

# TOHOKU UNIVERSITY STEM SUMMER PROGRAM

2018.6.18-7.13

## TABLE of CONTENTS

- 1. Participants list**
- 2. Syllabus for TU STEM Summer Program**
- 3. Program**
- 4. Outline of lectures**
- 5. Field trips**
- 6. Maps**
- 7. Accommodation**
- 8. Other information**



## 1. Participants list

### Tohoku University STEM Summer Program 2018

#### List of Participants

No	Family name	First name	Home University <sup>*1</sup>	College/Department	Year <sup>*2</sup>
1	Milovanov	Egor	NSU	Physics	1
2	Paulish	Nataliya	NSU	Physics	2
3	Ly	Nathan	UCR	Engineering	1
4	Pan	Ryan	UCR	Chemical and Environmental Engineering	2
5	Lo	Carissa	UCR	Electrical and Computer Engineering	1
6	Ly	Dylan	UW	Engineering	1
7	Lee	Andrew	UW	Engineering	1
8	Medel Martinez	Beatriz	UW	Engineering	2
9	Luo	Xinsui	UW	Engineering	2
10	Yan	Yukai	UW	Arts & Science	1
11	Cady	Jonathan	UW	Engineering	2
12	Sent	Catherine	UW	Engineering	2
13	Lee	Kayla	UW	Engineering	1
14	Robison	Maren	UW	Engineering	1
15	Re	Ignacio	UW	Engineering	1
16	Wu	Hongjun	UW	Engineering	2
17	Zhou	Sirui	UW	Engineering	1
18	Bruner	Collin	UW	Engineering	1
19	Song	George	UW	Arts & Science	2
20	Lin	Bryan	UW	Arts & Science	1
21	Levidow	Kai	UW	Arts & Science	2
22	CHEN	YEQI	UW	Engineering	1

\*1 NSU: Novosibirsk State University  
 UCR: University of California-Riverside  
 UW: University of Washington

\*2 1: Freshman  
 2: Sophomore

#### Instructors List

Professor Yoshitaka Kasukabe (Lead TU instructor): yoshitaka.kasukabe.c3@tohoku.ac.jp  
 Professor Yumiko Watanabe: yumiko.watanabe.a5@tohoku.ac.jp  
 Professor Takeshi Koike: takeshi.koike.b6@tohoku.ac.jp  
 Professor Fumio S. Ohuchi (Lead UW instructor): ohuchi@uw.edu

## 2. Syllabus for TU STEM Summer Program

### **Syllabus for TU STEM Summer Program (TSSP): Exploring the Frontier of Science and Technology**

June 18-July 13, 2018 at Tohoku University, Sendai, Japan

#### **PROGRAM DESCRIPTION**

Japan continues to be a world leader in technological, manufacturing, and engineering innovation. **Tohoku University STEM Summer Program (TSSP): Exploring the Frontier of Science and Technology** provides a unique opportunity for freshmen and sophomores to learn about the originality and the state of the advanced and art technology that can be seen in various engineering produced in Japan. Students will also get hands-on experience learning about creative science and engineering at one of Japan's premier universities, Tohoku University, in Sendai City.

During the course of the program, students will be introduced to fundamental engineering concepts through lectures, lab visit, and laboratory work. Students then work on project teams with Tohoku University engineering students to use innovative engineering concepts to solve problems. In addition, several special seminars and lectures are given by experts to develop knowledge about more advanced science and engineering principles.

During the four-week program, lessons and site visits will show students how Japanese society impacts the country's culture of science and engineering. The program provides Japanese language training and exposure to traditional local culture through workshops and site visits. Several field trips will take students to tour J-PARC of a series of world-class proton accelerators and the experimental facilities, a production plant for a Japanese automotive manufacturer, to visit the historic castle in Shiroishi, and to see the recovery efforts in coastal areas around Sendai, most affected by the 2011 tsunami.

