# Kyoto University Research Center San Diego



#### **General Information**

- Approved in FY 2018
- Established in September 2019
- Established by the Graduate School of Medicine
- Partner institution: The University of California San Diego (UCSD), USA
- Location: The University of California San Diego (UCSD), San Diego, USA (outbound)
- Purposes: Acceleration of research collaboration, industry-academia collaboration, education collaboration, and global human resource development through sharing space in the Center for Novel Therapeutics with UCSD's top researchers.
- Functions: Joint research in the field of medicine, recruitment of international students, and expansion of collaboration with industrial partners.

#### Ripple effect on the university's activities

- Development of human resources through overseas training of early-career doctors and others
- Support for study abroad and global exchange by students and faculty and staff members

#### [FY 2023]

- Promotion of international joint research
- Development of laboratory for cross-bound exchange
- Recruitment of international talented students
- Support for KU ventures
- Many internationally renowned researchers in the field of cancer immunology are affiliated with UCSD/MCC, where KURC-SD is located. The implementation of a joint research program in cancer immunology with MCC as a counterpart, taking advantage of each other's strengths, will become an important factor in the development and sustainability of KURC-SD. Furthermore, research collaboration in cancer immunology with UCSD, which has been highly evaluated internationally, is anticipated to lead to cutting-edge research, contribute to society through medical treatment, and raise Kyoto University's international profile.
- The facility will function as an "open-space" research environment that provides KU researchers with a convenient environment in which to launch projects with lower costs.

#### **Activity Overview**





#### 1 The 4<sup>th</sup> Kyoto University LifeScience Showcase @ San Diego 2023 (February 27, 2023)

- KULS2023 was held in San Diego with the aim of promoting the international dissemination of innovations in medical fields by Kyoto University and other Japanese universities.
- Enthusiastic presentations were delivered by 14 venture companies from Japan and abroad, which were divided into four sessions. 100 participants mainly from the US and Japan viewed the live presentations.
- Each presentation was followed by feedback from commentators familiar with US venture companies and discussions with the participating companies.
- The award was given to the company with the most outstanding presentation, which was selected by the commentators and a moderator.





#### 2 The 1<sup>st</sup> Joint Symposium of Kyoto University's Three North American On-site Labs Transformative Innovations in Medical and Life Sciences (February 28, 2023)

- Kyoto University's three North American-based OSLs held a joint symposium in collaboration with the university's International Strategy Office to share the outcomes of outstanding cutting-edge research in the field of medical and life sciences. The event was held in a hybrid format (on-site and online).
- The theme of the San Diego lab's session was "Cancer immunotherapy", and it featured two lectures: one by President Nagahiro Minato of Kyoto University and the other by Dr. Mitchell Kronenberg, representing the San Diego area. In addition, Prof. Mitinori Saitou, a medical researcher engaged in pioneering research at Kyoto University, was selected as one of the keynote speakers.
- The symposium attracted over 700 participants, from over ten countries and regions, including the US and Japan.
- A question-and-answer session was held after each lecture, during which participating students and researchers enthusiastically asked questions and engaged in lively discussions.





#### **General Information**

- ♦ Approved in FY 2018
- Established in April 2020
- Established by the Graduate school of Medicine
- Partner institution: The AIRC Institute of Molecular Oncology (IFOM ETS), Italy
- Location: Kyoto University, Kyoto, Japan (inbound)
- Purposes: Promotion of international research collaboration through the establishment of an international joint laboratory on the campus of the KU Graduate School of Medicine, co-funded by IFOM ETS and Kyoto University.
- Functions: Advanced cancer biology research and training of graduate students and early-career researchers.

#### Ripple effect on the university's activities

- Boost research activity by bringing together the knowledge and expertise of both institutions.
- Foster global human resources by internationalizing the research environment
- Create innovation through interdisciplinary academic collaboration

#### [FY 2023]

- Promotion of research collaboration in Japan and overseas (Dr. Anthony Cesare [co-authored paper in 2019], Dr. Katsushi Kagaya [Grants-in-Aid for Scientific Research (B)]), and publication of internationally co-authored academic papers.
- Hosting short-term students through the AMGEN Scholar Program and the JSPS summer program to contribute to the university's internationalization efforts.
- Short-term stay in IFOM ETS for 2 month to foster our international relationship.





