



Keio University
Human Biology-Microbiome-Quantum Research Center (Bio2Q)
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A FULFILLING SUMMER OF OPEN SEMINARS!

This summer featured six open seminars. We are pleased to share highlights from three.

Dr. Jianguo Xia

Canada Research Chair in
Bioinformatics and Big Data
Analytics,

McGill University, Canada



Jianguo Xia, © Bio2Q 2025

In his recent seminar at Keio University, Dr. Jianguo (Jeff) Xia (McGill University) presented innovative approaches to studying the microbiome through cutting-edge metabolomics. He highlighted how comprehensive metabolite profiling can illuminate the hidden chemistry of microbial communities, revealing that local sub-environments can shape microbial activity and influence host interactions. Dr. Xia emphasized that by integrating large-scale metabolomics with microbiome datasets, researchers can move beyond cataloguing microbes to uncover their functional roles. This systems-level perspective helps identify metabolic pathways that underlie communication within microbial communities, and between microbes and their hosts. He also discussed computational frameworks his group is developing to handle the complexity of multi-omics data, enabling more accurate modeling of microbiome dynamics. This insightful and engaging talk underscored how advanced metabolomics provides a powerful window into the microbiome's functional landscape,

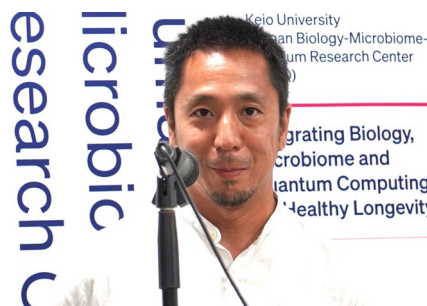
opening new avenues for understanding health, disease, and microbial ecology.

(Scott William Behie, Director of Research Programs)

Dr. Shinichi Sunagawa

Associate Professor, Department of
Biology
Head of Institute of Microbiology

ETH Zürich, Switzerland



Shinichi Sunagawa, © Bio2Q 2025

On August 4, Prof. Shinichi Sunagawa from ETH Zürich visited WPI-Bio2Q and presented his work at a WPI-Bio2Q Open Seminar titled "Discovering new microbial taxa, enzymes and surface structural variability by (meta)genomics". During his visit, he had fruitful discussions with multiple PIs and Junior PIs at Bio2Q, after which he presented his work. The seminar focused on different examples of the metabolic and phylogenetic diversity of microbes. First, Professor Sunagawa discussed the discovery of a new bacterial family with an unparalleled biosynthetic diversity from the Ocean. He went on to describe how his lab characterized one of the enzymes responsible for some of the unexpected biochemistry underlying the observed biosynthetic diversity. In the second part of the talk, he presented a large-scale comparative genomics study

in which a machine learning approach revealed the genetic determinants for structural diversity in the cell surface of *E. coli* that is often neglected in serotyping. Overall, the talk was very well received with a lively and positive discussion of the results.

(Daniel Richard Mende, PI)

Dr. Kazuki Nagashima

Assistant Professor, Department
of Molecular and Cellular Biology

Harvard University, USA



Kazuki Nagashima, © Bio2Q 2025

On August 7, Bio2Q welcomed Dr. Kazuki Nagashima, Assistant Professor at Harvard University and an emerging leader in the field of mucosal immunology. Dr. Nagashima shared his groundbreaking work on how the immune system recognizes gut bacteria within the complex intestinal ecosystem. While traditional studies often examined single bacterial strains, his research uses a defined community of more than 100 strains to uncover how T cells respond in a more realistic setting. Surprisingly, many of these T cells were found to recognize multiple bacterial species through a conserved surface protein. These findings shed light on a fundamental principle of host-microbe interactions. Dr. Nagashima's inspiring seminar not only showcased his innovative research but also resonated strongly with Bio2Q's mission of understanding how environmental cues, including diet and the microbiome, shape health and disease. His visit underscored the exciting international connections and cutting-edge science that continue to drive the Bio2Q community forward.

(Leonie Brockmann, Jr. PI)

WELCOME ON BOARD!

We are delighted to introduce a new member who joined Bio2Q in September.



Dr. Cody Cole
Postdoctoral Fellow
Bio-1 Core

Cody Cole, Used with permission.

