ICR2024

INSTITUTE FOR CHEMICAL RESEARCH KYOTO UNIVERSITY

2024

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

Preface

Director

SHIMAKAWA, Yuichi

Founded in 1926 as the first research institute of Kyoto University, the Institute for Chemical Research will celebrate its 100th anniversary in 2026, two years from now. As the 36th director of the Institute with such a long history, I have assumed the responsibility of carrying on the traditions and achievements of the Institute, and I will do my best to develop the Institute into the future.

Our Institute has the founding philosophy of "excelling in the investigation of the basic principles of chemistry and their applications". With this philosophy in mind, the Institute has consistently embarked on diverse and innovative pioneering research by flexibly and actively adapting to the changing times. In the course of an era that is about to enter its 100th year, significant advances in science and technology have drastically changed people's living environment, and the chemistry we target and the chemistry society demands have also changed significantly. In line with these changes, our Institute has developed high-level research by broadening perspectives and strengthening collaborations with other institutes based on our own curiosity and drive for improvement. Research at the Institute for Chemical Research, which began 100 years ago with the synthesis of an antibiotic drug compound known as Salvarsan, was mainly synthetic chemistry using flasks and beakers. Today, however, we can design and synthesize novel chemical compounds at the atomic and molecular levels, and analyze their structures and properties using state-of-the-art quantum beams and informatics. In doing so, our institute has contributed to the development of society through a wide range of sciences, including chemistry, physics, biology, and information technology. Indeed, we are proud that the knowledge and technology we have accumulated over the years, the many experimental and analytical instruments currently available, the competent personnel within the Institute, and the extensive domestic and international networks have enabled us to meet the needs of society and industry in various ways.

Nevertheless, in order to adapt to the rapid changes in modern science, including AI technology, and in the roles of universities and research institutions, it is now more necessary than ever to have greater perception, sensitivity, and judgment not only in research but also in the management of the Institute. It also requires passion and effort to translate these judgments into action and results. Our Institute is in an important position to reflect on its long history and traditions, and to discuss its future for the next 100 years of development. In fact, the government policy and the future vision of Kyoto University are moving towards the establishment of a new framework, University of the International Research Excellence. We believe that strengthening the presence of our institute at the international level and nurturing the next generation of young people who will play an active role in the world are essential tasks that we should focus on. We would like to outline a new vision for the University and the Institute, including collaborative efforts both within and outside the Institute to support a prosperous future.

With the announcement of the WHO's declaration of the end of the public health emergency associated with coronavirus infection, everyday life seems to indicate the end of the pandemic. We have entered a new era, with many activities returning to their pre-pandemic status and adopting various new approaches developed during the difficult environment of the past four years. The research activities of our Institute are also entering a new era after a period of turmoil. However, it is truly crucial to remember that technological innovations that support society and enrich the future are always based on the results of fundamental research. We should reaffirm our founding principle of "excelling in the investigation of the basic principles of chemistry".

From this April, under the leadership of myself, Vice Directors Profs. Tatsuo Kurihara and Toshiharu Teranishi, and Director of the International Joint Usage/Research Center (iJURC) Prof. Teruo Ono, we are committed to further developing both our research and the Institute. We hope to enjoy building a great future with our faculty, staff, and students. We sincerely appreciate your continued encouragement and support.

April 2024

History

For almost a century, ICR has been striving to unlock the mystery of chemistry and its related disciplines.

1926 ICR founded to "excel in the investigation of the basic principles of chemistry and their applications."

1929 Main Building of ICR completed in Takatsuki, Osaka.

1949 ICR affiliated to Kyoto University.

1962 Started to accept graduate school students.

1964 ICR divided into 19 research divisions.

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

1968 High-Voltage Electron Microscopy Building completed in Gokasho.

ICR relocated to Gokasho, the present location of the institute.

1971 Low-Temperature Laboratory completed.

1975 Biotechnology Laboratory and Central Computer Facility completed.

1981 Research Facility of Nucleic Acids completed.

1983 Nucleic Acid Research Building completed.

1985 Biotechnology Laboratory completed.

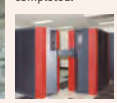
High-Voltage High-resolution Electron Spectromicroscope completed.

1988 Nuclear Science Research Facility relocated to Gokasho.

Accelerator Laboratory and Research Building completed.

1989 Supercomputer Laboratory completed.

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



1999 Joint Research Laboratory Building completed.

Our Mission

The founding philosophy of the ICR is to “excel in the investigation of the basic principles of chemistry and their applications,” and the core values of its research lie both in independence and integration. Following this philosophy and core values, the ICR is dedicated to solving global chemical challenges to benefit society.

Research

Our research is based on examining fundamental questions about the wide field of chemistry with a viewpoint that considers how answering these questions will contribute to solving ever-changing global challenges.

