



NanoSquare Newsletter (English) Vol. 17

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NanoSquare Newsletter

Osaka Prefecture University

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Synergy effects by strengthening cooperation between NanoSquare and the faculties

Professor Noboru MASUDA

Dean of Graduate School of Life and Environmental Sciences

The NanoSquare program began as a high-incentive tenure-track system, then known as the “center of excellence,” and has hired a total of 18 tenure-track special lecturers since 2008, when JST adopted the OPU application for the SCF-Fund. As a “Leading University as a Base for Human Resource Development in Nanoscience and Nanotechnology,” this program offers young researchers an independent research environment and has produced a number of talented young scientists. We frequently hear of its excellent achievement having received “S” grades for all individual items evaluated, the highest government evaluation score, receiving various awards, such as The Young Scientists’ Prize by MEXT, and obtaining prestigious external funds.

It is often very difficult for young researchers to build an independent research environment, considering the financial requirements and necessary facilities, and this program offers various types of support to address these issues. The program has been highly successful; in addition to developing a faculty-based tenure-track system, a “Tenure-track promotion committee” was organized. We were able to create a system in which the whole university promotes the growth of young researchers thanks to this program.

At NanoSquare, a wide range of research areas are represented, such as nanomaterial synthesis, optical science, biosensors, cellular functions, biomaterials, superconductors, electronic devices, and so forth. Furthermore, it includes both basic and applied research. Accordingly, a particular feature of NanoSquare is the diversity of research, which promotes the success and growth of researchers and provides a basis for future developments. Moreover, in this program, we have hired

female researchers at a high ratio. This is great for our university in view of our goal of promoting diversity in human resources. We hope this program serves as a reference model for other faculties in this regard.

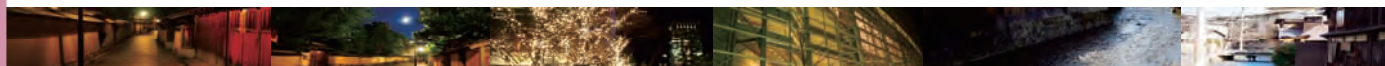
It has been almost 9 years since the program started. Over 10 young researchers have already completed their 5-year tenure-track terms. Some have moved outside of OPU, but most currently work in the faculty of their choice as tenured associate professors of the Graduate School of Engineering or Graduate School of Science. They are expected to play major roles in innovating new research fields.

In particular, the focus on teaching cross-faculty students during the 5-year tenure-track term has been appreciated as a breakthrough achievement for creating true relationships across schools. These cooperative relationships have become great models for building cooperation across Graduate Schools and I am sure they will continue to expand.

I believe the key for sustainable development in tertiary education is maintaining a balance between continuity and change. In addition to continuing the successes of traditional disciplines in each faculty, advanced and innovative ideas can be adopted. I think the interchange between “continuity” and “change” is necessary, and I look forward to promoting each of these.



Professor Noboru MASUDA



The 10th NanoSquare Workshop Science Hall, Nakamozu Campus Friday, November 4th

On November 4th, 2016, the 10th NanoSquare Workshop was held in Science Hall. Six NanoSquare tenure-track special lecturers and 8 graduates of NanoSquare who now belong to the faculties of their choice as associate professors presented their state-of-the-art research. Assessment committee members, including external advisory members, chaired each session, and after each talk, the presenters were asked a lot of questions. It was an academically inspiring day.

President Hiroshi TSUJI delivered the opening address, and Masato MASAKI, Deputy DG of Science and Technology Policy Bureau, MEXT, then talked about "Human Resource Development for Young Researchers in Japan." Program Officer, Prof. Takekazu ISHIDA followed with the annual report of the NanoSquare program. Prof. Hiroshi NUMAKURA gave a keynote lecture titled "Solute-Solute Interaction in Iron: Basic Study of Steels on 'Element Strategy'."

