



QBITS



It's super loud!

Local children discovered firsthand that supercomputers can be super loud! The MDGRAPE-4 Supercomputer was a crowd favorite again at this year's RIKEN Osaka Open day.

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CATCHING UP WITH QBiC's nurse

Nurse Natsuko Yasuhara, is here for your health and wellbeing. Natsuko, who has nearly a decade's experience treating patients in the hospital setting, recently join RIKEN as QBiC's fulltime nurse.

As you enter Natsuko's office on the second floor of the B building, you'll find a digital scale, a blood pressure self-check gadget and a few over the counter medical supplies. Inside the office, you'll find a spacious first aid treatment room and a sick room for resting while ill. There is a private counseling room around the corner from her office as well.

Natsuko has made an obvious effort to have excellent English language signage throughout these areas and she speaks a good bit of English herself. She explains, "My husband is British and he speaks English 99% of the time so I get a lot of practice at home. There are researchers



from all over the world here at QBiC and I understand that some people have unique challenges adapting to life in Japan, so I am eager to help."

Natsuko gives the details on her office, "It is open from nine to four on weekdays and everyone is welcome. If you don't already have access to the B building, you can ring me directly from the call box at the front door and I can let you in. Also, my RIKEN email works 24 hours a day." In addition to providing expert healthcare Natsuko has brought in professional counseling services, yearly health screenings and yoga lessons open to all. ■

Award winning science!



Yuichi Taniguchi (center), pictured with QBiC Director Toshio Yanagida (right), given his award certificate by Akihiro Fujita, Director of RIKEN cluster for industry partnerships.

Yuichi Taniguchi received the 2016 RIKEN Industry Partnerships Contribution Award, for the most profitable patent of the year.

What novel, industrially applicable thing did he invent? Taniguchi explains, "It is a light sheet microscope that is titled like the leaning tower of Pisa. Conventional light sheet microscopy has many advantages, including low bleaching and low phototoxicity. It also has excellent sensitivity but it isn't amenable to high throughput studies. By tilting the microscope but not the stage we are able to image directly in culture dishes and microtiter plates which facilitate unprecedented flexibility. We think it will be very useful in studies requiring 3D imaging of mammalian cells." ■

Recent Science Events

- Jan 10, 2017
QBiC-CDB Joint Seminar
Kristin Gunsalus
Center for Genomics and Systems Biology, Department of Biology, New York University

Recent Science Events

MEET THE LAB

Studying biological systems based on heterogeneity

Katsuyuki Shiroguchi's Laboratory for Integrative Omics



Biological systems consist of heterogeneity, and they work based on that heterogeneity. For example, distributions of the number of molecules or cells in the systems determine the states of higher biological organization—from cells and tissues up to organisms. I am interested in visualizing the distributions and network in them (e.g., cell-cell network) by accurate system-wide

measurements with single molecule, single base, and/or single cell resolution. This approach may provide significant insights in also medical science and diseases since, for example, at the onset of a disease, homeostasis is not destroyed simultaneously in an entire population of cells, but instead starts at the single cell level. Highly sensitive measurements of these phenomena may contribute to an early diagnosis, which may provide preventive care for the patients. Moreover, finding differences between individuals by accurate measurements will contribute to the personalization of care.

In our laboratory, the first aim is usually to develop new techniques to "see" something unknown, in order to understand biological systems as described. Secondly, we often collaborate with biologists and/or medical scientists to contribute to medical sciences and our understanding of diseases. Concretely, we have been focusing on counting copy number of RNA

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HOT OFF THE PRESS

Recent publications from QBiC researchers

◆ Yuji Sugita, with collaborator Michael Feig of Michigan State University, had publications in *eLife* and the *Journal of Physical Chemistry B*: “Biomolecular interactions modulate macromolecular structure and dynamics in atomistic model of a bacterial cytoplasm” and “Thermodynamics of macromolecular association in heterogeneous crowding environments: theoretical and simulation studies with a simplified model”, respectively.