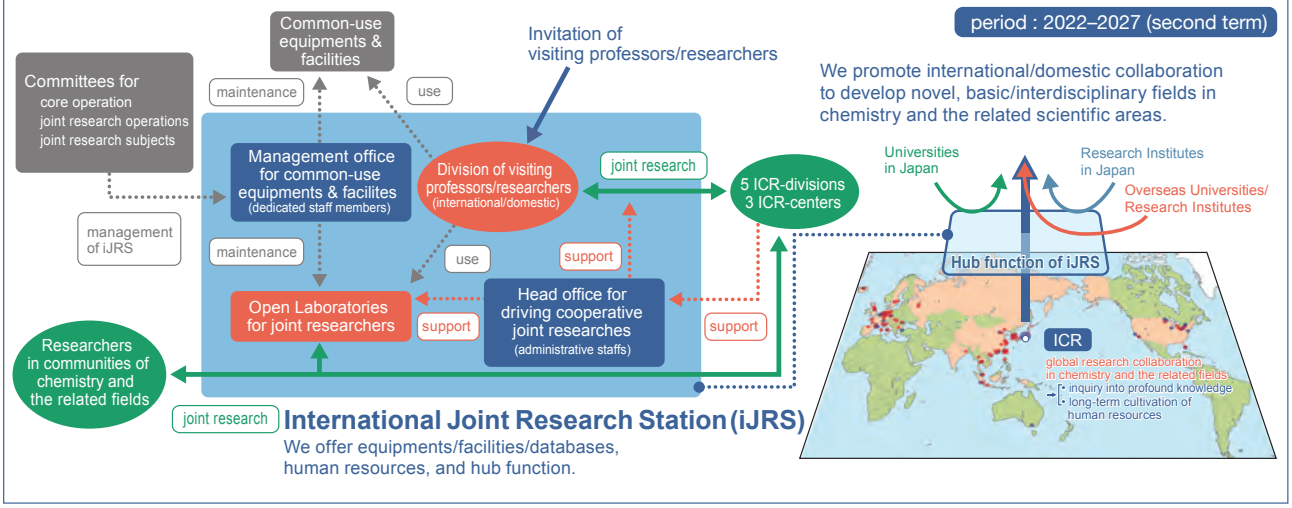
Education

Providing excellent research opportunities in a world-class environment, we train our people to have high-level problem solving skills and leadership skills to globally push forward the field of chemistry. Our success comes from the success of our students becoming top scientists in chemistry.

Outreach

As researchers and educators of chemistry, we endeavor to deepen our exchanges with local communities and Japan as a whole. At the same time, we actively work with international researchers and institutions to solve global problems. By joining the ICR, researchers have the accountability to the public and the opportunity to work closely with leading scientists around the world.

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



2000
- ICR Administration Department merged with Uji Administration Office.

2001
- Bioinformatics Center founded.

2002
- Endowed Research Section of Proteome Informatics (SGI Japan) established. (Closed in March, 2005.)

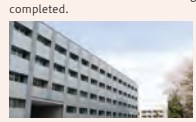
2003
- ICR reorganized into 9 research divisions and 3 satellite facilities.
- International Research Center for Elements Science founded.

2004
- ICR reorganized into 5 research divisions and 3 centers.
- Advanced Research Center for Beam Science established.
- Uji Research Building completed.

2005
- Laser Science Laboratory completed.

2007
- Established ICR alumni association named “Hekisuikai.”

2009
- Endowed Research Section of Water Chemistry Energy (AGC) established. (Closed in March, 2012.)
- First term of a Joint Usage / Research Center started.
- Seismic retrofit of the main building completed.



2010
- Endowed Research Section of Nano-Interface Photonics (SEI group CSR Foundation) established. (closed in March, 2015.)
- Bioinformatics Center reorganized.

2011
- Monochromated Atomic Resolution Analytical Electron Microscope introduced.

2013
- Second term of a Joint Usage / Research Center started.
- International Research Center for Elements Science reorganized.

2016
- Dynamic Nuclear Polarization-enhanced NMR (DNP-NMR) Systems introduced.

