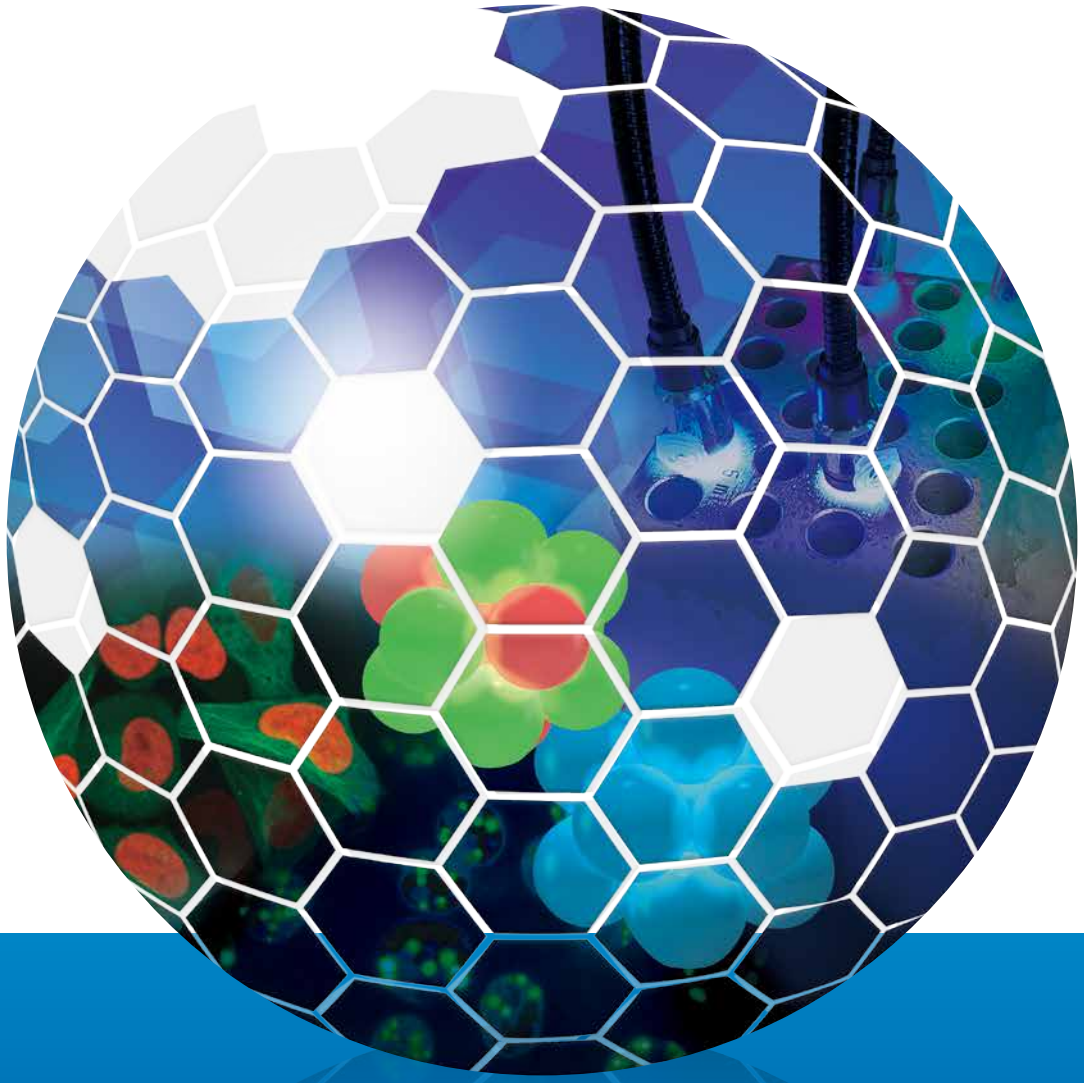
CLS

Laboratory for Chemistry and Life Science



Tokyo Tech

Message from the Director

The Laboratory for Chemistry and Life Science (CLS), previously known as the Chemical Resources Laboratory (CRL), was newly established within the Institute of Innovative Research (IIR) in April 2016. CLS focuses on the creation of new academic fields and next-generation science and technology, aiming at the improvement of highly-advanced systems and the realization of affluent and sustainable social development. We aspire to contribute to the development of chemistry and life science in Japan. Therefore, under the joint research initiative by the Network Joint Research Center for Materials and Devices (NJRC), CLS is actively collaborating with research institutes at four other universities: IMCE at Kyushu University, SANKEN at Osaka University, IMRAM at Tohoku University, and RIES at the Hokkaido University.