◆ The molecular mechanisms of sleep are explored in Hiroki Ueda’s most recently work “Knockout-rescue embryonic stem cell-derived mouse reveals circadian-period control by quality and quantity of CRY1” in *Molecular Cell*.

◆ QBiC Director Toshio Yanagida’s laboratory continues to publish breakthrough molecular motor work with two

publications in *Nature Communications*: “Transcriptional bursting is intrinsically caused by interplay between RNA polymerases on DNA” and “A programmable DNA origami nanospring that reveals force-induced adjacent binding of myosin VI heads”.

◆ QBiC Deputy Director Makoto Taiji’s lab published “Evaluation of protein-ligand affinity prediction using steered molecular dynamics simulations” in the *Journal of Biomolecular Structure and Dynamics*.

◆ Yo Tanaka's lab published "Vapor-based micro/nano-partitioning of fluoro functional group immobilization for long-term stable cell patterning" in *Royal Society of Chemistry Advances*.

◆ Tom Watanabe’s lab published “Non-label immune cell state prediction using Raman spectroscopy” in *Scientific Reports*.

REACHING OUT

QBiC well represented at RIKEN Open Day Kobe

On Saturday, November 5, the RIKEN centers in Kobe jointly held the once a year open day event. Researchers from QBiC and the Center for Developmental Biology (CDB) jointly held events at the CDB buildings on Kobe's Port Island. The researchers welcomed visitors into their labs and enjoyed stimulating discussions. There were more than 5,000 visitors to RIKEN facilities.

In an exhibit of model organisms, QBiC's Laboratory for Developmental Dynamics displayed nematodes, while the Laboratory for Physical Biology showed chicks still in the egg, and the Laboratory for Developmental Morphogeometry splashed with zebrafish. While observing these animals through microscopes, visitors listened to researchers explain their usefulness for different kinds of studies.

In a hands-on DNA experiment activity, researchers from the Laboratories for Reconstitutive Developmental Biology and Developmental Morphogeometry performed demonstrations and instructed people on how to use a pipet and load samples on an agarose gel.

A total of 12 researchers from QBiC and CDB were on stage at the Anatomy of Scientists, question and answer session. The audience asked researchers questions about science but also about things related to the scientists' everyday life.



Post-doctoral researchers Ai Niitsu (left) and Mistuhiro Matsuda

Mitsuhiro Matsuda of the Laboratory for Reconstitutive Biology participated in both the hands-on experiments and the discussions. He enjoyed the events, especially the interactions with kids. "I could see the genuine curiosity in their eyes even though they had probably been dragged there by their parents." On the other hand, Matsuda regretted that the question and answer session did not get many questions from kids because the atmosphere was dominated by adults who started asking very specific questions. After that session a small girl and his mother approached the researchers and consulted them about her school research project. She was trying to prove an unusual theory about a plant. Matsuda said, "It was funny that at that moment the researchers got so excited discussing what

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QBiC was there

QBiC Unit Leader Miki Ebisuya shares her experience as an invited speaker at the International Conference on Systems Biology in sunny Barcelona, Spain.

"Since it was my first time to give a plenary talk at such a big meeting, I was a bit nervous, but I enjoyed the opportunity a lot. Some of the conference attendees stopped to talk to me after the presentation, which made me very happy. I was also able to have in depth discussions with some of the researchers I always wanted to talk with.



QBiC hosts second annual RIKEN Open Day Osaka

On November 19, the second RIKEN Osaka Open Day was held at the QBiC A and B Buildings in Suita, Osaka. Despite the wet weather, the free event attracted more than 500 people from the surrounding communities and although the focus was primarily on the local QBiC researchers there was significant presence from other RIKEN centers.

