



Institute for Chemical Research Kyoto University

2007

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 by Integrating the Wisdom in ICR at Kyoto University Continues Its Challenge

Preface



Director
ESAKI, Nobuyoshi

Institute for Chemical Research at Kyoto University celebrates its 81st anniversary in 2007. We reached in 2004 the current organization comprising five research divisions and three leading-edge centers: the Advanced Research Center for Beam Science, the International Research Center for Elements Science, and the Bioinformatics Center. Currently, 104 faculty members and 240 graduate students are engaged in research activities in 31 laboratories supervised by full-time professors or associate 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 school to which our labora-

tories belong spans diverse fields of science, engineering, agriculture, pharmaceutical sciences, medicine, informatics, and human/environmental studies. 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. We appreciate your continued encouragement and support.

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."

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.



The first ICR building in Takatsuki



The main building of ICR in Uji

1985 Biotechnology Laboratory was established.

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.

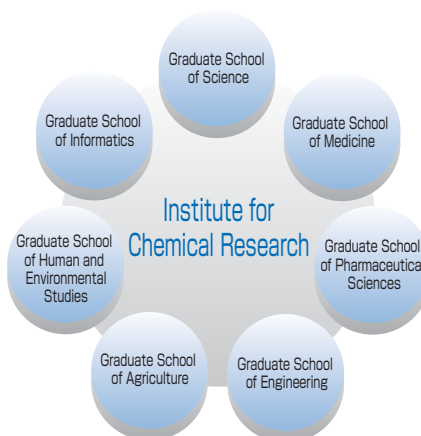
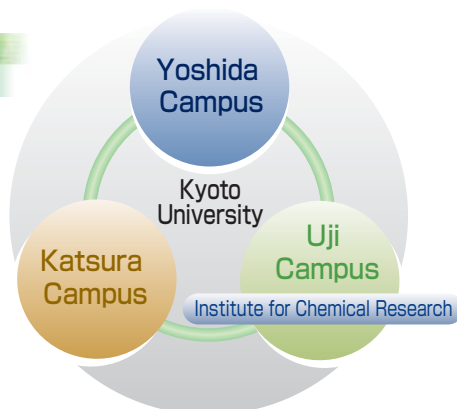
2005 Laser Science Laboratory was built.



Commemorative Ceremony for the 80th Anniversary (2006)