The external members were very impressed with the advanced research of the 14 energetic young investigators. At the end of the workshop, the external members gave high praise to the NanoSquare program and to all of the researchers. The workshop was successfully completed with a closing address by Vice President Hirokazu MAEKAWA.

At Science Hall



Prof. Numakura's keynote lecture



A large audience joined the workshop.

Prof. Magnusson asking a question



Selected Words from External Committee Members' Comments

"Usually young people belonging to some Departments cannot find such collaborators in different fields. Here you can find the collaborator. It is a very good thing."

by Prof. Hisatomo Harima

"I can say OPU tenure-track system is the most successful system in Japan. In the sense of Human Resource Development, OPU is a role model in Japan."

by Prof. Sadamichi Maekawa

"It's really important to anybody here to remember the old papers, to remember what has been done. Old papers are sometimes deep and really important."

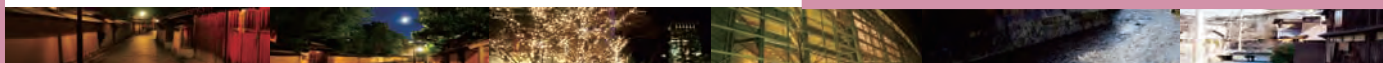
by Prof. Robert Magnusson

"Converging to 4 different topics is very nice because from this conversions, it has been of course triggered by the fact that our collaboration between people. That's a quite good achievement."

by Prof. Michel Che

"Now you have an important impulse in your life, and you should keep this impulse rise."

by Prof. Victor V. Moshchalkov



The 15th NanoSquare Café

-Exosome-based intracellular delivery of therapeutic molecules-
Ikuhiko NAKASE, the 6th term tenure-track faculty member



The 15th NanoSquare Café was held on July 30th, 2016, at I-site Namba. Eleven audiences joined our Café and enjoyed listening about both basic information on the development of drug delivery systems based on cell-derived nanomaterials and my recent research activity.

Taylor-Made Therapy New Method of Curing Cancer

Exosomes are 30–200-nm cellular nanomaterials abundant in most cells in our bodies. Exosomes contain bioactive molecules, such as microRNAs and enzymes, and facilitate cell-to-cell communication when they are internalized by other cells. Owing to the superior properties of exosomes for pharmaceutical applications, they are expected to be important next-generation drug delivery carriers. Additionally, as

a nanomaterial, they may be useful for the development of tailor-made therapies specific to each symptom. At this NanoSquare Café, I talked about what exosomes are, how they are secreted from cells, and intercellular delivery using exosomes with functional peptides, which is the focus of our current research. The guests had various backgrounds. Some worked in the pharmaceutical and medical fields, and others had no experience in cellular biology. I appreciate their careful attention to my lecture and great questions. In particular, an audience in the medical field asked me about the possibility and future prospect of exosomes as drugs according to their relationship to various diseases, like cancer; this insightful question will inform my research.

What is NanoSquare Café?



NanoSquare Café opened in 2010 to introduce young NanoSquare scientists and their recent research activities to local citizens. The café is small; the number of the guest is no more than about 20, so that everyone can relax and enjoy casual discussions with the lecturers. This café is ideal not only for bright and curious local people interested in science, but also for whom has fear of asking ignorant questions for serious professors.

Please come and join us at our café. Your ideas about a 'university lecture' will be changed! Please visit our website for more details.



The 16th NanoSquare Café

-Nano structure information analysis using computers and lights-
Hidekazu IKENO, the 6th term tenure-track faculty member

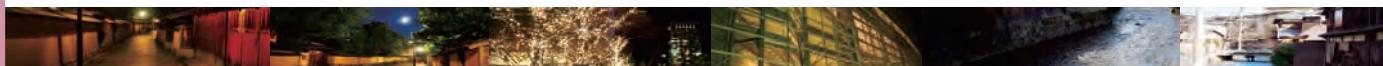
The 16th NanoSquare Café was held at I-site Namba on November 19th, 2016. I enjoyed the questions asked by audiences of broad ages, from university students to the elderly. I was especially impressed with the elderly participants, who had vigorous intellectual curiosity.