#### Research outcomes

Peer-reviewed article

Diana Romero-Zamora and <u>Makoto T. Hayashi</u>, "A non-catalytic N-terminus domain of WRN prevents mitotic telomere deprotection," *Scientific Reports*, 2023, Jan 12 DOI:10.1038/s41598-023-27598-0

- Conference presentations
  - Zamora DR, <u>Hayashi MT</u>, "A non-catalytic N-terminus domain of WRN prevents mitotic telomere deprotection," at the 74th Annual Meeting of the Japan Society for Cell Biology, Tokyo, Japan, June 28–30
  - Diana Romero, Sam Rogers, Fuyuki Ishikawa, Anthony J. Cesare, <u>Makoto Hayashi</u>, "The TRF1-BTR-AURKB pathway promotes mitotic telomere deprotection by competing with TRF2" at the 40th Chromosome Workshop and the 21st Nuclear Dynamics Meeting (held online), Dec. 20–21, 2022
- Acquisition of external funding Grant-in-Aid for Scientific Research-Basic Research (B), SGH Cancer Research Grant

# DAPI CenX chrX Time-lapse

Analysis of the fate of X chromosome fusion by the chromatid fusion visualization system (FuVis)

#### **2** Education, internationalization, and outreach

• The laboratory hosted:

<u>IFOM ETS post-doc:</u> 1 (Nigerian) <u>Research assistants:</u> 4 (1 Mexican, 1 Chinese, 2 Japanese) <u>Researchers/doctoral students:</u> 2 (1 Mexican, 1 Japanese) <u>Short-term international student (AMGEN Scholars Program):</u> 1 (US)

• Online meetings with IFOM ETS

PI chalk-talk meetings (online, once per month), PI meetings (online, once per month), PI retreat (Italy, October 17–19, 2022), Mid-term review (Kyoto, March 24, 2023)

Education and outreach

Molecular Biology, Kyoto Prefectural University, First semester lecture. 2022 1st IFOM-KU Joint Mini-Symposium (Kyoto, November 9, 2022) 2nd IFOM-KU Joint Mini-Symposium (Kyoto, March 1, 2023)



The IFOM-KU Joint Research Laboratory

#### Kyoto University-Tsinghua University Cooperative **Research and Education Center for Environmental Technology**



#### **General Information**

- Approved in FY 2018
- Established in December 2018
- Established by the Graduate School of Engineering and Graduate School of Global Environmental Studies (GSGES)
- Partner institution: Tsinghua Shenzhen International Graduate School, Tsinghua University, Shenzhen, China
- Location: Tsinghua Shenzhen International Graduate School, Tsinghua University, Shenzhen, China (outbound)
- Functions: Research and education in environmental engineering fields, and international double degree program

#### **Ripple effect on the university's activities**

- Recruitment of talented international students in environment-related fields.
- Expansion of internship education to fields other than environmental engineering.
- Expansion of international double degree programs to other fields, and implementation of diverse degree programs.
- Development of international industry-government-academia collaboration in other fields and in collaboration with other universities, local governments, and companies in Japan and China, building on the research collaboration in environmental engineering between Kyoto University and Tsinghua University.

#### [FY 2023]

Launched a double master's degree program at the Graduate School of Engineering in 2022. Conducting an online training program to attract talented students from Tsinghua University and Kyoto University to the program. Further advancement of ongoing international research collaboration.



The on-site laboratory will facilitate interaction with various fields other than environmental engineering.



#### I Kyoto University-Tsinghua University Symposium 2022 on Research and Education of Environmental Engineering

- The Kyoto University-Tsinghua University Symposium 2022 on Research and Education of Environmental Engineering (hereinafter "the symposium") was held online.
- The symposium featured lively discussions among its 120 participants, which included students, faculty, and staff members of the two universities, and delegates from environment-related companies in Japan and China.
- The symposium included a report on the situation regarding education and international exchange during the COVID-19 pandemic, research presentations by researchers from the two universities, overviews of the latest technologies by environment-related companies in Japan and China, and reports by students from the two universities about their outputs on the Online Education Program for Global Environmental Human Resource Development.
- As a result on a new collaborative research project "Degradation of Refractory Organic Matter Using New Catalyst", two peer reviewed papers have been published in international journals.