Education

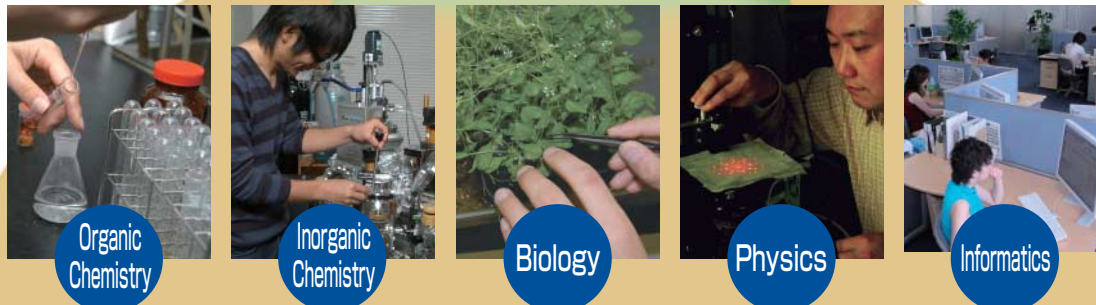
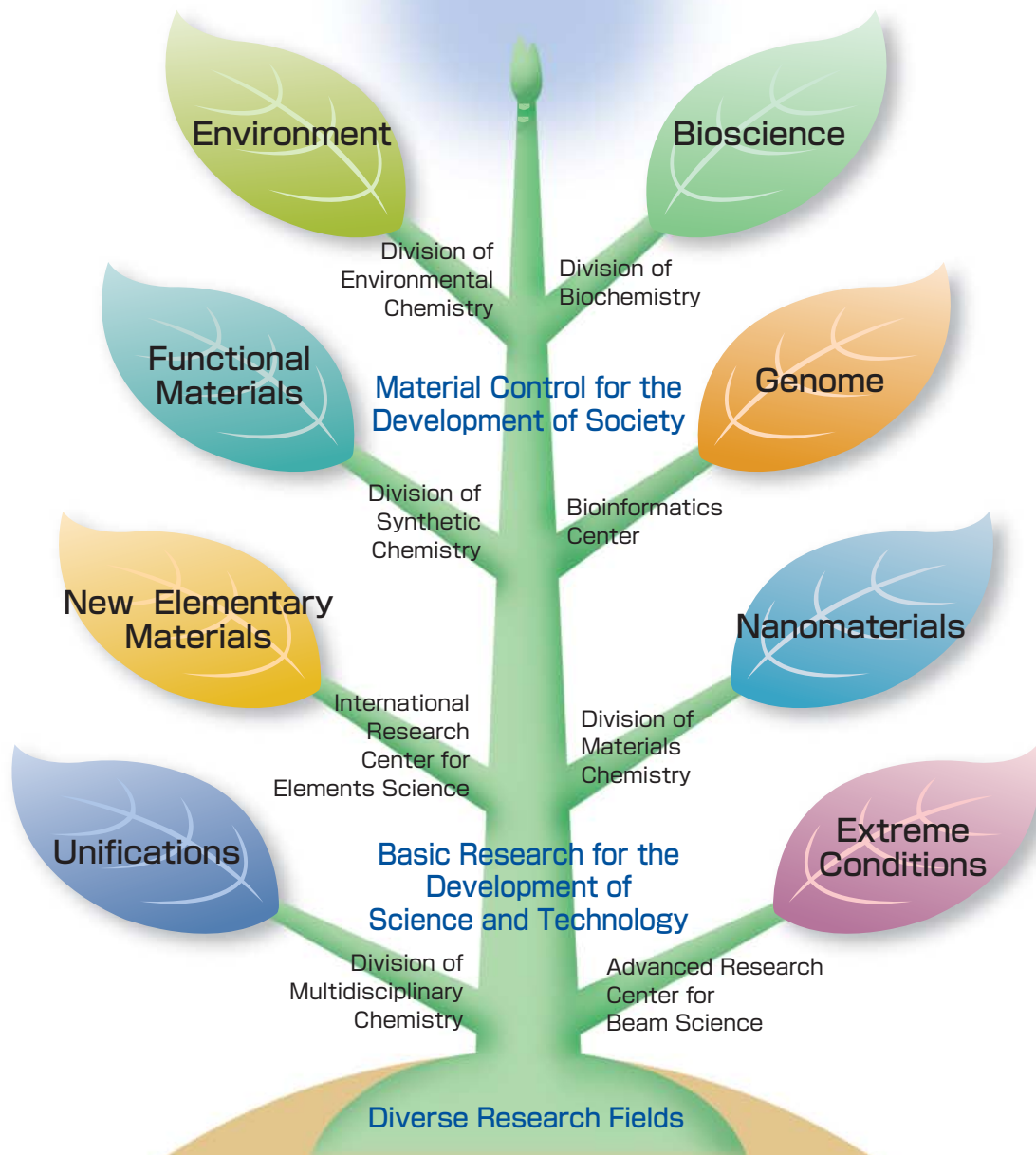
Every laboratory in ICR is affiliated with one of the Graduate Schools and has contributions to education.



Novel Fields of Research
 Our Various Research Fields.
 to Reveal Novel Findings for the Human Society.

Research

Challenge and Innovation



ICR = Spring of Wisdom

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



Functional Materials

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.

Division of Synthetic Chemistry

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 NAKAMURA, Kaoru (D Sc)
Assist Prof SASAMORI, Takahiro (D Sc)
MIZUHATA, Yoshiyuki (D Sc)
Technician HIRANO, Toshiko

Structural Organic Chemistry

E

Assoc Prof MURATA, Yasujiro (D Eng)
Assist Prof MURATA, Michihisa (D Eng)

Synthetic Organic Chemistry

P Prof KAWABATA, Takeo (D Pharm Sc)



Assoc Prof TSUBAKI, Kazunori (D Pharm Sc)
Assist Prof YOSHIMURA, Tomoyuki (D Pharm Sc)
Technician TERADA, Tomoko

Advanced Inorganic Synthesis

S Prof SHIMAKAWA, Yuichi (D Sc)