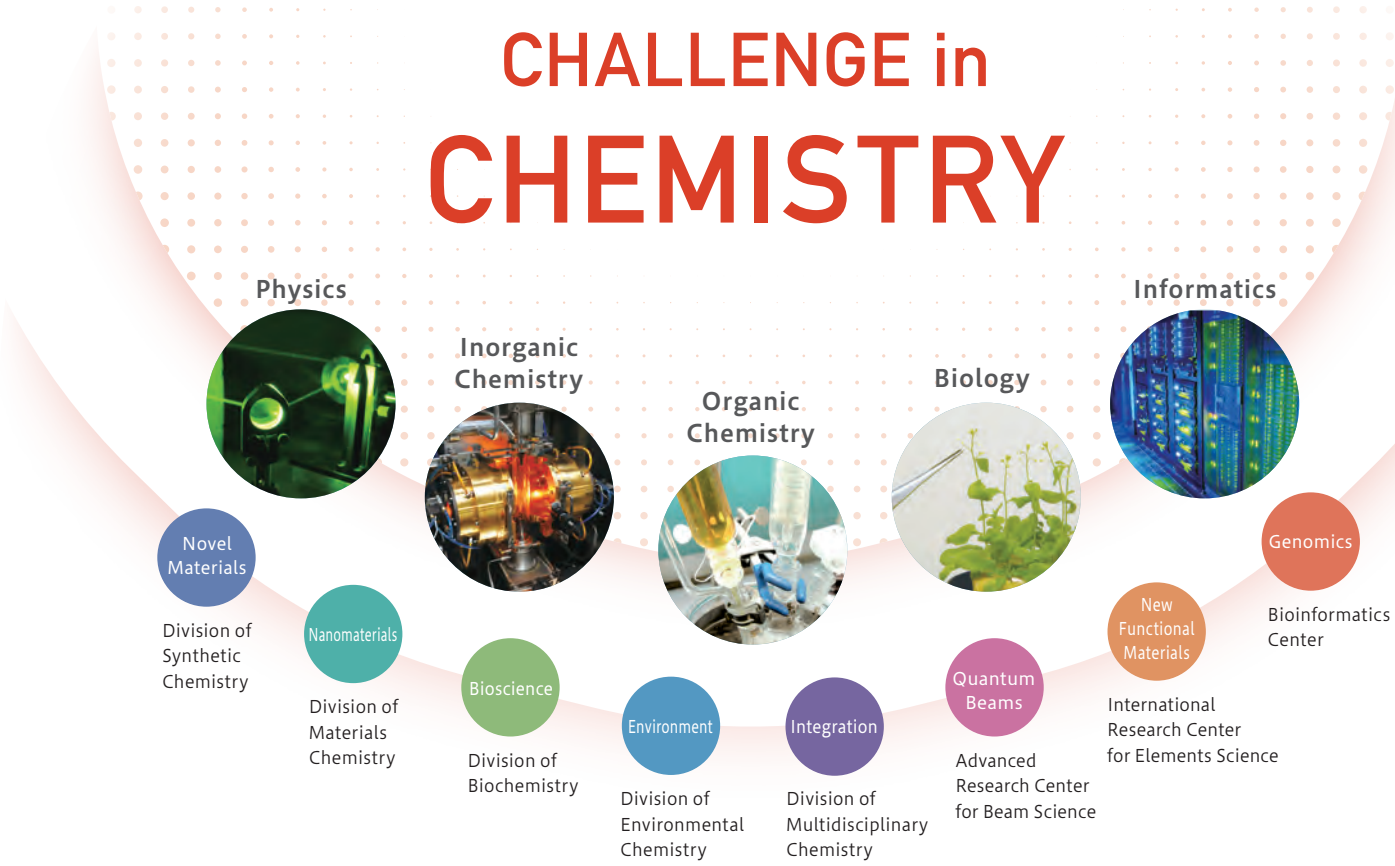
2017
- First term of an International Joint Usage / Research Center started.

2018
- Second term of an International Joint Usage / Research Center started.

2022

Research

Research at the ICR spans the entire breadth of chemistry and includes organic chemistry, inorganic chemistry, biological chemistry, physical chemistry, analytical chemistry, and computational chemistry. The ICR is organized into five research divisions and three research centers and has over 100 faculty members leading independent research programs in 30 laboratories.



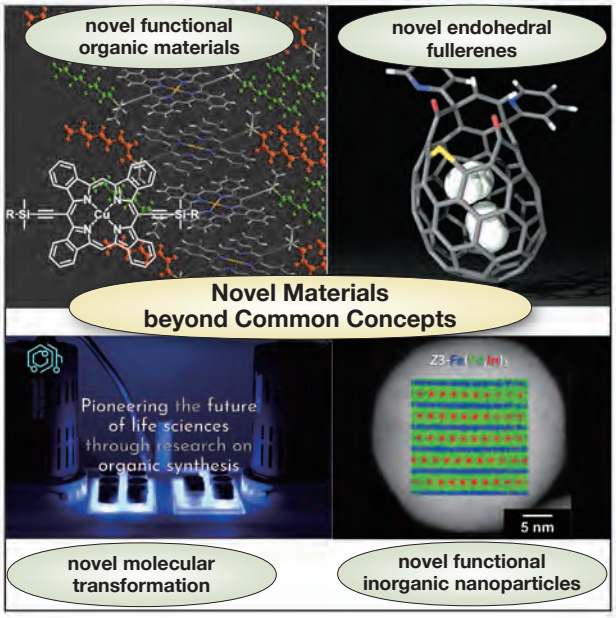
Education

Students who join the ICR will enter through one of the following six graduate schools at Kyoto University: Science, Engineering, Agriculture, Pharmaceutical Sciences, Medicine, and Informatics. Regardless of the school, the ICR offers exceptional teaching and research programs across a wide range of disciplines to all of its students.

Novel Materials

Division of Synthetic Chemistry

Exploring beyond traditional concepts, we use inorganic and organic chemistry to synthesize new functional molecules and materials, and investigate their structures, properties, and applications.



