

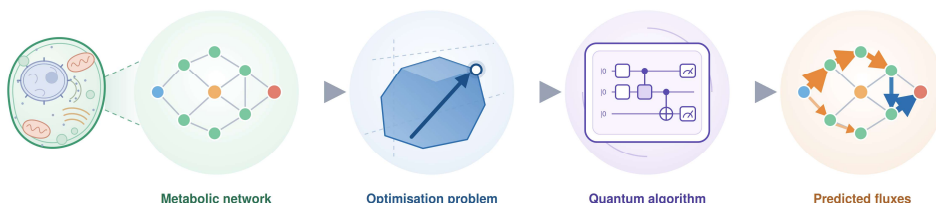


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BEHIND THE PAPER

A paper from Bio2Q Q-core, titled "Quantum algorithm for metabolic network analysis," was published in *Machine Learning with Applications*. We interviewed the first author to learn more about their work.



Visual abstract, created by Ashish Joshi, used with permission

1. What key problem did it address?



Metabolic networks describe the large number of reactions sustaining a cell. Optimal reaction rates of these networks can be predicted using classical methods. However, these methods become computationally prohibitive as networks become large in size. Quantum computing could help, yet no quantum algorithm had been applied to metabolic network analysis.

2. How did you solve this problem?



We built a quantum algorithm that, given the stoichiometric matrix and reaction constraints, finds the optimal reaction rates of the network. Such methods iteratively solve a linear system of equations, called the Newton system. Our key algorithmic innovation was to solve this Newton system in a basis more natural to metabolic networks which, when combined with adaptive regularization methods, made this quantum algorithm feasible. We benchmarked our method on glycolysis and the TCA cycle, the central energy-producing pathways of cellular metabolism.

3. Why is this important, and what is next?



This is the first quantum algorithm for metabolic pathway analysis, designed for early fault-tolerant hardware, and can target metabolic networks larger than what the current methods can handle. Now we are extending this method from steady-state analysis to analysis of network dynamics.

(Ashish Joshi, Postdoc)

WELCOME ON BOARD!

ZEHAO WU, BIO-1 CORE, LONG-TERM INTERN



Hello everyone! I'm Zehao Wu. I'm a Fulbright Fellow from the US and a recent graduate of Princeton University. My research focuses on the interplay between immunity and microbes. This interest first arose somewhere far from the lab. I never had a food allergy before, but I developed an avocado allergy after moving to the U.S. from China. Since then, I've been enthralled by how profoundly our environment shapes immunity. At Bio2Q, I aim to integrate my background in environment-immunity interactions with the Honda Lab's mechanistic expertise, working to understand how microbes from natural microbiomes modulate immunity. Beyond the lab, I love to cook stir-fries, take candid photos while I travel, and jog around the neighborhood while listening to Yoasobi. Super excited to meet everyone, so please reach out and chat!

Zehao Wu, photo used with permission

In this issue, a new member who joined Bio2Q in September introduces himself to us.

EVENT REPORT

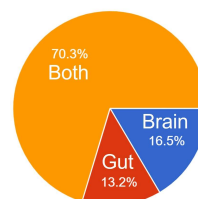
Gut or Brain: Which One is Smarter?

Which is smarter—your gut or your brain? We posed this question at our Bio2Q booth during Children's Kasumigaseki Tour Day, July 29-30 2026, and the answers blew us away! Out of 91 voters, 70% said "Both!", while 17% chose the brain and 13% the gut.

The heart of this event was connectivity: bringing Bio2Q research closer to the public while revealing how deeply connected our bodies and gut bacteria. To do that, we hosted three interactive activities, Bio1: An organ puzzle exploring human anatomy. Bio2: Coloring gut bacteria, neurons, and glia. Quiz: A challenge testing knowledge on the gut-brain axis. Seeing most participants recognize both organs as smart proved our message hit home: the gut and its microbiome play a vital role in health through constant crosstalk with other organs, such as brain.

"The quiz was tricky, but super fun!" shared one visitor. Another noted, "I realized the microbiome matters for our whole lives—even for more than 100 years." Bio2Q looks forward to hosting future events that spark curiosity and bridge the gap between basic research and the public.

(Hongping Wei, Admin)



Top: Survey results

Bottom: Bio2Q Booth at Children's Kasumigaseki Tour Day 2026
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VOICES FROM Bio2Q MEMBERS

In this issue, three of our members have kindly shared their experiences at Bio2Q.



Buse Nur Kiral (fifth from left in front row) and Matsuzaki Lab members. Photo used with permission.

Hey everyone! I would like to share my two months in Tokyo as a WPI-Bio2Q intern. Heading to campus on day one, I was in awe of the endless skyscrapers and dense crowds. However, the second I stepped into Matsuzaki-sensei's lab, all my fears vanished. By the end of my first month in cancer research, I had made lifelong friends and gained projects that broadened my scientific perspective.

During my second month in Yuzaki-sensei's neuroscience lab, every supervisor equipped me with invaluable knowledge in a short time, teaching me to view science holistically.