#### **LEARNING OBJECTIVES**

This course has been designed to provide students with the contextual engineering background to apply critical thinking skills to modern engineering problems in an international context. Through this course, you will be able to:

- 1) Understand key information about advanced science and engineering concepts and their application in professional engineering practice
- 2) Demonstrate a knowledge of engineering culture and practice in Japan
- 3) Utilize technical design skills
- 4) Work effectively in diverse teams
- 5) Articulate your own academic and professional goals related to science and engineering
- 6) Communicate at an introductory level in Japanese and apply the language in real-world contexts

## **ATTENDANCE POLICIES**

Attendance is mandatory at all academic activities, including laboratories, guest lectures, instructor lectures, laboratory visits, field trips, discussion groups, course meetings, etc. Academic activities are scheduled on all weekdays and some Saturdays. Excessive tardiness or absence may be grounds for dismissal from the program. Optional activities will be advertised as such and may include trips to sightseeing, shopping, or social gatherings.

**Each student submits a Summary (a word file) of what you learned from each activity in 250 words.** If it is unclear if an activity is optional, please ask Prof. Kasukabe and/or other professors.

## **PROGRAM SCHEDULE**

Course schedule is shown below. Program has been designed to require 200 hour of work, equivalent to an 8-ECTS, 4-week long course. The outline below is provided to help students guide use of their time.

### **A. Students pre-program work and home work during the program**

Pre-program work before the program and home work during the program (40 educational hour equivalents):

- 12 hour equivalents: pre-program work (including self-study about Japan)
- 28 hour equivalents: home work during the program

### **B. June-July Program Time:**

160 educational hours over the 4 weeks term with approximate distribution as follows


- 2 hour equivalents of orientation and guidance
- 34 hour equivalents of lectures and lab-visit, including reading preparation
- 44 hour equivalents of group laboratory projects, including reading and report preparation
- 40 hour equivalents of field trips, including reading preparation
- 12 hour equivalents of culture learning
- 18 hour equivalents of language learning, including exercises
- 6 hour equivalents of group discussion
- 6 hour equivalents of individual and group presentation, including PPT preparation

A reading list will be posted in the class Canvas website to allow advance preparation. Readings are designed to coordinate with guest lectures, laboratory visits, group laboratory projects and field trips. Final details and assignment schedules will be posted on the class Canvas page.

## **TEACHING APPROACH**

This course will focus on learning from “hands-on” projects, field trips, expert topical lectures, targeted scholarly readings, culture and language experience, group discussion, and student presentations.

### 3. Program

 <b>Tohoku University STEM Summer Program (TSSP) 2018</b>							
WEEK 1							
Sun	Mon	Tue	Wed	Thu	Fri	Sat	
17-Jun	18-Jun	19-Jun	20-Jun	21-Jun	22-Jun	23-Jun	
AM 9:00 - 12:00	<b>9:00-12:00</b> <b>Opening Ceremony &amp; Orientation</b> Welcome Speech (Vice President, Prof. Yamaguchi) Introduction to Tohoku University (Prof. Kasukabe) Orientation for Tohoku University STEM Summer Program (Profs. Watanabe, Koike and Ohuchi) <b>Self-introduction (3 min PPT x 22~70 min)</b> <b>Campus Tour</b> Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館702室) Aobayama Campus	<b>9:00-12:00</b> <b>Interactive Japanese Language</b> <b>Instructor: Ms. Takahashi &amp; Ms. Shimasaki</b> <b>Introducing Culture</b> Aoba Memorial Hall (C03) Room No. 702 & 501, School of Engineering (工学研究科青葉記念会館 702, 501室) Aobayama Campus	<b>9:00-9:30</b> <b>Introduction to Qantum Theory</b> Prof. Kasukabe <b>9:30-11:30</b> <b>Challenging Experiments for Qantum Theory (1)</b> Prof. Kasukabe Student Laboratories (A06) Kawauchi Campus	<b>8:50-11:30</b> Lecture and Lab Visit 1 <b>Introduction to aircraft design</b> Prof. Nakamura Conference Room, 2nd Floor, 1st Building (C09) Institute of Fluid Science (流体科学研究所、第1棟2階会議室) Katahira Campus (片平キャンパス)	<b>9:00-12:00</b> <b>Paper Aircraft Competition 2</b> Prof. Moriya, Prof. Watanabe & Prof. Koike Creative Engineering Center (D02) 創造工学研修センター Aobayama Campus	<b>8:00-22:00</b> <b>Visit to National Museum of Emerging Science and Innovation in Tokyo</b> Prof. Ohuchi & Prof. Kasukabe	
	Lunch (with TU students) Arrive in Sendai	<b>Japanese talk lunch (with TU students)</b> Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702 室) Aobayama Campus	Lunch (with TU students)	Lunch (with TU students)	Lunch (with TU students)		
PM 13:00 - 16:00	<b>13:00-16:00</b> <b>Interactive Japanese Language</b> <b>Instructors: Ms. Takahashi &amp; Ms. Backley</b> <b>Self-introduction in Japanese</b> Aoba Memorial Hall (C03) Room No. 702 & 501, School of Engineering (工学研究科青葉記念会館 702, 501室) Aobayama Campus	<b>13:30-16:30</b> <b>Japanese Culture 1 Ikebana (Flower arrangement)</b> Prof. Chen Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702 室) Aobayama Campus	<b>12:30-14:30</b> <b>Challenging Experiments for Qantum Theory (2)</b> Prof. Kasukabe <b>14:30-16:00</b> <b>Group Work of Challenging Experiments for Qantum Theory</b> Student Laboratories (A06) Kawauchi Campus	<b>13:00-16:00</b> <b>Paper Aircraft Competition 1</b> Prof. Moriya Creative Engineering Center (D02) 創造工学研修センター Aobayama Campus	<b>13:00-16:00</b> <b>Paper Aircraft Group Work</b> Prof. Moriya, Prof. Watanabe & Prof. Koike Creative Engineering Center (D02) 創造工学研修センター Aobayama Campus		