Graduate School of Science
Organoelement Chemistry

Prof.
YAMADA, Hiroko (D.Sc.)
Assoc. Prof.
MIZUHATA, Yoshiyuki (D. Sc.)
Assist. Prof.
MATSUO, Kyohei (D. Sc.)
Assist. Prof.
YAMAUCHI, Mitsuaki (D.Eng.)
Techn. Staff
HIRANO, Toshiko

Graduate School of Engineering
Structural Organic Chemistry

Prof.
MURATA, Yasujiro (D. Eng.)
Assoc. Prof.
HIROSE, Takashi (D. Eng.)
Assist. Prof.
HASHIKAWA, Yoshifumi (D. Eng.)

Graduate School of Pharmaceutical Science
Synthetic Organic Chemistry

Prof.
OHMIYA, Hirohisa (D. Eng.)
Assoc. Prof.
NAGAO, Kazunori (D.Sc.)
Assist. Prof.
MURAKAMI, Sho (D. Pharm. Sc.)

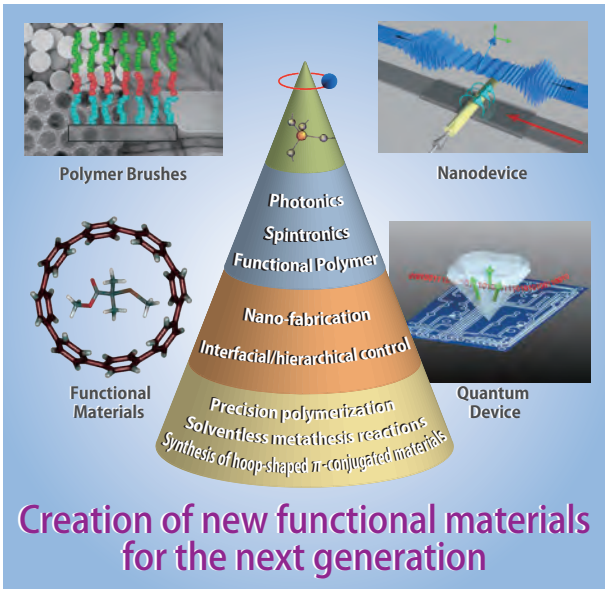
Graduate School of Science
Advanced Inorganic Synthesis

Prof.
TERANISHI, Toshiharu (D. Eng.)
Assist. Prof.
TAKAHATA, Ryo (D. Sc.)
Assist. Prof.
TAKEKUMA, Haruka (D.Sc.)
Program-Specific Assoc. Prof.
SARUYAMA, Masaki (D. Sc.)
Program-Specific Assist. Prof.
SATO, Ryota (D. Sc.)
Program-Specific Assist. Prof.
MATSUMOTO, Kenshi (D. Sc.)
Program-Specific Assist. Prof.
YAMADA, Takumi (D. Sc.)

Nanomaterials

Division of Materials Chemistry

We focus on the creation and development of next-generation nano-sized functional materials by controlling electronic, photonic, and spin states as well as fabrication methods.



Graduate School of Engineering
Chemistry of Polymer Materials

Prof.
TSUJII, Yoshinobu (D. Eng.)
Assist. Prof.
KINOSE, Yuji (D. Eng.)
Assist. Prof.
ISHIDA, Koichiro (D.Agr.)

Graduate School of Engineering
Polymer Controlled Synthesis

Prof.
YAMAGO, Shigeru (D. Sc.)
Assoc. Prof.
TOSAKA, Masatoshi (D. Eng.)
Assist. Prof.
KAYAHARA, Eiichi (D. Eng.)
Techn. Staff
FUJIHASHI, Akiko

Graduate School of Engineering
Inorganic Photonics Materials

Prof.
MIZUOCHI, Norikazu (D. Sc.)
Assoc. Prof.
MORIOKA, Naoya (Ph. D.)
Assist. Prof.
SHIGEMATSU, Ei (Ph.D.)
Program-Specific Assoc. Prof.
OHKI, Izuru (Ph.D.)
Program-Specific Assist. Prof.
HERBSCHLEB, Ernst David (Ph. D.)

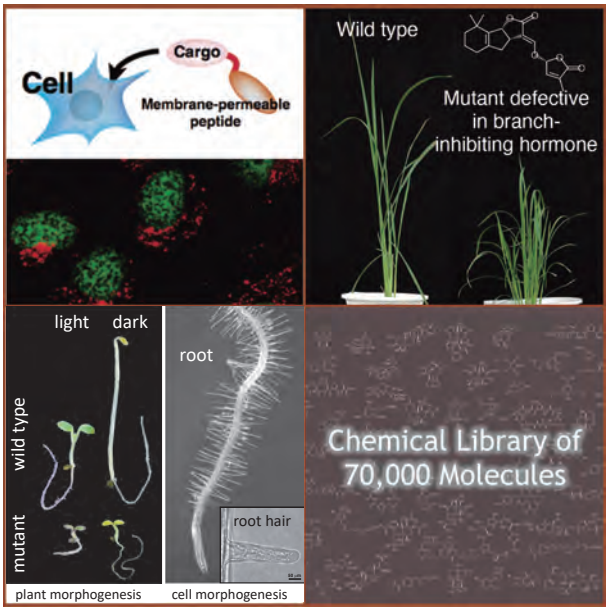
Graduate School of Science
Nanospintronics

Prof.
ONO, Teruo (D. Sc.)
Assoc. Prof.
SHIOTA, Yoichi (D. Eng.)
Assist. Prof.
HISATOMI, Ryusuke (D. Eng.)
Program-Specific Assoc. Prof.
KARUBE, Shutaro (D.Sc.)
Program-Specific Assist. Prof.
NARITA, Hideki (Ph. D.)