I am deeply grateful to the Bio2Q team and everyone who supported us along the way. If you are looking for a collaborative, international team to push scientific boundaries in a city of endless possibilities like Tokyo, Bio2Q is the place to be. I cannot wait for our paths to cross again!

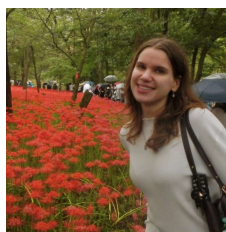
(Buse Nur Kiral, Research Intern)

After almost twelve weeks at Bio2Q, my time as an intern is coming to an end. Looking back, this has been one of the research experiences most tailored to my personal interests and learning goals. I appreciate how thoughtfully the internship allowed me to develop valuable skill sets while exploring topics I am genuinely passionate about.

One aspect I value most is the culture of collaboration and how it shapes science today. Bringing together researchers from different backgrounds, disciplines, and areas of expertise creates an environment for exchanging ideas and perspectives.

For me, Bio2Q has also provided a unique insight into Japanese research and culture, something that is not easily captured from outside the system. Navigating it firsthand has been invaluable. I would highly recommend investing time in this experience and preparing thoughtfully, both scientifically and practically, to make the most of the opportunities it offers.

(Valeria Kamozina, Research Intern)



Valeria Kamozina used with permission



Kokona Takano used with permission

At Bio2Q, research spans many fields united around a common axis: gut microbiota. Because gut microbiota has been linked to diseases throughout the body, understanding how changes in the microbiome relate to disease—and how it might be controlled—stands as an important challenge for the future of medicine. Bio2Q brings together researchers from a wide range of fields, offering rich opportunities to learn and connect through seminars, and to build lasting networks through the annual retreat. Exchanging ideas with researchers from other disciplines often opens up new perspectives that move research forward.

As a STaMP RA (research assistant), I focus on the relationship between gut microbiota and immunity. Immunity affects the entire body and is implicated in a wide range of conditions, from infections to allergies to autoimmune disease. By analyzing how gut microbiota influences immune function and proposing ways to regulate it, I hope to contribute to the advancement of future medicine.

(Kokona Takano, STaMP)

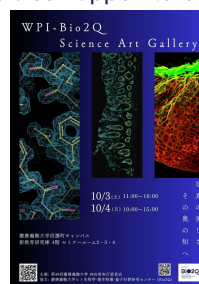
WPI-Bio2Q SCIENCE ART GALLERY

Researchers at WPI-Bio2Q spend their days tackling massive scientific questions—ranging from the tiny molecules and human body networks to cutting-edge quantum computing simulations. While the images and data they capture are essential scientific evidence, they also happen to be surprisingly breathtaking.

Until now, these stunning visuals were seen only by the scientists behind lab doors, but soon there will be an opportunity for researchers to share these moments with the public.

In collaboration with the Yotsuya Festival Executive Committee, WPI-Bio2Q will hold the “WPI-Bio2Q Science Art Gallery” photo exhibition on Keio University's Shinanomachi Campus on October 3 (Sat) and 4 (Sun), 2026. Stop by, see science in a whole new light, join in on a voting activity, and share your thoughts!

(Hongping Wei, Admin)



WPI-Bio2Q Science Art Gallery Poster ©Bio2Q 2026

UPCOMING EVENTS

Oct. 3 (Sat) – 4 (Sun)

Yotsuya Festival @Shinanomachi

Oct. 18 (Sun)

2026 Mita-Kai Homecoming Day @Hiyoshi

Dec. 9 (Wed) – 10 (Thu)

The 5th Keio University WPI-Bio2Q International Symposium 2026 @Shinanomachi



Web Page



Registration Form

Dec. 11 (Fri)

Symposium on Spatiotemporal Dynamics of Biological Systems @Mita

Science Meeting Series

Sep. 30 (Wed) 14:00-15:00

@Shinanomachi

#43 Yuki Kagoya, Affiliated PI

Oct. 14 (Wed) 14:00-15:00

@Yagami

#44 Yukari Fujimoto, Affiliated PI

Oct. 28 (Wed) 14:00-15:00

@Shinanomachi

#45 Koji Atarashi, Jr. PI

Nov. 11 (Wed) 14:00-15:00

@Shiba-Kyoritsu

#46 Kenjiro Hanaoka, Affiliated PI

Structural Analysis Workshop Series

@Shinanomachi

Oct. 9 (Fri) 15:00-16:30

#5 Wataru Shihoya, Jr. PI

Nov. 13 (Fri) 15:00-16:30

#6 Tatsuya Ikuta, Keio University

WPI-Bio2Q Open Seminar

@Shinanomachi

Oct. 1 (Thu) 17:00-18:00

Djenet Bousbaine, Stanford University

Oct. 6 (Tue) 17:00-18:00

Chun-Jun Guo, Weill Cornell Medicine

Oct. 22 (Thu) 16:00-17:00

The 175th Brain Club Seminar

Peter Scheiffele, University of Basel

The next “Bio2Q Connect” will be issued on October 29, 2026.