WEEK 2							
Sun	Mon	Tue	Wed	Thu	Fri	Sat	
24-Jun	25-Jun	26-Jun	27-Jun	28-Jun	29-Jun	30-Jun	
AM 9:00 - 12:00	<b>9:00-12:00</b> <b>Special Lecture 1</b> <b>Material Science and Japanese Sword Smith</b> Prof. Ohuchi Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702 室) Aobayama Campus	<b>8:30-18:00</b> <b>Field Trip</b> (Shiroishi (Castle) and Sward Smith)	<b>9:00-12:00</b> <b>Japanese Culture 2 Rinnouji Temple and Experience in Zen Meditation</b> Prof. Ohuchi & Prof. Kasukabe Rinnouji Temple (輪王寺)	<b>9:00-12:00</b> <b>Lecture 2</b> <b>The 2011 Tohoku Earthquake</b> Prof. Matsuzawa Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702 室) Aobayama Campus	<b>9:00-12:00</b> <b>Lecture and Museum Visit 4</b> <b>Living with Planet of Disaster</b> Prof. Kakegawa Earth Science Research Bldg. (H12) Room 503, School of Science (理学研究科地球科学503室) Aobayama Campus	<b>8:30-18:00</b> <b>Field Work</b> (Disaster-affected area: Mnamisa nriku, Arahama, etc.)	
	Lunch (with TU students)		Lunch (with TU students)	Lunch (with TU students)	Lunch (with TU students)		
PM 13:00 - 16:00	<b>13:00-16:00</b> <b>Interactive Japanese Language</b> <b>Instructor: Ms. Takahasi &amp; Ms. Backley</b> <b>Restaurant</b> Aoba Memorial Hall (C03) Room No. 702 & 501, School of Engineering (工学研究科青葉記念会館 702, 501室) Aobayama Campus		<b>13:00-16:00</b> <b>Japanese Culture3 Calligraphy</b> Prof. Watanabe Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702 室) Aobayama Campus	<b>13:00-16:00</b> <b>Lecture and Lab Visit 3</b> <b>Robotics for Space Exploration</b> Prof. Yoshida Lecture Room Building-M.E (A02) in Aobayama campus, Lecture Room No.1 (機械系講義棟(青葉山キャンパスA02)第一講義室) Aobayama Campus	<b>13:00-16:00</b> <b>Interactive Japanese Language</b> <b>Instructor: Ms. Takahasi &amp; Ms. Backley</b> <b>Interview in Japanese</b> Aoba Memorial Hall (C03) Room No. 702 & 501, School of Engineering (工学研究科青葉記念会館 702, 501室) Aobayama Campus		