Our Mission

CLS concentrates on four major disciplines, namely, "Molecular Synthesis," "Molecular Materials Design," "Molecular Function," and "Molecular Bioscience". Furthermore, CLS conducts extensive research on molecular science and engineering that covers not only fundamental and applied chemistry but also life science. By combining domestic and international research activities, CLS formulates new principles in molecular-based chemistry and bioscience aiming at breakthroughs in next-generation science and technology. The professors at CLS are also faculty at the Tokyo Institute of Technology (Tokyo Tech). They educate and train both undergraduate and graduate students to nurture next-generation researchers. The students currently account for 65% of the 320 CLS members, making them a significant core source of CLS activities. The final goal of CLS is to contribute to the realization of sustainable social development through cutting-edge chemical research and the fostering of responsible human resources.

Facts

320+ Colleagues

59 Faculty Members (include associate and assistant prof.)

200+ Students

40+ Staffs

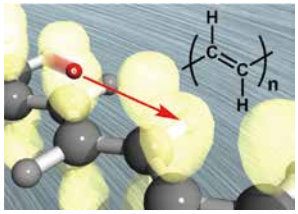
57 International students and researchers

$5.5m
annual grant and commissioned research expenditure

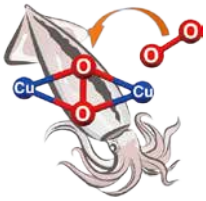
41
research projects supported by national grants

44
projects for collaboration with industries and universities

Scientific Discoveries



1976
Dr. Hideki Shirakawa discovered a conducting polymer (Nobel prize in chemistry at 2000)



1989
Dr. Y. Moro-oka and Dr. N. Kitajima elucidated the structure of copper complexes, which is the key of blue blood in crustacea.