Assoc Prof AZUMA, Masaki (D Sc)
Assist Prof IKEDA, Yasunori

novel bond systems
Bi=Bi double bond

novel endohedral fullerenes

Novel Materials beyond Common Concepts

novel molecular transformation
(RCO)₂O
RCOO
>99% selective

novel functional oxides
Ni²⁺
Mn⁴⁺



Nanomaterials

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

Division of Materials Chemistry

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

Assoc Prof TSUJII, Yoshinobu (D Eng)
Assist Prof OHNO, Kohji (D Eng)
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

Inorganic Photonics Materials

E Prof YOKO, Toshinobu (D Eng)



Assoc Prof TAKAHASHI, Masahide (D Sc)
Assist Prof TOKUDA, Yomei (D Eng)

Nanospintronics

S Prof ONO, Teruo (D Sc)



Assoc Prof KOBAYASHI, Kensuke (D Sc)
Assist Prof KASAI, Shinya (D Sc)
Technician KUSUDA, Toshiyuki

Polymer Brushes

Photonics Spintronics

Nanodevice

Micro-fabrication of multilayer film

Super high density grafted surface

Organic-Inorganic hybridization

Controlled synthesis of multilayer film with artificial lattice

Controlled synthesis under anhydrous acid-base reaction

Living radical polymerization/Controlled polymerization

TERP

Living Polymerization

Hybrid Materials

Creation of new functional materials for next generation



Bioscience

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.

Division of Biochemistry

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

Prof FUTAKI, Shiroh (D Pharm Sc)



Assist Prof IMANISHI, Miki (D Pharm Sc)
NAKASE, Ikuhiko (D Pharm Sc)

Chemistry of Molecular Biocatalysts

A

Assoc Prof HIRATAKE, Jun (D Agr)
Assist Prof MIZUTANI, Masaharu (D Agr)
SHIMIZU, Bun-ichi (D Agr)

Molecular Biology

Prof OKA, Atsuhiko (D Sc)



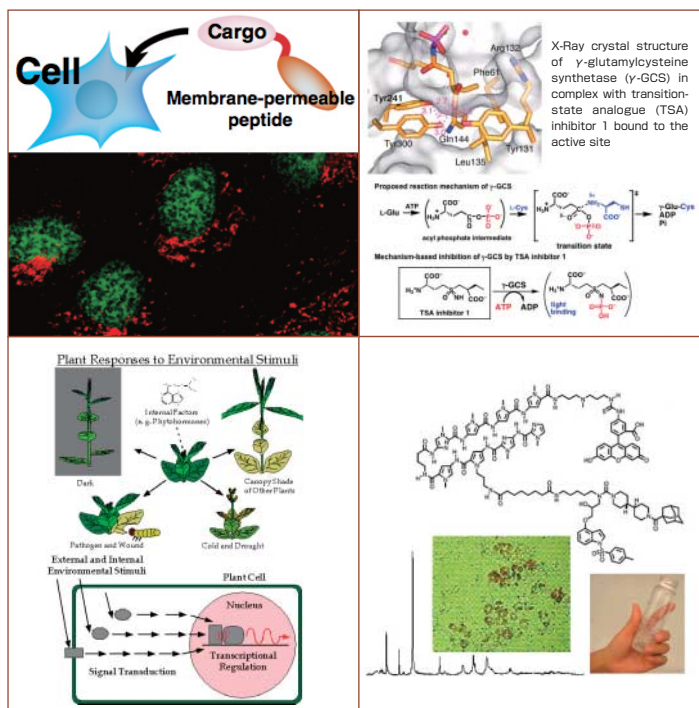
Assoc Prof AOYAMA, Takashi (D Sc)
SUGISAKI, Hiroyuki (D Sc)
Assist Prof TSUGE, Tomohiko (D Sc)
Technician YASUDA, Keiko

Chemical Biology

Prof UESUGI, Motonari (D Pharm Sc)



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



Environment

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.

Division of Environmental Chemistry

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 supercritical water and ionic liquids and drug binding into membrane. (4) Physiology of extremophilic microorganisms and their applications to substance production and bioremediations. Biochemistry of trace elements.