# Tohoku University STEM Summer Program (TSSP) 2018

WEEK 3							
	Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1-Jul	2-Jul	3-Jul	4-Jul	5-Jul	6-Jul	7-Jul
AM 9:00 - 12:00		9:00-12:00 Lecture and Lab Visit 5 <b><u>Introduction to Spintronics</u></b> President, Prof. Ohno  Laboratory for Nanoelectronics and Spintronics (E04) (ナノ・スピン実験施設) A401  Katahira Campus	7:45-18:00 <b><u>Field Trip</u></b> (Ichinoseki and Toyota)	9:00-12:00 <b><u>Fastest Paper Clip Motor Competition 1</u></b>  Prof. Moriya  Creative Engineering Center (D02) 創造工学研修センター Aobayama Campus	9:00-12:00 Lecture and Lab Visit 8 <b><u>Biomolecular Design and Robotics</u></b> Prof. Murata  Mechanical Engineering Bldg.2 (A03), Room No. 203 (青葉山キャンパス、機械系2号館 203会議室)  Aobayama Campus	7:45-19:00 <b><u>Research Facility Tour</u></b> (Japan Proton Accelerator Research Complex: J-PARC in Tokai-mura, Ibaraki)	
		Lunch (with TU students)		Lunch (with TU students)	Lunch (with TU students)		
PM 13:00 - 16:00		13:00-16:00 Lecture and Lab Visit 6 <b><u>Symmetry Breaking Create Nature</u></b> Prof. Tanaka  Lecture Room (2nd floor of Molecular Imaging Building), Cyclotron and Radioisotope Center (CYRIC) (分子イメージング棟2階講義室、サイクロトロン・ラジオアイソトープセンター、北青葉山キャンパス)  Aobayama Campus		13:00-16:00 Lecture 7 <b><u>Introduction to Advanced Research with Accelerator</u></b> Prof. Koike  Aoba Memorial Hall (C03) Room No. 601, School of Engineering (工学研究科青葉記念会館 601室)  Aobayama Campus	13:00-16:00 <b><u>Fastest Paper Clip Motor Competition 2</u></b> Prof. Moriya  Creative Engineering Center (D02) 創造工学研修センター Aobayama Campus		

WEEK 4							
	Sun	Mon	Tue	Wed	Thu	Fri	Sat
	8-Jul	9-Jul	10-Jul	11-Jul	12-Jul	13-Jul	14-Jul
AM 9:00 - 12:00		9:00-12:00 Lecture and Lab Visit 9 <u>Study of Japanese historical disaster and culture</u> Prof. Ebina  International Research Institute of Disaster Science (J31) Seminar room S100 (災害科学国際研究所セミナー室、S100、青葉山キャンパス)  Aobayama Campus	9:00-12:00 Lecture and Lab Visit 10 <u>Structural Metallic Materials for Industry Innovation</u> Prof. Yoshimi  Materials Science and Engineering (B01) Lecture room 2 (Room No. 102) (工学研究科材料科学棟(B01) 講義室2(102室))  Aobayama Campus	9:00-12:00 Lecture and Lab Visit 11 <u>Human Information Systems and Information Contents</u> Prof. Kitamura  M531, RIEC Main building (G10), Katahira Campus (電気通信研究所本館5階 M531 セミナー室、片平キャンパス)  Katahira Campus	9:00-12:00 <u>Group Work Session</u> (Preparation for Experimental Reports and/or Wrap-up Presentation)  Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702室)  Aobayama Campus	9:00-12:00 <u>Wrap-up Presentation of TSSP 2018</u>  Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702室)  Aobayama Campus	
		Lunch (with TU students)	Lunch (with TU students)	Lunch (with TU students)	Lunch (with TU students)	Lunch (with TU students)	
PM 13:00 - 16:00		13:00-16:00 <u>Japanese Culture 4 Aikido</u>  Prof. Fujino  Kawauchi Sub Arena, 3rd Floor (B05) (川内サブアリーナ棟3F)  Kawauchi Campus	13:00-16:00 <u>Fastest Paper Clip Motor Group Work</u>  Prof. Moriya  Creative Engineering Center (D02) 創造工学研修センター Aobayama Campus	13:00-16:00 Special Lecture 2 <u>Advanced Tutorial in Materials Science and Engineering</u>  Prof. Ohuchi  Lecture Hall (B03), Materials Science and Engineering, School of Engineering (工学研究科材料系大講義室)  Aobayama Campus	13:00-16:00 <u>Group Work Session</u> (Preparation for Experimental Reports and/or Wrap-up Presentation)  Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702室)  Aobayama Campus	13:30-15:30 <u>Wrap-up Presentation of TSSP 2018</u> Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702室) Aobayama Campus  16:00-16:45 <u>Closing Ceremony</u> 17:00-18:30 <u>Farewell Party</u>  Aoba Memorial Hall (C03) Room No. 702, School of Engineering (工学研究科青葉記念会館 702室) Aobayama Campus	