Popular exhibits included QBiC Deputy Director Makoto Taiji's MDGRAPE-4 supercomputer, Unit Leader Atsuko Iwane's organelle model 3D printing, and Group Director Hiroki Ueda's transparent mouse. Multiple labs joined forces in an interactive display of the flow of cell biology research starting with new fluorescent probes, followed by a hand-made fluorescence microscope and finally live cell samples for observation. The microscope was hand built specifically for this event by Taro Ichimura, a senior scientist and laser microscope expert. After building

the microscope on very short notice, Ichimura spent the day helping guests use the microscope and explaining the principles of fluorescence. Then, even more quickly than it was built, it was disassembled and returned to the lab as jumble of mirrors and lenses, to be reused in his next project. Another microscope under development by Unit Leader Yuichi Taniguchi used for single molecule imaging was also quite popular and had a queue just to catch a glimpse.

Unit Leader Yo Tanaka's laboratory did a hands-on activity with children, writing a hidden message on microscope slides so that it only appears in water. Tanaka's presentation and demonstration of power generation from electric rays was also well received and the lecture by Team Leader Yasushi Okada, "What is life?" was standing room only. ■

Outreach Activities

◆ Oct 26, Yo Tanaka, Laboratory for Integrated Biodevice Unit Leader, gave a RIKEN evening seminar in Tokyo. RIKEN evening seminars are hosted by the RIKEN cluster for industry partnerships.

◆ Nov 20, Yo Tanaka explained his Electric Ray Battery project to a group of about 50 people at the monthly RIKEN Day event held at the Science Museum in Tokyo.

NEWCOMERS at QBiC



Koji Ochiai
Team Takahashi
Sports: Soccer
Hobbies: Reading science fiction
Food: Sushi, Seafood

"Barcelona was a lovely city and the conference does a great job organizing social activities. I did a Gothic walking tour, while Ichimura-san and Okamoto-san [both of QBiC Watanabe Lab] ran at the Cursa de la Merce [a ten-kilometer foot race through the city].

"Also, it was light out until very late in Barcelona, so a group from QBiC went out for dinner. We enjoyed Tapas and wine. Then Kyoda-san [of QBiC Onami Lab] and I tried to catch a Pokemon that was exclusive to Europe, we tried our best but we couldn't find it."

Koji Kyoda said, "I always attend ICSB because it is the premier systems biology conference. There is good science using unique approaches on unique subjects. It is a great way to get inspiration for future projects."

Shortly after running his first 10K, Taro Ichimura, gave a talk on applications of Raman spectroscopy for systems biology. He said, "It was my first time giving at an international conference of biologists so I was worried there would be a negative reaction to my talk but people seemed really interested and had good questions."

GET OUT!

Onsen, kimono, and seafood The best of traditional Japanese tastes in Kinosaki, Hyogo



Many tourists have experienced an onsen ryokan, the traditional accommodation with an in-house hot spring, but visiting as many bathhouses as you like on one street is a rare experience. In Kinosaki, where there are seven public bathhouses along the main street, this onsen dream can be realized.

Kinosaki, which lies just three hours from Osaka by express train, is a traditional resort town that is one of the oldest and most famous hot springs in Japan. The first record of Kinosaki Onsen dates back to the Heian period, thirteen hundred years ago. Many Japanese poets and novelist got inspiration from this place and the name "Kinosaki" appeared repeatedly in Japanese literature since Meiji era. The town kept many traditional Ryokan buildings along the picturesque stream lined with weeping willows.

If you stay in any accommodation in town you will have free access to all of the public bathhouses. Each of these onsen buildings have traditional looks but their facilities are modern. Most have both indoor and outdoor baths, with each in different styles and looks. For example, there is a huge barrel bath built with Hinoki cypress and

a cave bath built with natural rocks. In newly renovated "Goshono-yu" you lie in an open-air bath with a view of a garden of natural rocks and small water falls. All the houses on the street have a large rest area and a small shop.

Hotels provide their guests with yukata, a casual kimono, and geta, wooden sandals. Visitors can enjoy wearing a kimono and wandering among souvenir shops on the street.

There are bunch of cherry trees along the small stream running through the town. In spring, the old town with full cherry blossoms is an irresistible photo opportunity.