Bioscience

Division of Biochemistry

We develop new applied biomaterials by investigating biological processes such as recognition and sensing from a chemical perspective.



Graduate School of Pharmaceutical Science
Biofunctional Design-Chemistry

Prof.
FUTAKI, Shiroh (D. Pharm. Sc.)
Assoc. Prof.
IMANISHI, Miki (D. Pharm. Sc.)
Assist. Prof.
KAWAGUCHI, Yoshimasa (D. Pharm. Sc.)
Program-Specific Assist. Prof.
KIMURA, Seigo (D. Pharm. Sc.)

Graduate School of Agriculture
Chemistry of Molecular Biocatalysts

Prof.
YAMAGUCHI, Shinjiro (D. Agr.)
Assist. Prof.
MASHIGUCHI, Kiyoshi (D. Agr.)
Assist. Prof.
HAYASHI, Kengo (D. Sc.)
Program-Specific Assist. Prof.
OGAWA, Satoshi (D. Agr.)

Graduate School of Science
Molecular Biology

Assoc. Prof.
TSUGE, Tomohiko (D. Sc.)
Assist. Prof.
KATO, Mariko (D. Agr.)

Graduate School of Pharmaceutical Science/Medicine
Chemical Biology

Prof.
UESUGI, Motonari (D. Pharm. Sc.)
Assist. Prof.
ABO, Masahiro (D. Pharm. Sc.)
Assist. Prof.
NISHIO, Kosuke (Ph.D. Medicine)

Environment

Division of Environmental Chemistry

We contribute to solving environmental problems through research on environment-friendly organic device design, enzyme/microorganism-based biotechnology, and hydrospheric biogeochemistry.

Graduate School of Engineering
Molecular Materials Chemistry

Prof.
KAJI, Hironori (D. Eng.)
Assist. Prof.
SHIZU, Katsuyuki (D. Eng.)
Assist. Prof.
SUZUKI, Katsuaki
(D. Human & Envirnmtl. Studies)
Program-Specific Assoc. Prof.
TANAKA, Hiroyuki (D. Eng.)
Techn. Staff
MAENO, Ayaka
Techn. Staff
NAKAJIMA, Yuuki

Graduate School of Science
Hydrospheric Environment Analytical Chemistry

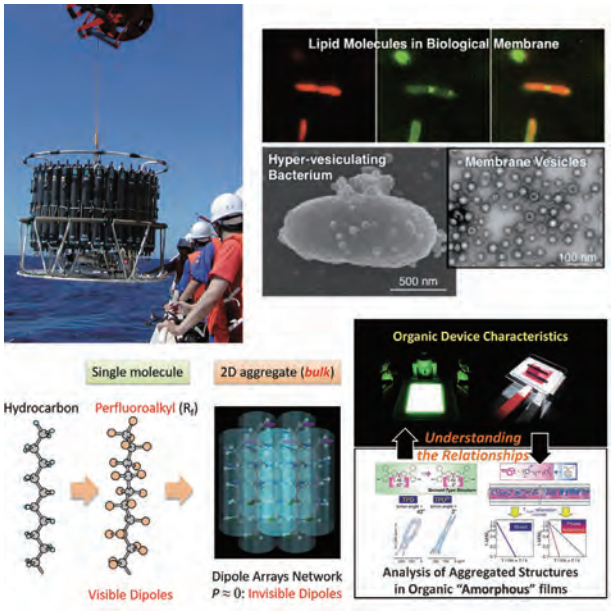
Prof.
SOHRIN, Yoshiki (D. Sc.)
Assoc. Prof.
TAKANO, Shotaro (D. Sc.)
Assist. Prof.
ZHENG, Linjie (D. Sc.)
Techn. Staff
NAKAHARA, Fumiko

Graduate School of Science
Chemistry for Functionalized Surfaces

Prof.
HASEGAWA, Takeshi (D. Sc.)
Assoc. Prof.
MORI, Taizo (D. Eng.)
Assist. Prof.
SHIOYA, Nobutaka (D. Sc.)

Graduate School of Agriculture
Molecular Microbial Science

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



Integration

Division of Multidisciplinary Chemistry

We flourish in the intersection of chemistry and physics, carrying out fundamental research in cooperation with the other divisions to enhance the scientific value of materials development.