Molecular Materials Chemistry

Prof HORII, Fumitaka (D Eng)



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

Hydrospheric Environment Analytical Chemistry

Prof SOHRIN, Yoshiaki (D Sc)



Assoc Prof UMETANI, Shigeo (D Sc)
Assist Prof NORISUYE, Kazuhiro (D Sc)
Technician MINAMI, Tomoharu

Solution and Interface Chemistry

Prof NAKAHARA, Masaru (D Sc)



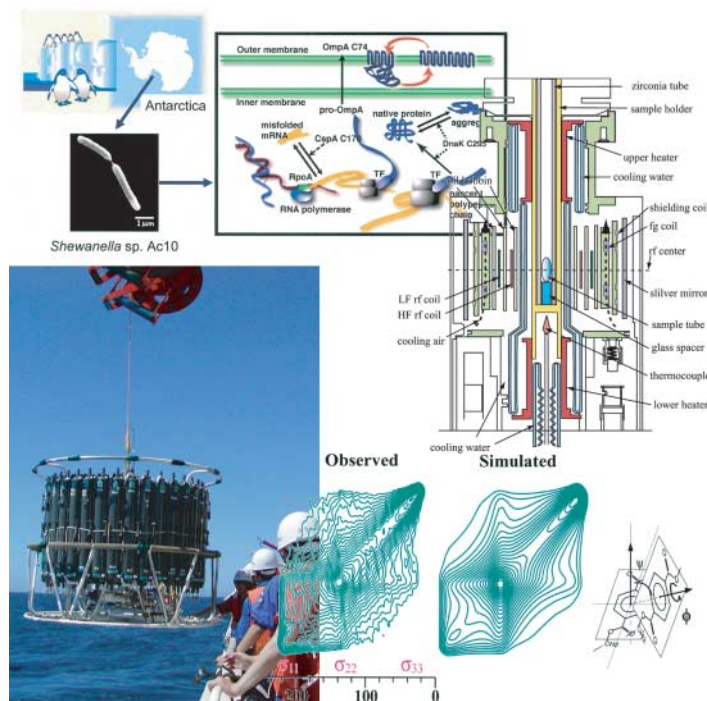
Assoc Prof MATUBAYASI, Nobuyuki (Ph D)
Assist Prof WAKAI, Chihiro (D Sc)

Molecular Microbial Science

Prof ESAKI, Nobuyoshi (D Agr)



Assoc Prof KURIHARA, Tatsuo (D Eng)
Assist Prof MIHARA, Hisaaki (D Agr)









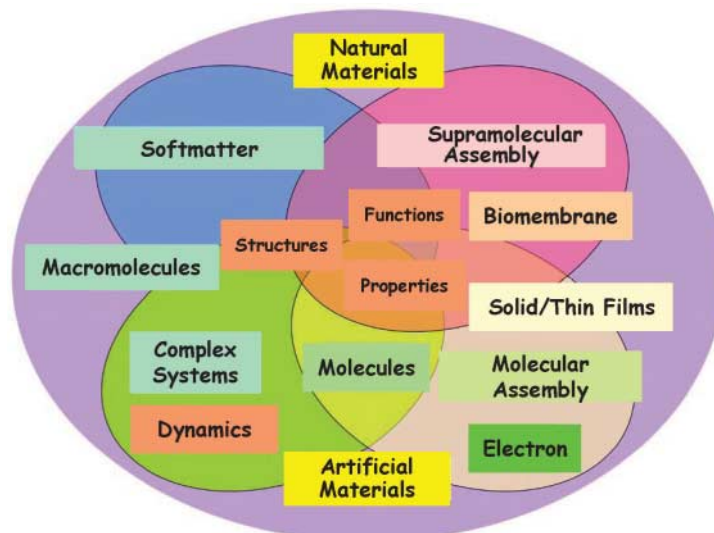
Unifications

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.

Division of Multidisciplinary Chemistry

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.