The Sea of Japan is just a few minutes away by car from the town. You can spot several seafood markets selling fresh seafood along the route to the ocean. During the winter, the crabmeat is a specialty of the hotels in the area, available from November to the end of March.

Another attraction in the area is a family friendly Marine World located on the coast, where there are shows with dolphins, sea lions, penguins and more. And a

geologically interesting spot nearby called Genbudo is also accessible by car. This area has several dome like stone pits surrounded by countless honeycomb shaped stone columns.

If you are a fan of Soba noodle, Izushi, a small town south of Kinosaki is a must visit place. The town called little Kyoto in Tanba has many souvenir shops and Soba

noodle restaurants in old wooden buildings.

Izushi Soba is served in small amounts on multiple small plates. Ordinarily customers order five plates to start and add as many plates as they want. Hungry youngsters can go for the restaurant's big eater prize for eating fifteen or more plates of soba. If you're really hungry, one restaurant's top prize is the surreal free Soba for life pass! ■

Transport: One-way transport from Yamada Station near QBiC ¥5,750. From Yamada Station take an Umeda-bound Hankyu train to Umeda. From Osaka station take a JR Kounotori express train to Kinosakionsen Station. Not all Kounotori trains go as far as Kinosakionsen so a change at Fukuchiyama Station may be needed.

Kinosakionsen is a popular destination and many other routes are possible and available.



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is the right experiment with the proper controls to prove the theory. It probably did not make sense to the girl.”

Also enthusiastically discussing the importance of control groups for the girl's science project, Ai Niitsu of the Laboratory for Biomolecular Function Simulation, said, “I enjoyed the chance to answer the audience's question, especially, unexpected questions such as “What

is a human?” because it reminded me of my youth when I was very curious to know what I was, as a human. This was one of the reasons I chose to pursue a career as a scientist.” Researchers from the Laboratories for Developmental Dynamics and Physical Biology were also among the researchers on the stage. ■

Shiroguchi continued from page 3

molecules genome-wide in a digital manner, and on identifying each cell and counting the number of cells by determining genomic DNA sequences at the single cell and single base resolution. Our targets are the microbiome, immune cells and others.

Our laboratory is also a part of the DECODE project. I had been working on single molecule observation of

molecular motors by optical microscopy, and have jumped into genomics research field. Based on these experiences, we are making a new platform which enables to combine imaging and sequencing. Using this system, we are studying the coordination dynamics between cell division and differentiation which are essential process for multi cellular organisms. ■

SAYONARA

QBiC says goodbye to 2016 and cheers to 2017



QBiC Director Toshio Yanagida (far right) raises a glass for a happy start to 2017

Happy New Year!

This year and into the future, my dream is to make our QBiC the paradise of scientists. I believe that this is the best way to maximize our research activities and so contribute to the happy future of people. In order to do this we should challenge ourselves vigorously in deep science and development of technology, that is, “OMOROI KENKYU”.

May your day and science be happy and successful!

Director Yanagida

Ai Niitsu's British Classic Victoria Sandwich from Mary Berry's recipe!

The Chow Down

Ingredients

- 4 eggs
- 225g sugar, plus a little extra for dusting the finished cake
- 225g flour
- 3 tsp baking powder
- 225g soft butter at room temperature, plus a little extra to grease the tins
- Raspberry/strawberry jam for filling
- Whipped cream (optional)
- 2 x 20cm (8in) greased and lined round tins

Recipe

1. Pre-heat the oven to 180°C
2. Add the butter, sugar, eggs, flour and baking powder into a large bowl and beat until well blended. Divide the mixture evenly between two tins and level out.
3. Bake in the pre-heated oven for about 25 minutes or until well risen. Leave to cool in the tins for a few minutes then turn out, peel off the parchment and again leave to cool on a wire rack.
4. When completely cold, sandwich the cakes together (one upside down) with the jam and whipped cream (optional). Sprinkle with granulated or icing sugar to serve.



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