#### 2 The Online Education Program for Global Environmental Human Resource Development

- The Online Education Program for Global Environmental Human Resource Development was provided online from Oct. 10–Dec. 17, 2022.
- 10 students from Tsinghua University (China), 2 students from the University of Malaya (Malaysia), and 13 students from Kyoto University participated in the program.
- Program contents: opening ceremony, group work (5 sessions), lectures (3 sessions), cultural exchange event (tea ceremony), virtual company visit tour, virtual facility tour, workshop, and symposium participation and presentation.
- The mini seminar on Microplastic pollution was organized with a prominent researcher from Norway and the carrier seminar was held on March 2023.
- Online seminars for supporting companies were held in July 2022 and January 2023.



#### Online symposium participants



Each program for Global Environmental Human Resource Development

#### Kyoto University On-site Laboratory at Mahidol University for **Educational and Research Collaboration in Environmental Studies**



#### **General Information**

- ◆ Approval Year: FY 2018
- Establishment: March 2019 (upgraded from the Mahidol University base established in January 2016); Opening ceremony was held.
- Implementing School: the Graduate School (GS) of Global Environmental Studies (GSGES); jointly implemented by GS of Engineering, GS of Agriculture, and GS of Medicine after FY 2020.
- Partner institution: Mahidol University, Thailand
- Location: Mahidol University, Bangkok, Thailand (outbound)
- Activities: Joint education and research activities on environmental studies, recruitment of talented international students, and development of international joint programs

#### **Ripple effect on the university's activities**

- Research collaboration with local companies
- Recruitment of talented international students
- Education and training for local students
- [FY 2018-2022]

- Extension of joint/double degree programs .
- Fusion of the humanities and sciences
- Expansion to cross-bound type
- **On-site Laboratory Workshops:** 1<sup>st</sup> Workshop (Mahidol University, March 8, 2019, 155 participants), 2<sup>nd</sup> Workshop (Kyoto University, November 25, 2019, 44 participants), 3rd Workshop (On-line, March 11, 2020, 51 participants), 4th Workshop (On-line, November 27, 2020, 88 participants), 5th Workshop (On-line, March 11, 2022, 118 participants), 6th Workshop (On-line, March 29, 2023, 110 participants). In addition, the International Symposium was co-hosted (on-lines, November 30-December 1, 2020, 279 participants).
- Double master's degree programs: the Graduate School (GS) of Global Environmental Studies (GSGES), the School of Public Health, GS of Medicine, and GS of Agriculture were concluded in 2016, 2019, and 2021, respectively. As of the end of March 2023, 1 KU student and 12 Mahidol students have enrolled/will enroll in the GSGES program, and 2 Mahidol student in the Public Health program.
- Exchange of students & faculty members: In 2018–2019, 52 of 17 groups from Mahidol and 57 of 15 groups from KU visited each. In 2020–2022, only 9 of 7 groups from KU and 1 from KU visited each due to COVID-19.
- Others: Joint lectures, joint research, co-authored research presentations, internships, etc., were conducted,



#### Activity Overview



#### **1** Symposium/workshops (held online)

- <u>Kyoto University Symposium & GSGES 20<sup>th</sup> Anniversary Ceremony, November 24–25, 2022</u>: Held by the Graduate School of Global Environmental Studies, with 345 participants. Thirty members from Mahidol University (maximum number in the other universities) participated, and actively contributed to the event by (1) Video congratulatory message from the president, (2) 8 presentations (including 6 joint research projects), and (3) participation as a panelist in a panel discussion.
- <u>6th Kyoto University-Mahidol University On-Site Laboratory Workshop, March 29, 2023</u>: 110 participants (50 from Kyoto University, 48 from Mahidol University, and 12 from other institutions). The workshop began with opening remarks by KU vice-president and a photo shooting, followed by four parallel sessions on "Environmental Engineering," "Chemical Engineering," "Agriculture and Ecosystems," and "Public Health," and then, concluded by plenary wrap-up session, and closing remarks by MU vice-president.
- <u>KU-MU-CU Research Progress Sharing, March 15, 2023</u>: Sixteen participants from three organizations (Kyoto University, Mahidol University, Chulalongkorn University), and seven research presentations were made.