Graduate School of Engineering
Polymer Materials Science

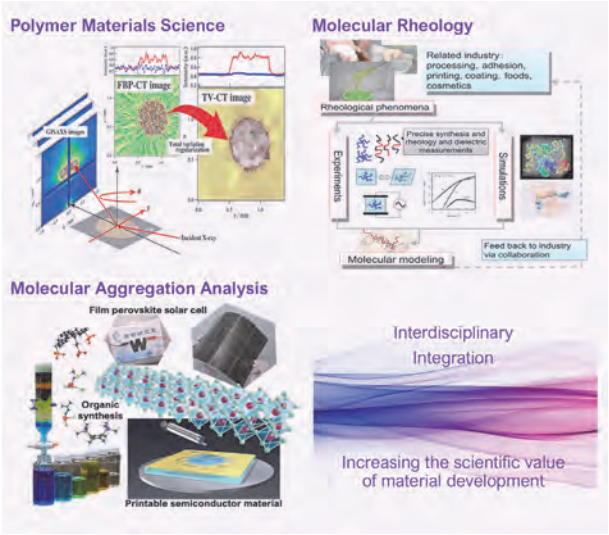
Prof.
TAKENAKA, Mikihito (D. Eng.)
Assoc. Prof.
OGAWA, Hiroki (D. Eng.)
Assist. Prof.
NAKANISHI, Yohei (D. Eng.)

Graduate School of Engineering
Molecular Rheology

Assoc. Prof.
MATSUMIYA, Yumi (D. Eng.)

Graduate School of Science
Molecular Aggregation Analysis

Prof.
WAKAMIYA, Atsushi (D. Eng.)
Senior Lect.
MURDEY, Richard (Ph. D.)
Assist. Prof.
NAKAMURA, Tomoya (D. Eng.)
Assist. Prof.
TRUONG, Minh Anh (D. Eng.)
Program-Specific Assist. Prof.
OHASHI, Noboru (D. Eng.)
Specially Appointed Assistant Professor
CHEN, Chien-Yu (D. Eng.)



Quantum Beams

Advanced Research Center for Beam Science

We promote the development of quantum beams and ultimate space-time analysis and their applications to physics of nuclei, materials and plasmas.

Graduate School of Science
Particle Beam Science

Prof.
WAKASUGI, Masanori (D. Sc.)
Assoc. Prof.
TSUKADA, Kyo (D. Sc.)
Techn. Staff
TONGU, Hiromu

Graduate School of Science
Laser Matter Interaction Science

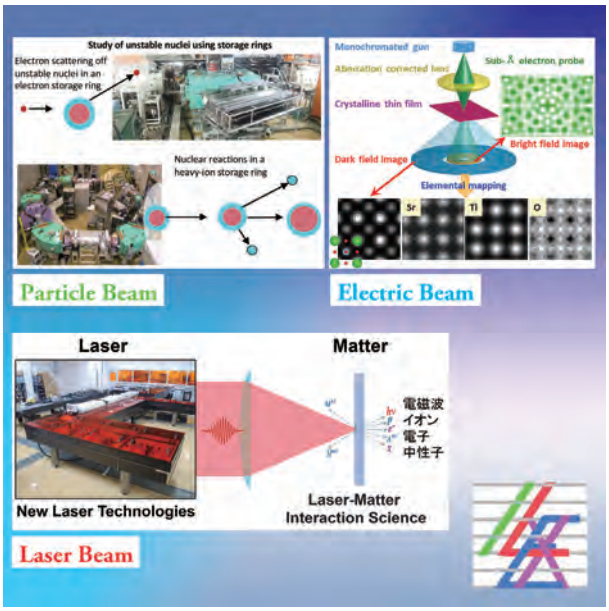
Prof.
TOKITA, Shigeki (D. Eng.)
Assist. Prof.
OKAZAKI, Daiki (D.Eng.)
Assist. Prof.
KIRITA, Yuri (D.Sc.)

Graduate School of Science
Electron Microscopy and Crystal Chemistry

Assoc. Prof.
HARUTA, Mitsutaka (D. Sc.)
Assist. Prof.
NEMOTO, Takashi (D. Sc.)

Graduate School of Science
Atomic and Molecular Structures

Assist. Prof.
FUJII, Tomomi (D. Sc.)



New Functional Materials

International Research Center for Elements Science

With the concept of “elemental science” as a base, we create ground-breaking functional materials with element-derived characteristic properties. This center has two joint laboratories in other divisions.

Graduate School of Engineering
Synthetic Organotransformation

Prof. **NAKAMURA, Masaharu** (D. Sc.)
Assoc. Prof. ISOZAKI, Katsuhiro (D.Eng.)
Senior Lect. PINCELLA, Francesca (Ph. D.)
Assist. Prof. DOBA, Takahiro (D.Sc.)
Program-Specific Assist. Prof. NAKAGAWA, Yuka (D. Sc.)
Program-Specific Assist. Prof. MINEO, Keito (D. Agr.)