1997
Dr. M. Yoshida directly observed a molecular motor in ATPase.

Professor


Toru HISABORI


Kan TANAKA


Hiroshi UEDA

Associate Professor


Tetsuya KITAGUCHI


Ken-ichi WAKABAYASHI


Keisuke YOSHIDA

Assistant Professor


Kumiko KONDO⁂

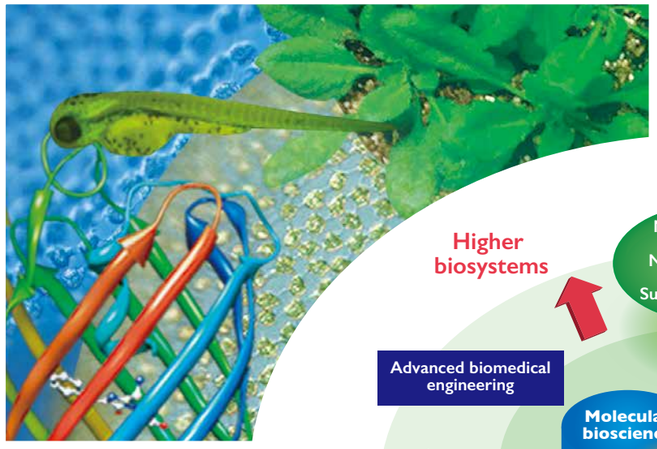

Kaisei MAEDA

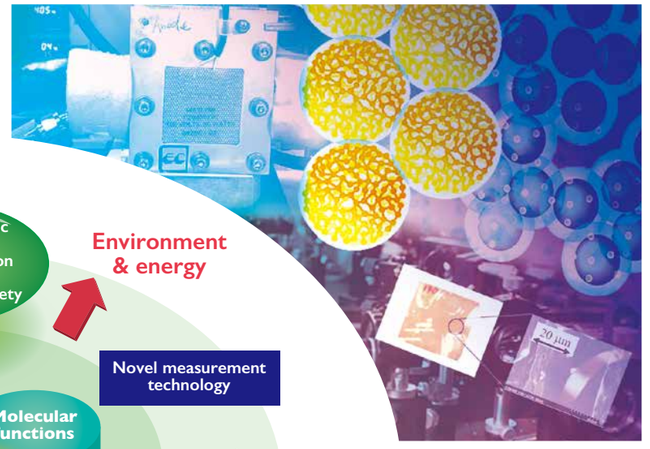

Takanobu YASUDA

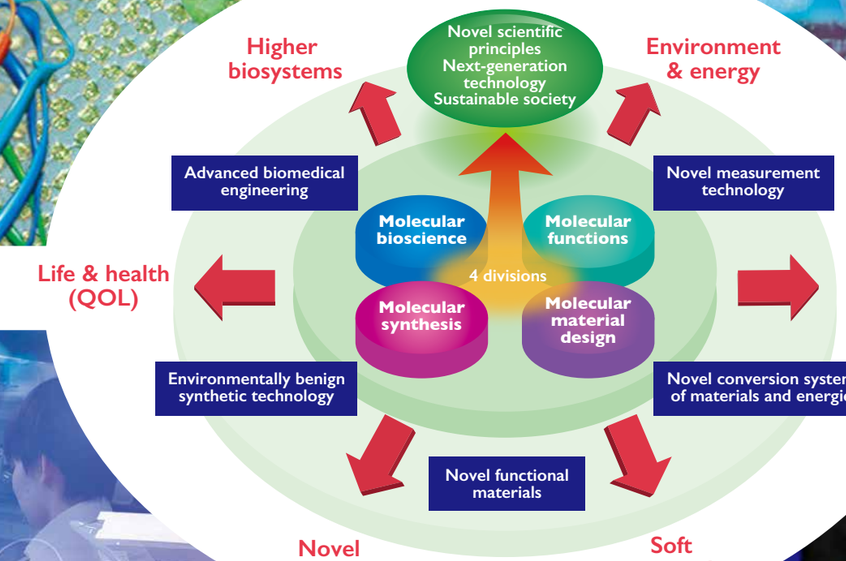

Bo ZHU

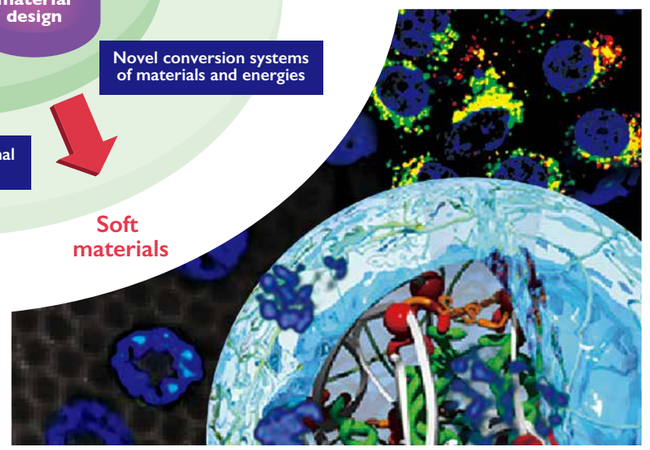
Molecular Bioscience

The human body works as a combination of diverse chemical reactions involving molecules with elaborate structures whose complexity and methods of regulation can be scarcely fathomed by humans. In this discipline, we aim to understand the molecular and regulatory mechanisms involved in various reactions that occur in living bodies, such as production and storage of energy, molecular recognition, and molecular motion using chemical terminologies. By integrating the obtained findings, we develop new technologies, such as clean energy and new disease diagnostic tools, to contribute to humanity.









Professor


Hiroyuki NAKAMURA


Kohtaro OSAKADA*


Michito YOSHIZAWA

Associate Professor


Satoshi OKADA


Tomohisa SAWADA

Assistant Professor


Lorenzo CATTI


Kazuki MIURA


Taiki MORITA


Yuya TANAKA

*Specially Appointed Professor
‡Specially Appointed Associate Professor
⁂Specially Appointed Assistant Professor

Molecular Synthesis

Molecules are fundamental components of a substance, and they could express infinite functions based on their diverse structures and sizes (e.g., molecular weight). In this discipline, we use our unique principles and methods to synthesize novel molecules and cement the foundation required to develop the expression of molecular functions. We target all organics, inorganics, metal complexes, and macro- and supra-molecules to ultimately build a new molecular world by combining elements, bonds, and secondary structures.

Molecular Functions

The smallest unit of material is a molecule, and the macroscopic properties that we observe are controlled by molecular functions, i. e. their structures and dynamics. Thus, we have been studying molecular functions by using the advanced experimental and theoretical approach for molecules and molecular aggregates. Based on the understanding of molecular functions, we develop advanced materials, devices, fuel cells, and catalysts, to contribute to achieve a prosperous and sustainable society.