#### **2** Student exchange/degree programs

- In addition to the Graduate School of Global Environmental Studies (2016) and the School of Public Health (2019), the Graduate School of Agriculture signed an agreement for the establishment of a master's double degree program with Mahidol University Kanchanaburi Campus in July 2022..
- One student who graduated from Mahidol University in 2018 (undergraduate), and in 2020 (MC) was selected as a recipient of the MEXT Scholarship by KU recommendation quota and enrolled in a doctoral program in Chemical Engineering at the Graduate School of Engineering in October 2022.
- One student on the double degree program (who entered Engineering, Mahidol University in August 2018, and GEGES, Kyoto University in April 2019) received a master's degree from Mahidol University in June 2022. MC degree in Kyoto University was already completed in March 2021.
- One student on the double degree program (who entered Engineering, Mahidol University in August 2019, and GEGES, Kyoto University in April 2020) received a master's degree from Mahidol University in May 2022. MC degree in Kyoto University was already completed in March 2022.
- Two students on the double degree program (who entered Engineering, Mahidol University in August 2020, and GEGES, Kyoto University in April 2021) received a master's degree from Kyoto University in March 2023. MC study in Mahidol University is still continuing.
- Two students on the double degree program (who entered Engineering, Mahidol University in August 2021, and GEGES, Kyoto University in April 2022) came to Kyoto University in April 2022, and left in March 2023.
- Two students who entered Engineering, Mahidol University in August 2022 were selected as the double degree program of GEGES, Kyoto University. They are expected to enter Kyoto University in April 2022, and to stay in Japan from April 2022 to March 2023.
- One student was invited from Mahidol University as a special audit program student in 2022, and completed the program by staying in Japan from April 2022 to September 2022.
- One student on the double degree program (who entered Public Health, Mahidol University in June 2019, and the School of Public Health, Kyoto University in October 2021) came to Japan in April 2022, and left in March 2023.

#### **B** Publication of collaborative research results in internationally co-authored academic papers

• Research results produced through collaboration between the two universities have been presented 5 times at international conferences, and published in 12 peer-reviewed co-authored papers.

## **Smart Materials Research Center**



#### **General Information**

- ♦ Approved in FY 2018
- Established in August 2018
- Established by the Institute for Integrated Cell-Material Sciences (iCeMS) and Kyoto University Institute for Advanced Study (KUIAS)
- Partner institution: Vidyasirimedhi Institute of Science and Technology (VISTEC), Thailand
- Location: Vidyasirimedhi Institute of Science and Technology (VISTEC), Rayong, Thailand (outbound)
- Functions: Research in materials science fields, and training of graduate students and early-career researchers for active roles in international academia

#### Ripple effect on the university's activity

- Development of international joint research including research with local companies
- Student recruitment
- Provision of education for local students and summer schools
- Development into international joint program (JD/DD)
- Establishment of venture companies
- Recruitment of talented undergraduate students from top universities throughout Thailand through in-person visits or online recruitment activities.
- Utilize VISTEC's one- and two-year study abroad programs for PhD students, and strengthen collaboration and develop joint research with relevant top laboratories around the world through using VISTEC as a hub.
- Continue to develop the research using the Thai research grants, and establish a new research consortium consisting of multiple research organizations.

#### Activity Overview



- Instructing PhD students and cultivating human resources for industry, government, and academia
- Establishment and management of a sustainable laboratory

Launching projects and obtaining external funding





- Publication of research results, e.g. through collaboration with research groups within VISTEC. As an example, seven Nature index publications were published in the period 12/1/2021 - 30/11/2022.
- The first students (Master's degree) of the on-site laboratory were successfully defended and graduated.
- Strengthening of dispatches and collaborative research structures, particularly to major research groups in Europe and the USA, through the VISTEC Study Abroad Programme.