## 4. Outline of lectures

TOHOKU UNIVERSITY STEM SUMMER PROGRAM 2018

### Lecture and Lab Visit #1

#### Introduction to aircraft design

**Associate Professor, Hisashi NAKAMURA**

Institute of Fluid Science, Tohoku University

##### Research fields

Combustion engineering

Industrial furnaces and engines (reciprocating, gas turbine, rocket, etc.)

Quantum chemistry

Analytical chemistry

##### Lecture room:

Conference Room, 2nd Floor, 1st Building (C09), Institute of Fluid Science, Katahira Campus (片平キャンパス 流体科学研究所、第1棟2階会議室)

##### Outline of the lecture

Fundamental knowledge on aerodynamics and structural mechanics required for aircraft design will be introduced. Practical learning will be given through the observation of flight of paper planes.

### Lecture #2

#### The 2011 Tohoku earthquake

**Professor Toru MATSUZAWA**

Graduate School of Science

Research Center for Prediction of Earthquakes and Volcanic Eruptions

##### Research fields

• Natural disaster science

• Solid earth physics

**Room:** Aoba Memorial Hall (C03) Room No. 702, School of Engineering

(工学研究科青葉記念会館 702 室)

### **Outline of the lecture**

The M9 Tohoku earthquake on 11 March 2011 had a great impact on the seismologists all over the world. This is because Tohoku (northeastern Honshu, Japan) is located in one of the most investigated plate subduction zones and the interplate coupling was thought to be too weak to generate M9 earthquakes there. In the lecture, I explain an elementary seismology, what happened in the source region of the M9 earthquake, and reasons why we failed to anticipate the event.

## **Lecture and Lab Visit #3** **Robotics for Space Exploration**

### **Professor Kazuya YOSHIDA**

Graduate School of Engineering  
Department of Aerospace Engineering  
Space Robotics Laboratory

### **Research fields**

- Space Robotics
- Dynamics and control of orbital free-flying robots
- Mobility/traction mechanics, sensing and navigation of mobile robots
- Development and operation of space flight models of university-based micro-satellites

### **Room**

Lecture Room Building-M.E (A02) in Aobayama campus, Lecture Room no.1  
(機械系講義棟 (青葉山キャンパス A02) 第一講義室)

### **Outline of the lecture**

Robotics is crucial technology for investigation/exploration of remote and difficult-to-access places, such as surface/sub-surface of the Moon and other planets. This lecture will provide an introduction to robotics for lunar/planetary exploration and from the aspects of hardware design, motion mechanics, sensing and navigation control.



## **Lecture and Museum Visit #4**

### **Living with planet of disaster**

#### **Professor Takeshi KAKEGAWA**

Natural Resources and Environmental Geochemistry Research Group  
Department of Earth Science  
Graduate School of Science

#### **Research fields**

- Environments and Life on the Early Earth
- Origin of Life

#### **Room**

Room 503 of Earth Science Research Building (H12) on Aobayama campus,  
(理学研究科地球科学系研究棟 (青葉山キャンパス H12) 503 室)  
<http://www.es.tohoku.ac.jp/EN/access/index.html>

#### **Outline of the lecture**

The Earth was born ca. 4.6 billion years ago. Life was flourished on the Earth at least ca. 3.8 billion years ago. The Earth and life has been evolving together since then. The Earth, however, has not been kind enough for life. Some species were extinct by catastrophic events in the past. Earthquakes and Tsunami are typical catastrophic events to threaten life, and such risk will continue in the future. Tohoku University is making special efforts to educate students for understanding natural disaster. We believe such efforts will help to make the future society safe.