Professor


Masaaki FUJII


Takeo YAMAGUCHI


Kimihisa YAMAMOTO

Associate Professor


Takane IMAOKA


Hidenori KUROKI‡


Shoji MIYANISHI‡

Assistant Professor


Tetsuya KAMBE


Hiroto OKUYAMA


Maxim SHISHKIN⁂


Yuuki SUGAWARA


Takamasa TSUKAMOTO

Professor


Takanori FUKUSHIMA


Nobuhiro NISHIYAMA


Atsushi SHISHIDO

Associate Professor


Shoichi KUBO


Yutaka MIURA

Yoshiaki SHOJI

Assistant Professor

Miho AIZAWA

Tomoya FUKUI

Kyohei HISANO

Yuto HONDA

Colin John MARTIN⁂

Takahiro NOMOTO

Ryosuke TAKEHARA

Molecular Material Design

The properties of organic materials are determined by molecular arrangement and orientation, along with the fundamental chemical structures of the constituent molecules. The research interest of this group focuses not only on the synthesis of functional molecules and polymers but also on the new methodology that enables controlled assembly of molecular building blocks into a desired structure at various levels from the nanoscale to the macroscopic scale. Deep understanding of the molecular behaviors regarding static and dynamic aspects allows us to design new soft materials exhibiting superb electrical, optical, thermal, mechanical, or biological functions that contribute to diverse scientific and technological fields for the realization of sustainable society.

Networking and Cooperation

The technological knowledge and experimental techniques in CLS, cultivated through cutting-edge scientific research, are widely utilized in both comprehensive joint projects and individual collaborative research. CLS is always open for collaborations with external researchers under NJRC, which is based on the Five-Star alliance project involving five university-affiliated research institutes in Japan. Numerous interdisciplinary collaborative research with other global research institutes and industries are currently underway.

CORE Lab

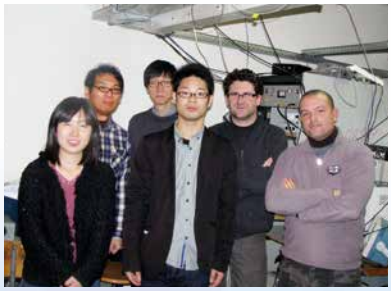
To strengthen the NJRC network based on the Five-Star alliance project, CLS has introduced "CORE lab," wherein young researchers from other organizations conduct joint research with their host supervisors. The principal investigators, selected through open recruitment, directly supervise, organize, and conduct long-term integrated collaborative research.

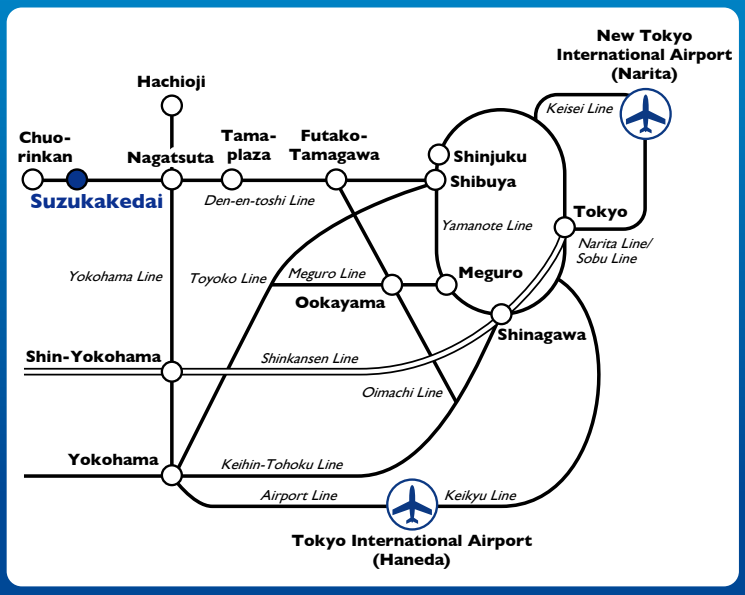
Facilities

As a comprehensive laboratory for chemistry and life science, CLS is equipped with facilities for a wide range of experiments, such as organic and inorganic synthesis, structural analysis, microanalysis, dynamic analysis of biomolecules, and animal testing. Many of these facilities are also open to external users through NJRC.

International Academic Activities

The professors at CLS are also faculty at Tokyo Tech, teaching both undergraduate and graduate students. Tokyo Tech's International Graduate Program (IGP) admits numerous international applicants, many of whom are then enrolled in CLS. Furthermore, Tokyo Tech's World Research Hub Initiative (WRHI) supports faculty recruitment and long-term stay of international researchers, and is the driving force for achieving an interdisciplinary network of leading researchers in the world.





Chem. & Life Sci. since 1939

Laboratory for Chemistry and Life Science

Laboratory for Chemistry and Life Science
Institute of Innovative Research
TOKYO INSTITUTE OF TECHNOLOGY

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Official site
http://www.res.titech.ac.jp/english/

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