Cover of the ChemComm journal © 2022 Royal Chemical Society

# **②** Efforts to establish sustainable laboratory/launching new projects and acquiring external funding

- The researcher stationed in the laboratory is affiliated with the School of Molecular Science & Engineering, VISTEC, provide lectures to students, and participates in the admission process at VISTEC. Those efforts contribute to the recruitment of talented students to the lab every year.
- Thai Program Management Unit (PMU-B) grant was successed. "Frontier technology for direct conversion of CO<sub>2</sub> from industry to metal-organic framework" in 1 year (total 5M THB)
- Thai Program Management Unit (PMU-B) grant was successed.
   "Development of manpower in international communities for Catalysis/Electrocatalysis for Zero CO<sub>2</sub> Emission" in 1 year (total 5M THB)



# Kyoto University Shanghai Lab



#### **General Information**



- Approved in FY 2019, established in September 2019
- Established by the Institute for Chemical Research
- Partner institution: Fudan University, China
- Purposes: Cutting-edge collaborative research and promotion of personnel exchange in the field of chemistry
- ◆ Location: Fudan University, Shanghai, China (outbound)
- Functions: Promotion of cutting-edge chemical research, expansion of international collaboration and equipment sharing, and exchange of human resources with partner institutions

#### Ripple effect on the university's activity

Secure funding for self-

- Promotion of activities as an international joint-usage/research center.
- Efficient research through sharing research resources and equipment.
- Recruitment of talented students through using the lab as a contact point.

#### [During FY 2023]

- Successfully matched talented Chinese students with faculty members through holding online and face-to-face lectures and interview sessions. Significant relaxation of restrictions in China will be expected in FY 2023. After travel restrictions are lifted, face-to-face interview sessions will be resumed in Beijing and Shanghai.
- Negotiations have begun to conduct graduate school admissions in Shanghai as a future strategy.

#### **Overview of activities**

♦ Research collaboration in advanced chemistry (porous materials and other new materials, energy conversion, chemical biology, etc.)

◆ Shared use of state-of-art research equipment available at Fudan University, Shanghai Jiao Tong University, ShanghaiTech University, and Kyoto University

◆ Shared use of the National Compound Library of the Chinese Academy of Sciences (two million compounds)

♦ Utilize Kyoto University's online courses and short-term study abroad programs to attract talented students from top Chinese universities

◆ Obtain research funds by inviting visiting professors, and promote early-career researcher exchange

\*Proactive applications for external funding \*Collaborative research with companies



Office of the Institute for Chemical Research (ICR)

> Fudan University Zhangjiang Campus



(Rear) Assoc. Prof. Lu, School of Pharmacy, Fudan University (concurrent post) (Left) Secretary



Shanghai-Kyoto Chemistry Forum, October 2019 (Shanghai)



#### **1** Strict entry restrictions in China due to the COVID-19 pandemic

In FY2022, strict travel restrictions in China made it difficult to launch new initiatives. Due to the highly contagious virus, the Omicron variant, Shanghai (population 25 million) was driven into a two-month lockdown beginning March 28, 2022 and lasting until June 1. Under these circumstances, even online interaction was difficult to establish. The current restrictions are expected to ease in FY2023. After the travel restrictions are lifted, the Shanghai-Kyoto University Forum will be held, and collaborative research and shared use with leading universities in Shanghai will be advanced in three fields of chemistry (chemical biology, new materials and energy). The forum will be co-hosted by members from the universities in Shanghai, Institution for Chemical Research (ICR) and iCeMS, with the aim of exploring the potential for collaborative research beyond distinction of fields and divisions. The forum will promote discussions on methods of shared use of large equipment and obtaining research funds.

#### **2** Presentation and dissemination of collaborative research results

Despite the severe restrictions, research collaboration in advanced chemistry was promoted remotely through online meetings and sample delivery. In particular, a research project conducted in collaboration with Tsinghua University has developed a new method for vaccines and published as "Self-assembling small-molecule adjuvants as antigenic nano-carriers" in the *Chem. Comm.* These international collaborative research results have been proactively disseminated through the ICR website and Twitter, including the Twitter accounts of the individual laboratories and professors.

### **iPS Cell Research Center at Gladstone Institutes**



#### **General Information**

- Approved as KU On-site Laboratory in FY 2019
- Established by the Center for iPS Cell Research and Application (CiRA) in September 2019.
- Partner institution: Gladstone Institutes, USA
- Purposes: Further development of world-leading iPS cell research, and fostering globally competent early-career researchers
- Location: Gladstone Institutes, San Francisco, USA (outbound)
- Functions: Advanced research on iPS cells, training of earlycareer researchers, and recruitment of international students

#### Ripple effect on the university's activities

- Advancement in activities of researchers and students through participation in cutting-edge research
- Exploration of new programs beyond the departmental level, including international collaborative research between KU and UCSF

#### [FY 2023]

- Promotion of academic exchange through joint symposium with the partner institution and building a basis for the promotion of personnel exchange and research collaboration, which will lead to the development of international research collaboration between departments, universities, and/or between industry and academia.
- Fostering early-career researchers and recruiting talented international students through research exchange and internship education.

