

INSO Summer School 2024, Osaka-Tsukuba

(Summer Lectures in 2024 on Nanotechnology/Nanoscience)

Three lectures: Live-hybrid (on site and on line)

Open during July 12 and August 1

Live final exam. (student presentation) at the end

Let's participate in the graduate-level lectures on nanoscience and nanotechnology
by top foreign scientists!

R³ Institute for Newly-Emerging Science Design, Osaka University, opens the INSO Summer School 2024 on Nanoscience and Nanotechnology, where three lectures are provided by live-hybrid and on-demand styles. This summer school is aimed for fostering international young talent on nanoscience and nanotechnology. Each set of lectures is composed of seven or eight classes during July 12th and August 1st, 2024. In principle, lectures will be given as a live-hybrid (on site face-to-face and on line) style. However, students can access to the on-demand style lectures in case that they cannot attend. These students should finish to view a series of lectures during the specified period and are requested, just after each lecture, to submit the answer to the short question raised during each of lectures to ensure the attendance. Final examination of all the three lectures will be executed as the live-hybrid style with the participation of the lecturers. ZOOM or Webex system will be used for hybrid and on-demand lectures. In this year, however, two lecturers in Osaka University will give lectures in person at Toyonaka campus. We strongly recommend all the students from Osaka University get the lectures at the site (Interdisciplinary Research Building at Toyonaka Campus).

The lecture documents and recorded lectures will be uploaded at the homepage of R³ center.

URL: <http://www.insd.osaka-u.ac.jp/>

■ **Lecturers:** Following lecturers will offer three topics.

Osaka University:

Prof. Albert M. (Fred) Brouwer

(Van't Hoff Institute for Molecular Sciences, University of Amsterdam, the Netherlands)

Prof. Brandon Mitchell

(Department of Physics and Engineering, West Chester University, USA)

University of Tsukuba:

Dr. Nathanaelle Schneider

(CNRS Senior Researcher, Institut Photovoltaïque d'Ile-de-France, France)

Schedule and abstracts of lectures are shown on the second page.

■ **Lecture Room:** (Toyonaka Campus) R.N. 305, INSO Seminar Room, 3rd floor of Interdisciplinary Research Building.

■ **Applicants:** Although the priority is given to graduate-school students who take "Graduate Minor Program or Graduate Program for Advanced Interdisciplinary Studies for Education, Research and Training on Nanoscience and Nanotechnology" (hereafter, nano-program), "Interactive Material Science Cadet Program", "Multidisciplinary PhD Program for Quantum Beam", and "Honors Program in Science, Engineering and Informatics", there is plenty of room for other domestic and foreign graduate and undergraduate students and staff members to be welcome. Homework exercises and final test (student presentation) will be imposed on graduate students who need credits. They are also requested to reply to short questions in case of on-demand lectures for the evidence of the viewing.

■ **Maximum number of topics and units of credit:** One unit of credit for "International Exchange Lecture on Nanoscience and Nano-engineering B or C" is given to graduate students who complete a series of lectures on one topic. Graduate students can get up to two units of credit. Especially, foreign students desiring to take the nano-program, but being not good at Japanese, are requested to complete these two topics in order to transfer two units of credit to the otherwise required module, "Nanotechnology Career-up Lectures for Social, Legal, Ethical Relationship".

■ **Deadline and method of application:** Deadline depends on the lecturers. Send the following information either in Japanese or in English to the INSO staff who is in charge. **E-mail address: nano-program@insd.osaka-u.ac.jp**

Registration deadline: **Prof. Brouwer and Prof. Mitchell: Monday, July 17th and Dr. Schneider : Friday, July 8th**

Full name, student registration code, affiliation (graduate school/school, department, D/M/B, school year, affiliated research laboratory), E-mail address, specify whether one takes nanoprogram or not, chosen lecturer's name(s).

You will receive the information how to access to the website for the lecture documents and recorded lectures.

■Lecture Schedule (about 90 minutes per one lecture)

| | | |
|---------------------------|-----------------------------------|-----------------------|
| Prof. Albert M. Brouwer | Live-hybrid (on site and on line) | Lectures from Osaka |
| Prof. Brandon Mitchell | Live-hybrid (on site and on line) | |
| Dr. Nathanaelle Schneider | Live-hybrid (on site and on line) | Lectures from Tsukuba |

| Time/date | 7/18 (Thu) | 7/19 (Fri) | 7/22 (Mon) | 7/23 (Tue) | 7/24 (Wed) | 7/25 (Thu) | 7/26 (Fri) | 7/29 (Mon) | 7/30 (Tue) | 7/31 (Wed) | 8/1 (Thu) |
|-------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|
| 10:45-12:19 | | | | 1 | 3 | 5 | 7 | 1 | 3 | 5 | 7 |
| 13:30-15:04 | | | | 2 | 4 | 6 | 8 | 2 | 4 | 6 | 8 |

| Lecturer | Time/Date | 7/12 (Fri) | 7/15 (Mon) | 7/16 (Tue) | 7/17 (Wed) | 7/19 (Fri) | 7/22 (Mon) | 7/24 (Wed) |
|---------------------------|-------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Dr. Nathanaelle Schneider | 13:45-15:19 | 1 | 3 | 4 | 6 | 7 | 8 | Oral exam |
| | 15:45-17:19 | 2 | | 5 | | | | |

(Students attending the lecture of Prof. Brouwer can join the oral exam after finishing the lecture of him on 24th, July.)

■Lecturers, and Titles and Abstracts of Lectures

Lectures from Osaka

Light & Nanoscience: Extreme Ultraviolet Photolithography & Fluorescence Microscopy and Contact Mechanics

Prof. Albert M. (Fred) Brouwer

(Van't Hoff Institute for Molecular Sciences, University of Amsterdam, the Netherlands)



Extreme Ultraviolet Photolithography

- optical lithography
- molecules and light: basic principles of (photo)chemistry
- chemistry of UV photoresists
- experimental techniques for chemistry in thin films
- chemistry of EUV photoresists

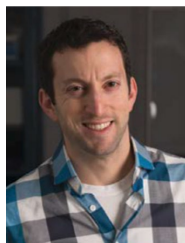
Fluorescence microscopy and contact mechanics

- imaging mechanical contact with fluorescent molecular rotors
- imaging dynamics and forces in contacts

Fundamentals of Nanomaterials and Applications in Quantum Information Engineering

Prof. Brandon Mitchell

(Department of Physics and Engineering, West Chester University, USA)



Fundamentals of Nanomaterials

- what are nanomaterials and why are they important?
- properties of nanomaterials and how to "see" them.

Introduction to Quantum Information

- nonclassical light, qubits, and the quantum erasure (theory)
- quantum gates, entanglement, and quantum teleportation
- quantum algorithms (e.g., Deutsch-Jozsa Algorithm)

Quantum Optics and Nanophotonics

- creating single photon sources
- characterizing single photon sources (quantum erasure)

Lectures from Tsukuba

Material Science for Energy Conversion

Dr. Nathanaelle Schneider

(CNRS Senior Researcher, Institut Photovoltaïque d'Ile-de-France, France)



General introduction on Energy and Energy conversion

Theoretical and application aspects of materials for Energy conversion

Basics of material fabrication and characterization

PV conversion

Solar fuels and H₂ production

Life cycle analysis, sustainability, stability and degradation of materials

R³ Institute for Newly-Emerging Science Design (INSD), Osaka University

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