This lecture is a digest version of the natural disaster course at Tohoku University, and is composed of three parts. General geology, which makes surface of the Earth mobile and shake, will be introduced in the first part of this lecture. In the second part, I will more focus on earthquake and tsunami disaster and will introduce what happen on March 11<sup>th</sup> of 2011 here at the Tohoku region. Afterwards I will bring you to our geological museum to show real rock records of past disasters.

## **Lecture and Lab Visit #5**

### **Introduction to Spintronics**

#### **President, Professor Hideo OHNO**

Tohoku University

### **Research fields**

- Electron/electric material engineering(Properties of Semiconductors)
- Electronic device/electronic equipment(Semiconductor Devices)
- Applied physical properties/crystal engineering(Semiconductor Crystal Growth)

**Room:** Laboratory for Nanoelectronics and Spintronics (E04)

(ナノ・スピン実験施設) A401

### **Outline of the lecture**

Spintronics is an emerging field that utilizes both spin and charge to realize new functions. I will discuss about the nonvolatile spintronic memory as an example; its basic operating principle and how it can make next generation VLSI's "greener".

## **Lecture and Lab Visit #6** **Symmetry Breaking Create Nature**

**Assistant Professor Kazuo TANAKA**

Cyclotron and Radioisotope Center (CYRIC)

### **Research Field**

Fundamental Physics by using an "exotic" atom

**Room:** Lecture Room (2nd floor of Molecular Imaging Building), Cyclotron and

Radioisotope Center (CYRIC), Aobayama Campus,

(分子イメージング棟2階講義室、サイクロトロン・ラジオアイソトープセンター、  
北青葉山キャンパス)

### **Outline of the lecture**

There are plenty of parity asymmetries around us, which make our world so unique. Why is not antimatter observable from the earth? Why is the human heart on the left side? In this lecture, we focus on breaking of the fundamental symmetries (parity symmetry, time reversal) which is an origin of asymmetries in nature.

## **Lecture #7** **Introduction to Advances Researches with Accelerators**

## **Associate Professor Takeshi KOIKE**

Institute for Excellence in Higher Education

Graduate school of science

### **Reserach Field**

Experimental Nuclear Physics

Nuclear structure and nuclei with strangeness

**Room:** Aoba Memorial Hall (C03) Room No. 601, School of Engineering

(工学研究科青葉記念会館 601 室)

### **Outline of the lecture**

As its name suggests, an accelerator is a device to accelerate various particles to high energy and provide beams of such particles for scientific research as well as application to medical and industrial fields. In the first half of the lecture, working principle of an accelerator and different types of accelerators will be explained. In the second half, some of various researches conducted at Japan Proton Accelerator Research Complex (J-PARC) in our field trip will be discussed.

## **Lecture and Lab Visit #8** **Biomolecular Design and Robotics**

### **Professor Satoshi MURATA**

Department of Robotics,

Graduate School of Engineering

### **Research fields**

- Structural DNA nanotechnology
- DNA computing
- Molecular Robotics

**Room:** Mechanical Engineering Bldg.2 (A03), 203, Aobayama campus

(青葉山キャンパス, 機械系 2 号館 203 会議室)

### **Outline of the lecture**

We are now able to design nanostructures and computing systems based on rigorous design of DNA sequences.

The number of designable bases are now reaching the order of 100,000 bases and growing further. In this lecture, I will discuss what is going on in this research field, and will introduce molecular robot which is a molecular system made of designed molecular sensors, computers, and actuators.

## **Lecture #9**

### **Study of Japanese historical disaster and culture**

#### **Associate Professor Yuichi EBINA**

Human and Social Response Research Division

Japanese Disaster Culture

International Research Institute of Disaster Science (IRIDeS)

#### **Research fields**

- Research of historical disasters.
- preservation activities of historical records.