Graduate School of Science
Advanced Solid State Chemistry

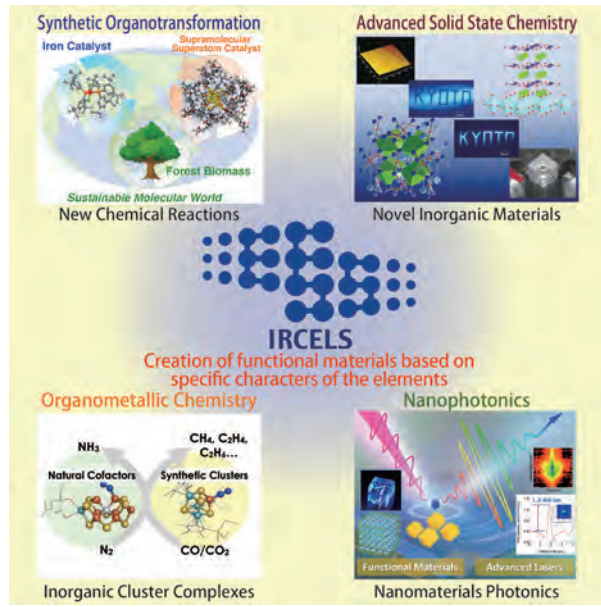
Prof. **SHIMAKAWA, Yuichi** (D. Sc.)
Assoc. Prof. KAN, Daisuke (D. Sc.)
Assist. Prof. GOTO, Masato (D. Sc.)
Techn. Staff ICHIKAWA, Noriya (D. Eng.)

Graduate School of Engineering
Organometallic Chemistry

Prof. **OHKI, Yasuhiro** (D. Eng.)
Assist. Prof. TANIFUJI, Kazuki (D. Sc.)
Assist. Prof. HIGAKI, Tatsuya (Ph. D.)
Assist. Prof. IZU, Hitoshi (D. Sc.)

Graduate School of Science
Nanophotonics

Assoc. Prof. HIRORI, Hideki (D. Sc.)



Genomics

Bioinformatics Center

We develop bioinformatics tools and resources to understand a wide variety of aspects of life sciences, from molecules to ecosystems.

Graduate School of Science/Pharmaceutical Science
Chemical Life Science

Prof. **OGATA, Hiroyuki** (D. Sc.)
Assoc. Prof. ENDO, Hisashi (D. Environmental Science)
Assist. Prof. OKAZAKI, Yusuke (D. Sc.)
Assist. Prof. HIKIDA, Hiroyuki (D. Agr.)
Program-Specific Assist. Prof. MENG, Lingjie (D. Sc.)
Program-Specific Assist. Prof. NECHES, Russell Young (Ph.D.)

Graduate School of Informatics
Mathematical Bioinformatics

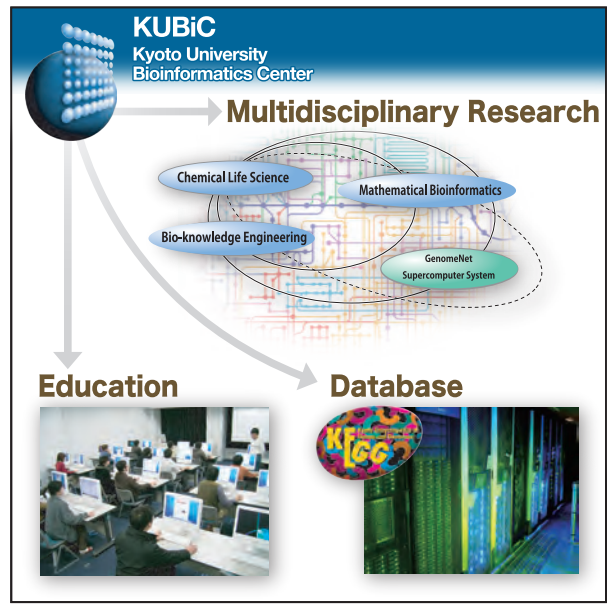
Prof. **AKUTSU, Tatsuya** (D. Eng.)
Assoc. Prof. TAMURA, Takeyuki (D. Inf.)

Graduate School of Pharmaceutical Science
Bio-knowledge Engineering

Prof. **MAMITSUKA, Hiroshi** (D. Sc.)
Senior Lect. NGUYEN, Hao Canh (D. Knowledge Science)

GenomeNet Project Management Office

Prof. **MAMITSUKA, Hiroshi** (D.Sc.)