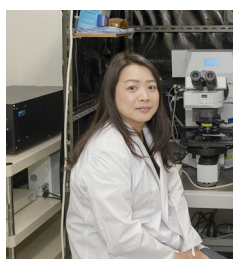
Hello everyone, I'm excited to join Bio2Q as a postdoctoral researcher and contribute to advancing our understanding of the human microbiome. My interest in this field began as an undergraduate at the University of Texas at Austin, where I studied insect symbionts in Dr. Nancy Moran's lab. I then worked with Dr. Bryan Davies, developing antimicrobial peptides against multi-drug resistant pathogens, which sparked my curiosity about microbial interactions. For my PhD at the University of Chicago's Duchossois Family Institute under Dr. Eric Pamer, I studied gut bacteria that produce bacteriocins called lantibiotics. I found that these compounds can disrupt the microbiome in ways that allow pathogens like *Klebsiella pneumoniae* and *Clostridioides difficile* to thrive, highlighting the delicate balance of microbial communities.

I'm eager to bring this background to Bio2Q and collaborate on projects exploring the gut microbiome's role in health and disease.

INTRODUCTION TO BIO2Q RESEARCH

Series #7:

Dr. Keiko Matsuda
Jr. PI
Bio-2 Core



Keiko Matsuda
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Maintaining homeostasis requires continuous communication between the brain and peripheral organs through sensory and autonomic pathways. While the molecular basis of synapse formation little is known about how peripheral neurons establish functional contact has been extensively studied in the central nervous system, little is known about how

peripheral neurons establish functional contact sites with their target organs. In the CNS, members of the C1q family act as secreted synaptic organizers, forming tripartite complexes with presynaptic neuroligins and postsynaptic glutamate receptors to diversify neural circuits. We hypothesize that such complexes may represent a general organizing principle, extending beyond conventional synapses to stabilize neuro-organ interfaces. To explore this, we will investigate visceral sensory and autonomic circuits mediating gut-brain communication, using viral labeling, co-culture systems, and proximity-labeling proteomics. Furthermore, by developing molecular tools capable of regulating synapse formation, we aim to probe the modifiability of these contact sites.



Keiko Matsuda,
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This work may broaden the concept of synaptic organization and provide new insights into systemic regulation.

Q-AI WORKSHOP TOPICS

Following on from the last article on the Quantum Computing and AI Workshop, we are continuing the activities of the workshop. This time, PI Daniel Mende picked up two papers on the application of AI to biology and held active discussions with STaMP students. This time, we discussed topics such as how to handle data and create predictive models from recent publications presenting computational methods using AI approaches. First, we discussed an AI approach for analyzing tabular data as many of us deal with such data on a daily basis. We further discussed the application of a similar approach to predict enzyme function. The discussions covered the state-of-the-art and recent progress. Together, we discuss how AI method can be used in your own research and what the obstacles and challenges could be. The QAI workshop will continue towards the end of the academic year, discussing Quantum applications, IT infrastructure for Bio2, and wrap up discussions through the workshops. If you are interested in this workshop, please contact us (sc-wpi-staff@adst.keio.ac.jp), and join us for discussions.



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(Shigeki Ishikawa, PI)

UPCOMING EVENTS

October 15 (Wed)-17 (Fri)
Metabolome Symposium@Kobe

October 10 (Sun) Keio Mita Alumni
Association General Meeting@Hiyoshi

November 15 (Sat)
WPI Science Symposium
@Tsukuba International
Congress Center

November 20 (Thu)
16:00-17:00
WPI-Bio2Q
Open Seminar
by Dr. Fumiaki Imamura
(Cambridge)
@Shinanomachi

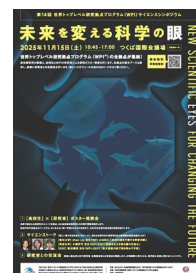
December 2 (Tue)-
3 (Wed) WPI-Bio2Q
International Symposium@Shiba-Kyoritsu

Science Meeting Series

October 22 (Wed) 14:00-15:00
#32: Leonie Brockmann, Jr. PI
@Shinanomachi and Zoom (Hybrid)

November 5 (Wed) 14:00-15:00
#33: Wataru Shihoya, Jr. PI
@Shinanomachi and Zoom (Hybrid)

November 19 (Wed) 14:00-15:00
#34: Kazuyoshi Ishigaki, PI
@Shinanomachi and Zoom (Hybrid)



WPI-QUP,
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NOTES FROM EDITING STAFF



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Can you recognize all these flags at a glance? "Yes!" "Absolutely!" "Why not?" — that's the confidence our staff naturally share with pride.

This isn't the United Nations Headquarters in New York—it's Bio2Q in Tokyo. Currently, researchers from 16 different countries are part of Bio2Q, and we continue to welcome outstanding talent from around the world.

Why not join us, add your country's flag to the collection, and stand alongside the nations already represented here?

For more information, please visit:
<https://bio2q.keio.ac.jp/#open-positions>

(Midori Yanase)

The next "Bio2Q Connect" will be
issued on Oct 29, 2025