<p>Polymer Materials Science</p> <p>E Prof KANAYA, Toshiiji (D Eng)</p>		<p>Assoc Prof NISHIDA, Koji (D Eng) Assist Prof MATSUBA, Go (D Eng)</p>
<p>Molecular Rheology</p> <p>E Prof WATANABE, Hiroshi (D Sc)</p>		<p>Assoc Prof MASUBUCHI, Yuichi (D Eng) Assist Prof MATSUMIYA, Yumi (D Eng) Technician OKADA, Shinichi</p>
<p>Molecular Aggregation Analysis</p> <p>S Prof SATO, Naoki (D Sc)</p>		<p>Assoc Prof ASAMI, Koji (D Sc) Assist Prof KITA, Yasuo (D Sc) YOSHIDA, Hiroyuki (D Sc)</p>
<p>Supramolecular Biology</p> <p>S Prof UMEDA, Masato (D Pharm Sc)</p>		<p>Assist Prof TAKEUCHI, Ken-ichi (D Pharm Sc) KATO, Utako (D Sc)</p>







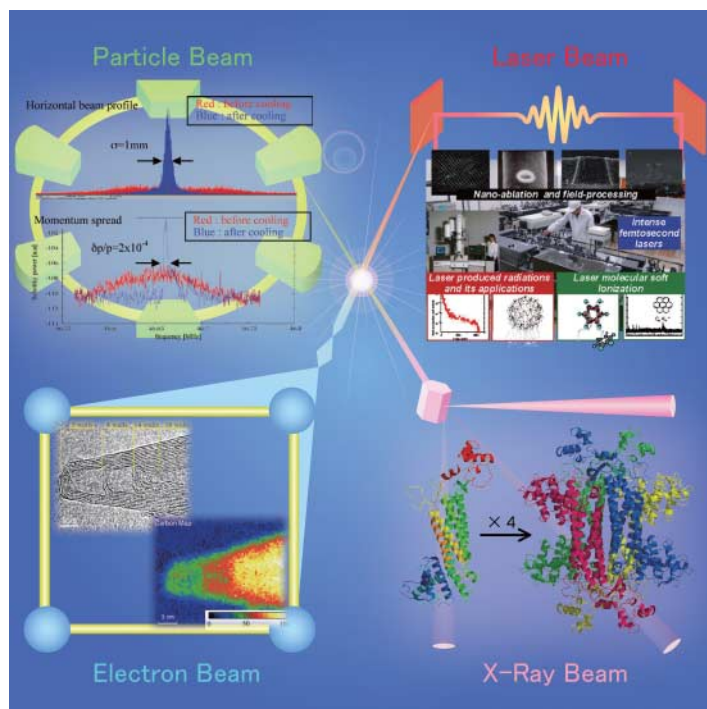
Extreme Conditions

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

Advanced Research Center for Beam Science

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.

<p>Particle Beam Science</p> <p>S Prof NODA, Akira (D Sc)</p>		<p>Assoc Prof IWASHITA, Yoshihisa (D Sc) Assist Prof SHIRAI, Toshiyuki Technician TONGU, Hiromu</p>
<p>Laser Matter Interaction Science</p> <p>S Prof SAKABE, Shuji (D Eng)</p>		<p>Assoc Prof HASHIDA, Masaki (D Eng) Assist Prof TOKITA, Shigeki (D Eng)</p>
<p>Electron Microscopy and Crystal Chemistry</p> <p>S Prof ISODA, Seiji (D Sc)</p>		<p>Assoc Prof KURATA, Hiroki (D Sc) Assist Prof OGAWA, Tetsuya (D Sc) NEMOTO, Takashi (D Sc) Res Associate MORIGUCHI, Sakumi (D Sc)</p>
<p>Structural Molecular Biology</p> <p>H Prof HATA, Yasuo (D Sc)</p>		<p>Assoc Prof ITO, Yoshiaki (D Sc) Assist Prof FUJII, Tomomi (D Sc)</p>



New Elementary Materials

Proposal of a guideline for the creation of novel elementary materials through uncovering the role of key elements which determine the functions of materials.

International Research Center for Elements Science

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)



Assist Prof HATAKEYAMA, Takuji (D Sc)

Advanced Solid State Chemistry

S

Assist Prof SAITO, Takashi (D Sc)

Organotransition Metal Chemistry

E Prof OZAWA, Fumiyouki (D Eng)



Assoc Prof OKAZAKI, Masaaki (D Sc)
Assist Prof TAKITA, Ryo (D Pharm Sc)

Photonic Elements Science

S Prof KANEMITSU, Yoshihiko (D Eng)



Assoc Prof MATSUDA, Kazunari (D Eng)
Assist Prof TAYAGAKI, Takeshi (D Sc)
SER Assist Prof YAMAMOTO, Shinpei (D Eng)

Organic Main Group Chemistry
Synthetic Organic Reactions Utilizing Universal Metals
Fe, Mg, Zn, Al
 $R-X + R'-Metal$
LC molecules, organic electronics devices, Drug intermediate, Natural product synthesis etc...