**Room:** Seminar room S100, International Research Institute of Disaster Science (IRIDeS) (J31), Aobayama Campus (災害科学国際研究所セミナー室、S100、青葉山キャンパス)

#### **Outline of the lecture**

The lecture about rescue and preservation of historical records in the Great East Japan Earthquake, and historical disasters research which united history and science in IRIDeS.

Demonstration of historical-records preservation. \*The dress which works easily is required.

## **Lecture and Lab Visit #10**

### **Structural Metallic Materials for Industry Innovation**

#### **Professor Kyosuke Yoshimi, Ph.D.**

Graduate School of Engineering

Department of Materials Science

#### **Research fields**

- Structural Materials
- Ultrahigh-Temperature Materials
- Mechanical Properties and Crystal Lattice Defects

**Room:** Materials Science and Engineering (B01), Lecture room 2 (Room No. 102)  
(工学研究科材料科学棟(B01), 講義室 2 (102 室))

### **Outline of the lecture**

Modern iron and steel industry has been established around the middle of the 19 century, and an extraordinary amount of iron and steel has been enabled to supply to the human society since then. Nickel-based superalloys was born in the 1940s, and the aeronautics industry has been dramatically developed in the world since then. Nowadays, titanium alloys have made big impacts on many industrial fields such as not only the automobile and airline industries but also social welfare and medical services. In this lecture, advanced metallic materials will be introduced with scientific backgrounds focusing on structural applications.

## **Lecture and Lab Visit #11** **Interactive "Content" Design**

### **Professor Yoshifumi KITAMURA**

Research Institute of Electrical Communication (RIEC)

### **Research fields**

- Human-Computer Interaction
- Virtual/Augmented Reality
- 3D User Interface

**Room:** M531, RIEC Main building (G10), Katahira Campus  
(電気通信研究所本館 5 階 M531 セミナー室、片平キャンパス)

### **Outline of the lecture**

As the Internet of Things (IoT) expands, everything around us is coming online and joining integrated networks. Even everyday items like furniture are going digital. Our research explores interactions between people, content, systems, and environments in order to build a world that is not only smarter, but also one that is happier, and better integrated. We focus on relationship and interaction in order to achieve greater harmony.

We view all artifacts, physical and digital, as content. Honouring the unique perspectives of people, systems, and the environments they inhabit, we study the interactions between types of content, with the ultimate goal of formulating cohesive, holistic, and intuitive approaches that promote efficiency, ease of use, and effective communication. We focus on content design to enhance living.

I will describe and demonstrate our recent efforts on realizing this vision.

# Japanese Culture 1: Japanese Flower Arrangement (Kadou)

**Professor Ying CHEN**

School of Engineering

## **Research fields**

- Condensed Matter Physics
- Computational Materials Science
- Materials Design Science

## **Room**

Room 702 of Aoba Memorial Hall (C03) on Aobayama campus,

(工学研究科 青葉記念会館 (青葉山キャンパス H3) 702 室)

<https://www.eng.tohoku.ac.jp/map/>

## **Outline of the lecture**

Let's take the opportunity to experience something authentically Japanese! Ikebana, the Japanese flower arrangement, has been appreciated since almost 600 years ago, and you are at the entrance of a traditional as well as creative world of Ikebana. Anybody can enjoy the process of mere flowers being sublimed to a type of art. In addition to flowers, green plants play an important part to make the world richer and denser. You will learn techniques such as fixing materials in a vase, cutting off unwanted leaves and twigs, curving materials and so on. Use your imagination, and decorate the room with flowers of calm and quite beauty.



## Japanese Culture 2: Rinnou-ji (temple) and Shikann taza (zazen for its own sake)

Rinnou-ji is a temple of Soto sect in Japanese zen Buddhism. Much information can be found in <https://global.sotozen-net.or.jp/eng/> Soto sect was founded by Zen master, Dogen upon returning to Japan from China at age 28. In China he has attained enlightenment (satori) under the Zen master, Nyojyo. It is worthwhile to mention that he brought no scrolls of Buddha teaching from China when it had been customarily for high priests studying in China to do so. Their journeys must have been dangerous enough to risk their lives through rough ocean path by ships. Instead he has expressed his own thoughts and experiences of zen meditation and Buddhism in Japanese. Soto sect emphasizes paying full attention to every aspect of your life. Be it eating, talking and meeting with others, studying, playing and goes on. When you enter the temple, you might see a sign written in Chinese character as 脚下照顧 (Kyakka Shyoko, look at your feet) What does it mean? How do you enter the hall as you take off your shoes?

