School of Engineering)

Representative from ICR : KANEMITSU, Yoshihiko／Term : 2007～2011

In this program, we aim at establishing the COE for "photonics and electronics science and engineering" to investigate and develop innovative technologies, by which an arbitrary manipulation of photons (light) and an ultimate control of electrons will be achieved, as we hold the motto of "challenge the limitations of current technology and create new functionalities".

Laboratory participating from ICR : Photonic Elements Science

The Next Generation of Physics, Spun from Universality & Emergence Developing Independent Researchers to Explore New Frontiers

Joint Program with Graduate School of Science (the Division of Physics and Astronomy), the Kwasan and Hida Observatories, the Yukawa Institute for Theoretical Physics, the Institute for Chemical Research, and the Research Center for Low Temperature and Materials Sciences/Program Leader : KAWAI, Hikaru (Graduate School of Science)

Representative from ICR : SAKABE, Shuji／Term : 2008～2012

In this program, we seek to unite seemingly independent realms by uncovering the fundamental universality extending across their boundaries, while searching for novel and diverse emergent phenomena that could not be predicted by deduction from such laws alone. The objective of this GCOE program is to make progress toward the construction of the next generation of physics, spun from universality and emergence, while developing independent-minded researchers who will be capable of opening new frontiers in the study of natural phenomena.

Laboratories participating from ICR : Particle Beam Science, Laser Matter Interaction Science, Group of Atomic and Molecular Physics in Structural Molecular Biology

● Research and Education Funding

For Inter-University Research Project : Joint Project of Chemical Synthesis Core Research Institutions／Representative from ICR : OZAWA, Fumiyuki／Term : 2005-2009
Inter-University Network for Efficient Utilization of Chemical Research Equipments／Representative from ICR : FUTAKI, Shiroh／Term : 2007-2011

● Grants-in-Aid for Creative Scientific Research

The Chemistry of Unsaturated Compounds of Heavier Main Group Elements: Pursuit of Novel Properties and Functions／Research Leader : TOKITOH, Norihiro／Term : 2005-2009
Strategic State-of-the-Art Solid State Chemistry for New Functional Materials: Exploring for New Multi-Functional／Research Leader : SHIMAKAWA, Yuichi／Term : 2007-2011

● BIRD Grant Program

Deciphering Systemic Biological Functions by Integration of Genomic and Environmental Information／Research Leader : KANEHISA, Minoru／Term : 2006-2010

● Next-Generation Supercomputing Project

Grand Challenges in Next-Generation Integrated Nanoscience／Representative from ICR : MATUBAYASI, Nobuyuki／Term : 2006-2012

● Integrated Database Project

Hierarchical Structuring and Integration of Knowledge in Life Sciences／Research Leader : GOTO, Susumu／Term : 2008-2010

● Open Advanced Facilities Initiative for Innovation

Kyoto-Advanced Nanotechnology Network／Representative : ISODA, Seiji／Term : 2007-2011

● Special Coordination Funds for Promoting Science and Technology

Creation of Innovation Centers for Advanced Interdisciplinary Research Areas: Photo-Medical Valley／Representative from ICR : NODA, Akira／Term : 2007-2016

● JSPS International Training Program

International Research and Training Program on Bioinformatics and Systems Biology／Program Director : KANEHISA, Minoru／Program Director／Term : 2009-2013

Faculty Members and Researchers

● University Staff

The number in ( ) represents Visiting Professors. ※PS:Program specific

Professor	Associate Professor	Assistant Professor	PSAssistant Professor	Research Associate	Technician	※ PS Researcher	Sub-total	Researcher	Other Staff	Sub-total	Total
28	21	37	6	1	8	12	113	17	36	53	166
(4)	(5)						(9)				(9)

(As of Jan. 12, 2010)

● Research Students, Fellows and Associates

Research Student	Research Fellow	Sub-total	Postdoctoral Fellow of JSPS	Research Associate	Sub-total	Total
2	1	3	6	6	12	15

(As of May 1, 2009)

● Graduate Students

The number in ( ) represents Students from Foreign Countries.

	Science	Engineering	Agriculture	Pharmaceutical Sc.	Medicine	Informatics	Human & Environmtl Studies	Total
Master's Course	51 (0)	44 (3)	13 (1)	19 (3)	0 (0)	3 (1)	2 (0)	132 (8)
Doctoral Course	47 (3)	19 (2)	9 (5)	23 (2)	4 (1)	2 (2)	0 (0)	104 (15)
Total	98 (3)	63 (5)	22 (6)	42 (5)	4 (1)	5 (3)	2 (0)	236 (23)

(As of May 1, 2009)

● Researchers and Students from Foreign Countries, and their Origins, 2009

Researchers (PD)	
Australia	1
China, P. R.	3
Egypt	1
Indonesia	1
Korea, R	2
Spain	2
Sri Lanka	1
USA	1
Vietnam	1
Total	13

Students	
China, P. R.	11
Egypt	1
France	1
India	1
Iran	1
Korea, R	1
Philippines	2
Taiwan	2
Thailand	1
Turkey	1
USA	1
Total	23

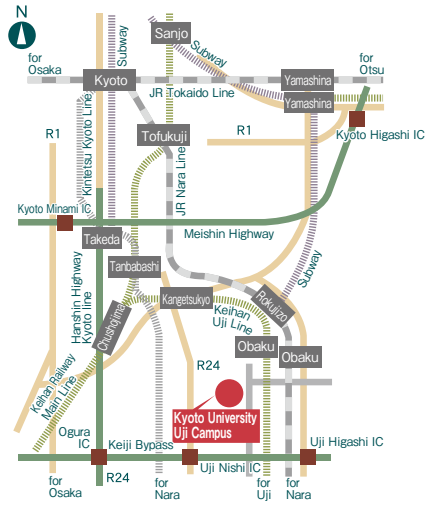
Visitors from Foreign Countries

Foreign Visitors in 2008			
Australia	1	Poland	1
Austria	1	Russia	2
Canada	1	Singapore	1
China, P. R.	15	Sweden	5
Czech	3	Switzerland	1
France	7	Taiwan	5
Germany	17	Thailand	3
Greece	1	UK	3
Holland	2	USA	13
India	1	Vietnam	2
Italy	7	Total	22 countries
Korea, R	13		105 people

39 students from KOREA visited ICR in August 27th 2008

Institute for Chemical Research Kyoto University

Gokasho, Uji, Kyoto, Japan 611-0011
Tel. +81-774-38-3344 Fax. +81-774-38-3014
URL http://www.kuicr.kyoto-u.ac.jp/index.html
E-mail koho@scl.kyoto-u.ac.jp



Access

From Obaku Station on the Keihan Uji Line: 10 min by walk
(from Keihan-Sanjo Station to Obaku Station: 35 min)
From Obaku Station on the JR Nara Line: 7 min by walk
(from Kyoto Station to Obaku Station: 25 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