Organotransition Metal Chemistry
Well-defined Catalysts

IRCELS
Creation of functional materials based on specific characters of the elements

Advanced Solid State Chemistry
Novel Inorganic Materials

Photonic Elements Science
Nanomaterials Photonics



Genome

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

Bioinformatics Center

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 Prof Kanehisa, Minoru (D Sc)



Assoc Prof GOTO, Susumu (D Eng)
Assist Prof HATTORI, Masahiro (D Sc)
Visiting Assist Prof ITOH, Masumi
YAMANISHI, Yoshihiro (D Sc)
TOKIMATSU, Toshiaki (D Agr)

Biological Information Networks

I Prof AKUTSU, Tatsuya (D Eng)



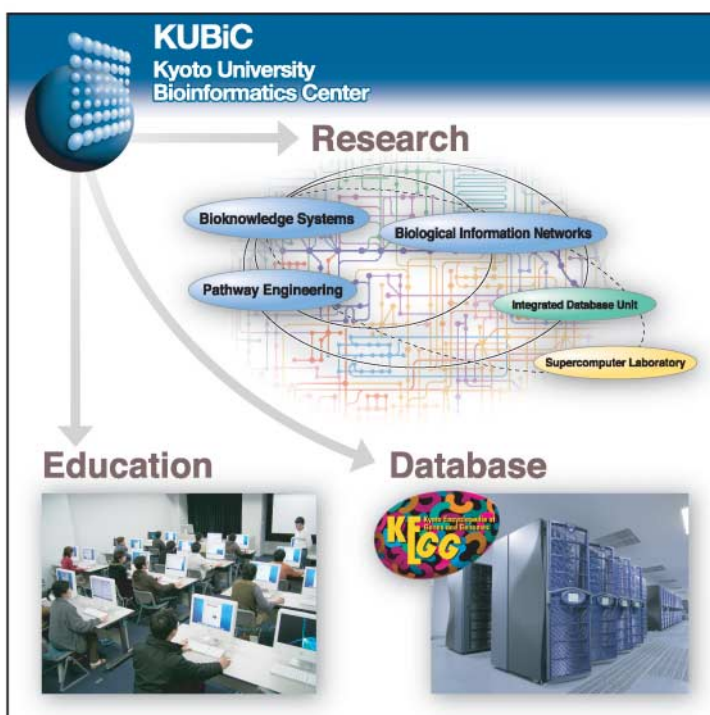
Assist Prof HAYASHIDA, Morihiro (D Inf)

Pathway Engineering

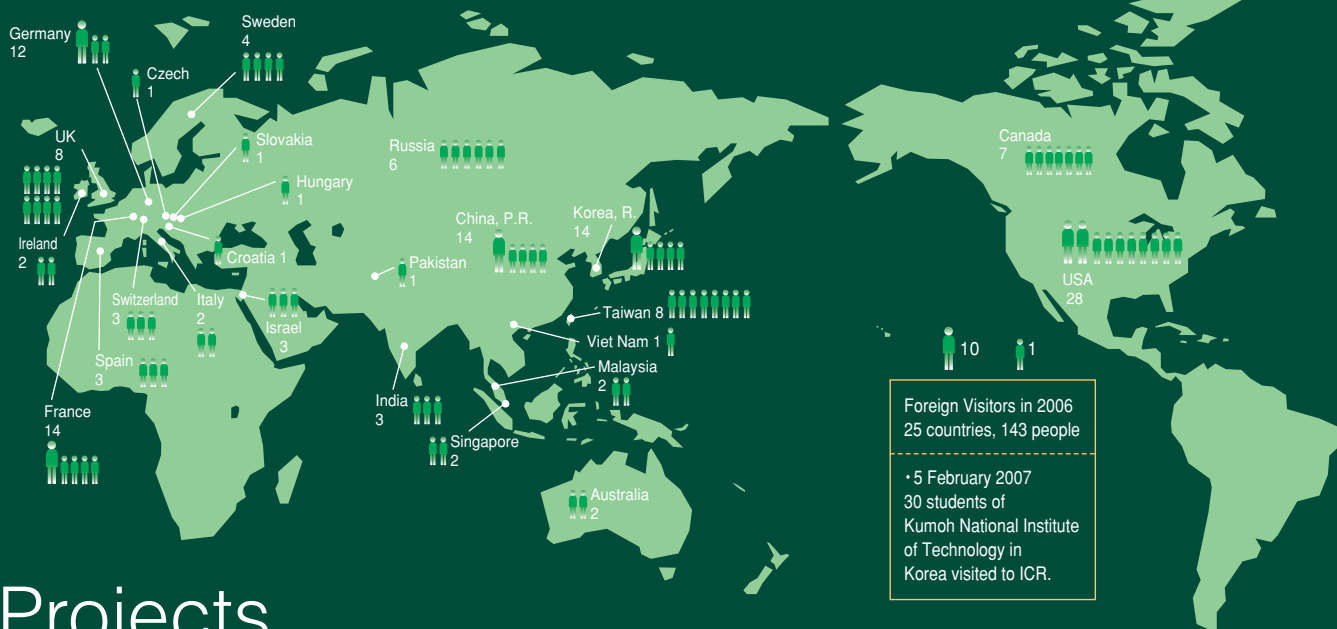
P Prof MAMITSUKA, Hiroshi (D Sc)