Why is Ruby Red? Let's find out!

My research objective is to elucidate the characteristics of materials at the microscopic level, such as atoms and electrons, using electronic structure calculations based on quantum mechanics. In this Café, I began with a simple introduction of common materials and explained how the magnetism of iron and colors of gems (i.e., optical properties) are actually related to the motion of electrons. This helped the audiences understand the origin of quantum mechanics. I explained that we are now able to precisely calculate the conditions of electrons in complicated materials owing to recent developments in computing as well as the density-functional theory, which won the Nobel Prize in Chemistry. I also talked about the

analysis of nanoscale structures for advanced materials by electron spectroscopy using high-energy light.

My greatest concern was my ability to convey the jargon and technical terms used in quantum mechanics to a broad audience. Even for current university students, these concepts are difficult to understand. Despite my concern that my explanations were too technical, the audiences were eager to learn. One even gave me warm regards as he wrote in his questionnaire, "He explained the difficult theory so well that I could understand." This experience gave me inspiration for my research and provided a good opportunity to improve my communication skills for the general public.



Common Infrastructures The 7th term tenure-track faculty member, Takashi KAMEGAWA

Advanced research and development in Nanoscience and Nanotechnology, supported by state-of-the-art common infrastructures

In the NanoSquare program, class-10, 100, 1000 clean rooms, a cryogenic research facility, and state-of-the-art research equipment are installed as shared infrastructures. Below are some of the major equipment in the Nanoscience and Nanotechnology Research Center (N2RC). As one of the features of N2RC, necessary support is provided to young researchers and scientists for advanced research of nanoscience and nanotechnology as this excellent research environment.

Catalyst Analysis Apparatus BELCAT II

The MicrotracBEL Corp catalyst analysis apparatus (BELCAT) is a device for obtaining findings related to adsorption/desorption phenomenon or reaction processes dependent on temperature. This device is designed to be able to deal with multiple objectives in a flexible manner. It is possible to perform evaluations of solid acids/bases, evaluations of redox property by temperature programmed reduction/oxidation (TPD/TPO), and evaluations of absorption capacity for various compounds that have used vapor introduction units formed by air thermostatic chambers/carburetors/heaters/condensers. In addition, it is possible to obtain data about oxygen storage release capacity of samples, and to determine the metal dispersion degrees and particle sizes of metal-supported materials by pulse methods.



The Planetary Ball Mill P-7 Type

The Fritsch planetary ball mill is a device used for mixing/grinding samples with a rotating and revolving motion of circular containers that have rigid balls and samples. It says that it is possible to grind all samples except for rubber/plastic types. The device can also be used for not only the dry process but also mixing and grinding in the wet process, and it is possible to control the atmosphere within the container, as necessary. This device can mainly be used for the mixing/grinding processes of metals, oxides, glass, and electronic materials. In addition, the device can be used for mechanical alloying of samples that are difficult to alloy by conventional melting methods.



FY 2016 NanoSquare Event Calendar

Sat. May 28	Tenure-track laboratory tour for future postgraduates	Bldg. C10, Nakamozu Campus, OPU
Sat. Jul. 30	The 15th NanoSquare Café	I-site Namba, OPU
Fri. Nov.4	The 10th NanoSquare Workshop	Science Hall, Nakamozu Campus, OPU
Sat. Nov. 5	Tenure-track laboratory tour for future postgraduates	Bldg. C10, Nakamozu Campus, OPU
Sat. Nov. 19	The 16th NanoSquare Café	I-site Namba, OPU
Mon. Dec. 19	The 2016 winter N2RC joint research presentation by students	Nakamozu Campus, OPU
Thu. Feb. 2	Tenure-track laboratory tour for future postgraduates	Bldg. C10, Nakamozu Campus, OPU
Mon. Feb. 6	The 34th N2RC Seminar	Bldg. B5 1B-38, Nakamozu Campus, OPU

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Photos: Winter of Japan