#### **Activity Overview**



#### VISION:

- Development of global human resources and acceleration of cross-border innovation

#### OUTLINE:

- Collaborative research on the mechanisms of protein translation regulation in the proliferation and differentiation of pluripotent stem cells.
- International exchange of researchers and students
- International exchange programs (symposiums, postdoc training programs)

#### MANAGEMENT STRUCTURE:

- Associate professor employed by CiRA stationed at the on-site laboratory through a cross-appointment
- Researchers employed by CiRA stationed at the on-site laboratory



# Co-hosted the 1<sup>st</sup> Joint Symposium of Kyoto University's Three North American On-site Labs (February 2023) Transformative Innovations

The iPS Cell Research Center at Gladstone Institutes, the Kyoto University Research Center San Diego, and the Quantum Nano Medicine Research Center co-hosted the 1<sup>st</sup> Joint Symposium of Kyoto University's Three North American On-site Labs in collaboration with the university's International Strategy Office.

Dr. Shinya Yamanaka delivered the opening keynote speech, and Dr. Kiichiro Tomoda served as chair of Session 2, which focused on "Stem cells and cell reprogramming," and featured two speakers: Dr. Juan Carlos Izpisua Belmonte (Altos Labs) and Dr. Jun Takahashi (CiRA).

The symposium served to disseminate cutting-edge information about iPS cell research and promote active academic exchange among the participating researchers and students, as well as deepen the network of the on-site laboratories in medical fields. The lab hopes to continue actively developing its outreach activities through the network.

#### **2** Further Improvement of Research Environment

The lab has increased its research staff and research equipment to further accelerate research. A UCSF student stationed in the lab completed his PhD and is now working at the lab as a postdoctoral researcher.

#### **3** Academic Paper Published

By utilizing a temperature-sensitive Sendai virus, researchers at the lab improved cell reprogramming technology and succeeded in efficiently generating naive iPSCs with significantly higher differentiation potency. The achievements were published in *Cell Reports Methods*.

https://www.cira.kyoto-u.ac.jp/e/pressrelease/news/221115-100000.html doi:10.1016/j.crmeth.2022.100317



#### Cell Reports Methods

Report

Improved Sendai viral system for reprogramming to naive pluripotency

# **Center for Integrated Biosystems**



#### **General Information**

- ♦ Approved in FY 2019
- Established in December 2019
- Established by: the Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University Institute for Advanced Study (KUIAS)
- ◆ Partner institution: Academia Sinica, Taiwan
- Location: Academia Sinica, Taipei, Taiwan (outbound)
- Functions: Advanced research in biomedical science fields, expansion of interdisciplinary collaboration, and recruitment of international researchers and students

#### Ripple effect on the university's activities

- The center serves as Kyoto University's point of contact in Taiwan
- The center serves as a hub for exchange with universities and research institutes in Taiwan
- Kyoto University students are motivated by international students from Taiwan and other countries.
- Promotion of internationalization for Kyoto University students
- The following benefits are anticipated: Promotion of international research collaboration between the Kyoto University Institute for Advanced Study (KUIAS) and IBMS, Academia Sinica (acquiring research funding), recruitment of talented international students through National Taiwan University (NTU), exchange between local students and Kyoto University students, development of international joint/double degree programs using TIGP, and research collaboration with local and Japanese companies.
- As Academia Sinica has many research laboratories in the social sciences, developments in the fusion of the humanities and sciences and cross-bound exchange involving other departments are anticipated. The research networks established in Taiwan are expected to be further expanded and effectively utilized for the university as a whole (such as the clinical trial network). During FY 2022, efforts will be made to strengthen relationships with NTU, a strategic partner of Kyoto University.