Assist Prof TAKIGAWA, Ichigaku (D Eng)



Visitors from Foreign Countries



Projects

Ministry of Education, Culture, Sports, Science and Technology (MEXT), Center of Excellence Global COE Programs

International Center for Integrated Research and Advanced Education in Materials Science

Joint Program with Graduate School of Science and 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.

Laboratory, participate from ICR

Organoelement Chemistry, Nanospintronics, Biofunctional Design-Chemistry, Chemical Biology, Organotransition Metal Chemistry, et al.

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

Joint Program with Graduate School of Engineering, School of Informatics and KU-IIC

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, participate from ICR

Photonic Elements Science

Faculty Members and Researchers

University Staff

The number in [] represents Fixed Term Program-Specific Faculty.
The number in () represents Visiting Professors.

Professor	Associate Professor	Assistant Professor	Research Associate	Technician	Sub-total	Researcher	Other Staff	Sub-total	Total
27	25	40	1	8	101	37	32	69	170
		[1]			[1]				[1]
(4)	(4)				(8)				(8)

(As of June 1, 2007)

Research Students, Fellows and Associates

Research Student	Research Fellow	Sub-total	Postdoctoral Fellow of JSPS	Research Associate	Sub-total	Total
5	2	7	6	5	11	18

(As of May 1, 2007)

Graduate Students

The number in () represents Students from Foreign Countries.

	Science	Engineering	Agriculture	Pharmaceutical Sc.	Medicine	Informatics	Human & Environm. Studies	Total
Master's Course	58	45	25	16	3	3	2	149
	(3)	(1)	(1)	(1)	(1)	(1)	(1)	(3)
Doctoral Course	48	12	10	14	3	3		90
	(3)	(1)	(2)	(1)	(1)	(1)		(8)
Total	106	57	35	30	3	6	2	239
	(3)	(1)	(3)	(2)	(0)	(2)	(0)	(11)

(As of April 10, 2007)

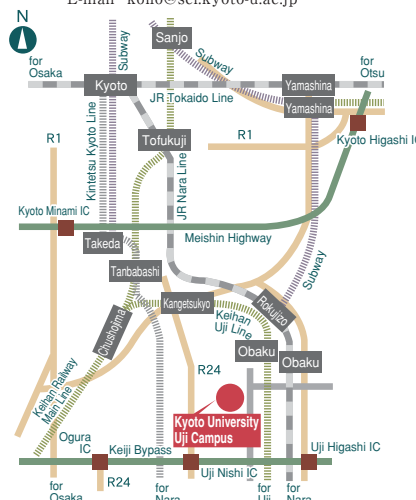
Researchers and Students from Foreign Countries, and their Origins, 2007

Researchers (PD)		Students	
Canada	1	China, P. R.	2
China, P. R.	7	Egypt	1
France	1	Indonesia	2
India	2	Italy	1
Spain	1	Korea, R	1
Taiwan	1	Philippines	1
UK	1	Romania	1
USA	2	Thailand	1
		USA	1
Total	16	Total	11



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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