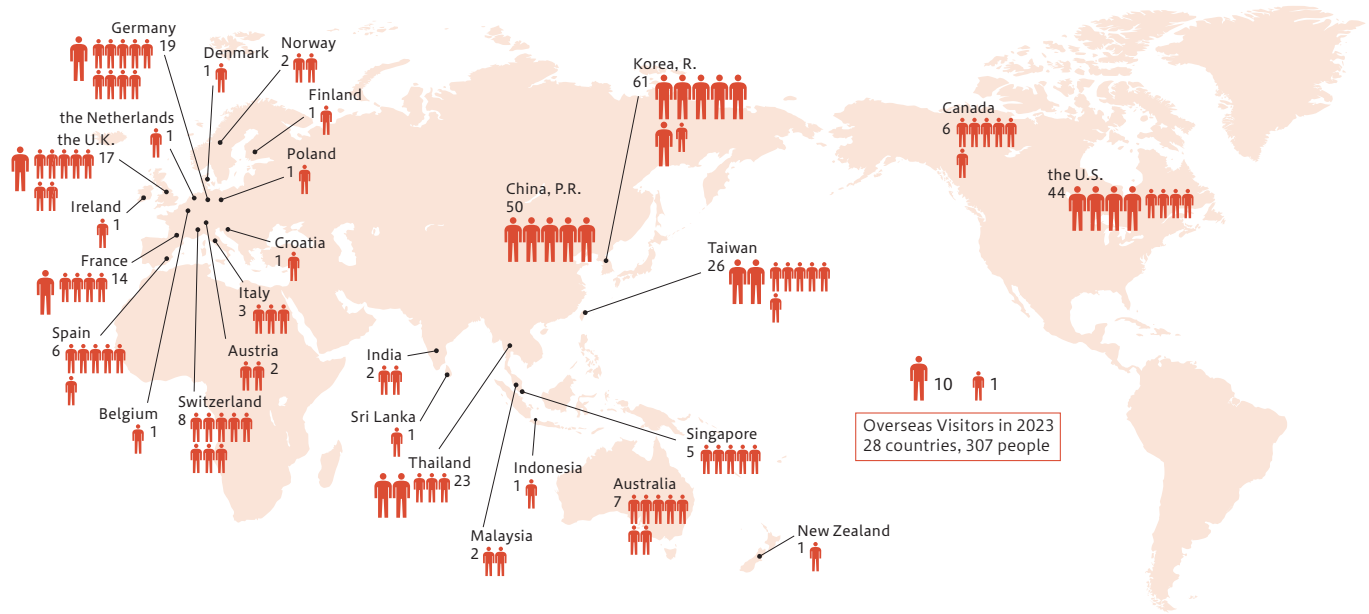
Facilities and Equipment

Dynamic Nuclear Polarization-enhanced NMR (DNP-NMR) System achieves great sensitivity enhancements. ICR also runs other solution/solid NMR spectrometers including an 800 MHz one.

ICR Supercomputer System, equipped with HPE Superdome Flex (2×24 TB memory, 1,152 cores) and Apollo 2000 (5,824 cores) and DL380 Gen11 (576 cores, NVIDIA H100 80GB×18), serves to accelerate researches in computational biology and chemistry.

A collection of state-of-the-art equipment is accessible in ICR, including mass spectrometers with a quadrupole ICP mass spectrometer, high functionality electron microscopes, a nano-scale dynamic structural analysis X-ray system, and an electron accumulation ring.

Overseas Visitors in 2023



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
25	20	3	36	7	4	12	10	117	23	42	65	182
(4)	(4)							(8)				(8)

* PS : Program Specific ** Including Researchers from Abroad As of May 1, 2024

Guest Researchers from Abroad

Australia	1	Canada	2	China, P.R.	5	Israel	1	the U.S.	2	Total	11

As of FY2023

Research Students, Fellows, and Associates

Research Student	Research Fellow	Postdoctoral Fellow of JSPS	Research Associate	Total
3	0	2	31	36

As of May 1, 2024

Graduate Students

Numbers in ( ) Represent Students from Abroad.

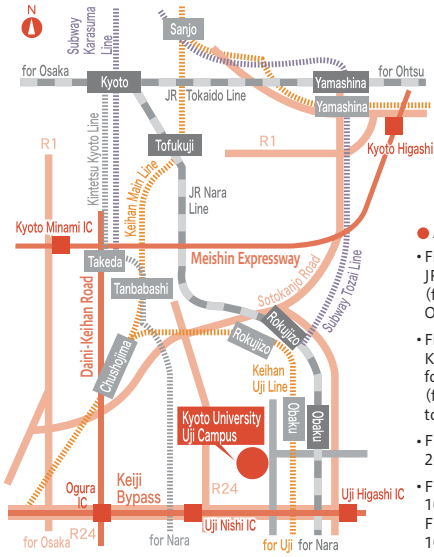
	Science	Engineering	Agriculture	Pharmaceutical Science	Medicine	Informatics	Total
Master's Course	52 (8)	36 (2)	9 (3)	16 (1)	1 (1)	2 (1)	116 (16)
Doctoral Course	49 (26)	29 (11)	7 (5)	18 (0)	3 (3)	10 (6)	116 (51)
Total	101 (34)	65 (13)	16 (8)	34 (1)	4 (4)	12 (7)	232 (67)

As of May 1, 2024

Graduate Students from Abroad

China, P.R.	50	Egypt	2	Iran	1	Total	67
Korea, R.	5	Mongolia	1	Pakistan	2		
Poland	1	Taiwan	3	the Phillippines	1		
the U.S.	1						

As of May 1, 2024



Access

- From Obaku Station on the JR Nara Line: 7 min on foot (from Kyoto Station to Obaku Station: 20 min)
- From Obaku Station on the Keihan Uji Line: 10 min on foot (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

ICR Institute for Chemical Research

Institute for Chemical Research Kyoto University

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

Web X YouTube