#### **Activity Overview**

Identification and functional analysis of genes involved in molecular sensing through interdisciplinary research



# **Center for Integrated Biosystems**



#### Main activities in FY 2022

# Mini SymposiumKyoto University & Academia Sinica

Presentations and discussions by six students and researchers from the Institute for Integrated Cell-Material Sciences (iCeMS) of Kyoto University and six students and researchers from the Institute of Biomedical Sciences (IBMS) of Academia Sinica.



# Mini SymposiumKyoto university & National Taiwan University

Presentations and discussions by six students and researchers from the Institute for Integrated Cell-Material Sciences (iCeMS) of Kyoto University and six students and researchers from the Department of Life Science of National Taiwan University (NTU).



# **Quantum Nano Medicine Research Center**



#### **General Information**

- Approved in FY 2019
- Established in October 2019
- Established by the Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University Institute for Advanced Study (KUIAS)
- Partner institution: The University of California Los Angeles (UCLA), USA
- Location: Kyoto University, Kyoto, Japan (inbound)
- Functions: Quantum nano-medicine research with a focus on cancer treatment applications, development of new research fields, and expansion of collaboration with UCLA and industrial partners

#### **Ripple effect on the university's activities**

- Establishment of new academic fields
- Ripple effects on particle physics and radiation medicine research
- Collaboration with the Institute for Integrated Radiation and Nuclear Science and SPring-8
- Collaboration with research centers in California
- Ripple effects on industries in California and Japan
- Advancements in quantum nano medicine research have influenced research at Kyoto University, including the development of new radiation therapies. The center promotes interdisciplinary research that transcends disciplinary boundaries at the university
- > The center provides opportunities for the university's researchers and world-class researchers in the US to interact by engaging in its activities



Collaboration: Institute for Integrated Radiation and Nuclear Science and SPring-8

# **Quantum Nano Medicine Research Center**



#### Main activities in FY 2022

#### Research promotion and academic exchange by the QNMC

- QNMC members visited the Kansai Photon Science Institute, and discussed further promotion of quantum nano research, which is the core pillar of research at the QNMC.
- QNMC members discussed the development of a new laser-driven electron generator with students from UC Irvine.
- An early-career researcher was dispatched to UCLA, and an interaction meeting was held by Prof. Fuyuhiko Tamanoi (iCeMS), Prof. Jerome Zack (distinguished professor and department chair), Sara Lee (chief administrative officer), and other members of UCLA's Department of Microbiology, Immunology and Molecular Genetics to discuss plans for future academic exchange. The QNMC members also met with companies in Los Angeles to discuss BNCT research.

#### **2** UCLA-Kyoto University Online Seminar series, *KAWARABAN* newsletter

- QNMC continued to hold the UCLA-Kyoto University Online Seminar series, which was launched in FY 2021 to initiate research exchange by promoting dialogue between world-class researchers in the US and Japan.
  - Date: #4 held on September 29, 2022.
  - Speakers: One each from Kyoto University and UCLA.
  - > Participants: A total of 41 participants from Japan and other countries.
- Vol. 5 of the *KAWARABAN* newsletter was published in July 2022 to disseminate information about the QNMC and its activities.



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# Laboratory for Green Porous Materials



#### **General Information**

- Approved in FY 2020
- Established in FY 2020
- Established by the Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University Institute for Advanced Study (KUIAS)
- Partner institution: The Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology and Research (A\*STAR), Singapore
- Location: IMRE, Singapore (outbound)
- Functions:
  - Research on environmental catalysis using porous materials, development of new fields of study that contribute to the environment, and promotion of cutting-edge interdisciplinary research.
  - Development of hybrid materials consisting of porous materials and biocompatible polymers for medical and healthcare applications.

#### **Ripple effect on the university's activities**

- Serves as Kyoto University's point of contact at A\*Star in Singapore.
- Acts as a bridge between Kyoto University and Singaporean universities and research institutes in material science research.
- Kyoto University early-career researchers and students are motivated by international students.
- Helps Kyoto university students develop international awareness.
- > Expansion and development of joint research topics between KUIAS and IMRE.
- Research guidance for talented students at the National University of Singapore, etc.
- Exchange between Kyoto University researchers and local researchers and students through holding seminars.
- Exploring the potential of porous materials development in cooperation with local companies.





#### **1** Research on design and synthesis of green porous materials

- 1. In 2022, we mainly conducted online meetings for the following research topics because researchers were unable to freely travel between Kyoto and Singapore due to the COVID-19 pandemic..
  - Theme 1: MOF catalysts for sustainable applications
  - Theme 2: MOF-mixed matrix membranes
  - Theme 3: MOF defect engineering
  - Theme 4: MOF/Biocompatible polymer hybrids
- 2. The researchers listed on the right engaged in research on synthesis of green porous materials. Prof. Susumu Kitagawa and Asst. Prof. Kenichi Otake of iCeMS developed the measurement equipments, and evaluated the structures and properties of the materials. They co-wrote and published papers based on the results of the collaborative research on Theme 3 and Theme 4.

(1). "UiO-66 Metal Organic Frameworks with High Contents of Flexible Adipic Acid co-Linkers"

Tristan Tan, Xin Li, Ken-ichi Otake, Ying Chuan Tan, Xian Jun Loh, Susumu Kitagawa, Jason Lim

Chemical Communications, 2022, 58, 11402-11405

(2) "Biomedically-relevant Metal Organic Framework-Hydrogel Composites",

Jason Y. C. Lim , Leonard Goh , Ken-ichi Otake , Shermin S Goh , Xian Jun Loh and Susumu Kitagawa

Biomaterial Sciences, 2023, in press (DOI=10.1039/D2BM01906J)

#### Mutual Research Visit

- Asst. Prof. Kenichi Otake of iCeMS stayed at the Onsite Lab from December 1st to December 13th as a visiting researcher. During this time, he gave a lecture and had research exchanges.
- Dr. Tristan Tan, a member of the Onsite Lab, stayed at iCeMS as a visiting researcher from January 11th to February 9th for research exchanges.

Research collaboration with the IMRE / Soft Materials Laboratory (PI: Prof. Loh Xian Jun, director of IMRE)

Onsite laboratory researchers (concurrent posts)

Assistant Professor Jason Lim Dr. Shermin Goh Dr. Tristan Tan Ms. Li Xin







#### **General Information**

- Approved in FY 2021
- Established in January 2022
- Established by the Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University Institute for Advanced Study (KUIAS)
- Partner institution: The MacDiarmid Institute for Advanced Materials and Nanotechnology, New Zealand
- Location: Wellington University, Wellington, New Zealand (outbound)
- Functions: Deepen research on material sciences using computational science and data science, and internationalize Kyoto University's research and education activities by enhancing collaboration with industry and local research institutions.

#### Ripple effect on the university's activities

- Development of interdisciplinary fields combining data science and material science.
- International industrial application of materials developed at Kyoto University
- Cultivating the perspective of contributing to the international community through basic research among students and early-career researchers.
- Raising the profile of the Kyoto University brand in Oceania.
- Expanding local research networks and enhancing the brand recognition of Kyoto University and KUIAS through establishing a policy for research on hydrogen conductor materials and porous materials with local research institutions, which is anticipated to contribute to the achievement of a decarbonized society.
- Creating networks with local companies and Japanese companies, which can lead to research collaboration.
- > Encouraging exchanges among early-career researchers and international students.
- Promoting the fusion of the humanities and sciences through research plans that fully respect the beliefs and customs of the Maori (indigenous people of New Zealand).





#### **1** iDM Online Workshop Series

- Integrated Data-Material Sciences: What, Why, and How? Panel discussion between L. Liu (Victoria University of Wellington), N. Gaston (Auckland University), K.Sugimura (University of Tokyo), P. Hume (Victoria University of Wellington). May 9 2022
- Integrated Data-Material Sciences: What, Why, and How? Part
   2. Panel discussion between M. Cowan (University of Canterbury), C. Wechwithayakhlung (iCeMS), M. Ohno (iCeMS), S. Furukawa (iCeMS). July 6 2022.
- Text and Data Mining: Frontier and Tools. Seminar by Axton Pitt (CEO of LitMaps). October 18 2022.
- Literature Mining: A Hands-On Tutorial. Seminar by Geoffrey Weal (Victoria University of Wellington). March 29 2023

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#### **2** Training time reduction for machine learning models

- New framework for training machine learning models for simulations of organic photovoltaic materials.
- 75 % reduction in model training time compared to existing framework.
- Database construction for developing new organic photovoltaic materials.