Also the sect approaches act of Zazen (zen sitting) as end itself instead of means of attaining enlightenment. In other words, you just have no purpose when sitting other than paying attention to each breath (只管打坐, Shikan taza). Dogen states that when you let yourself come out to be truly as your being through meditation (身心脱落、shinjin-daturaku), you will experience will oneness with the whole universe or “satori”.

In spirit of Zen, a tea ceremony holds a special meaning. Your host does her/his best to make a cup of tea to you, the hosted. You then will truly put yourself to savor the offering. It is an elevated act of fully paying attention to your meeting. (一期一会, every meeting is just one and one only)

After all, let us forget all that and just enjoy the meditation, the moment, and the tea.

How to do Zazen: <https://global.sotozen-net.or.jp/eng/practice/zazen/howto/index.html>



## Japanese Culture 3: Calligraphy (*Shodou*)

### Professor Yumiko WATANABE

Coordinator of Future Global Leadership Program

Global Learning Center

And

Department of Earth Science

Graduate School of Science

### Research fields

- Environments and Life on the Early Earth
- Astrobiology

### Room

Room 702 of Aoba Memorial Hall (C03) on Aobayama campus,

(工学研究科 青葉記念会館 (青葉山キャンパス H3) 702 室)

<https://www.eng.tohoku.ac.jp/map/>

### Outline of the lecture

*Shodou* is the art of Japanese calligraphy. It has developed a unique style that mainly depends on the written characters of the Japanese language. *Shodou* was strongly influenced by Chinese calligraphy at the early stage. However, after the invention of *Hiragana* and *Katakana*, which are unique Japanese writing systems, Japanese calligraphy developed its own distinctive look.

The basic tools for *Shodou* are as follows:

- brush (筆:*fude*)
- inkstick (墨:*sumi*)
- inkstone (硯:*suzuri*)
- paper (和紙:*washi*)

Japanese students of Tohoku University will help you learn how to write with the unique *Shodou* tools. You will take your work with you as a souvenir for your family or friends.



[http://www.naraya-honpo.com/images\\_mt/%E7%AD%86.jpg](http://www.naraya-honpo.com/images_mt/%E7%AD%86.jpg)

## Japanese Culture 4: Aikido

Prof. Yutaka FUJINO

### **Research fields**

- Materials Science and Engineering
- Ion Beam Analysis and Surface Modification Engineering

### **Room**

Kawauchi Sub Arena, 3rd Floor (B05)

(川内サブアリーナ棟 3F)

Kawauchi Campus

### **Outline of the lecture**

In the course, students learn Japanese culture through practice of Aikido, a Japanese martial way (budo) developed by Morihei Ueshiba (often referred to as 'O-Sensei' or 'Great Teacher' by his title). Morihei Ueshiba developed Aikido, drawing on the rich history of the martial traditions of Japan and refining them into a wholly new system for the future. On the technical side, Aikido is, in this way, rooted in several styles of jujutsu, traditional Japanese martial arts, (in which modern Judo is also originated), in particular Daito-ryu-(aiki)jujutsu, as well as sword and spear fighting arts.



## 5. Field Trips

### Field Trip to Miraikan (2-3-6 Aomi, Koto-ku, Tokyo, Japan): National Museum of Emerging Science and Innovation

June 23, Saturday 8:00 - 22:00

#### Train Schedule

Bullet train (Shinkansen) to Tokyo: Hayabusa 8 (Sendai 8:56 – Tokyo 10:32)

Bullet train (Shinkansen) back to Sendai: Hayabusa 39 (Tokyo 20:16 – Sendai 21:47)

Note: Please bring “Suica” (a JR prepaid smart card) to ride trains in Japan.

While you are in Tokyo, we would like to know your whereabouts, for an emergency and safety reason as follows:

1. Profs. Kasukabe and Ohuchi will be in “Restaurant 'Miraikan Kitchen'” on the 7<sup>th</sup> floor during 13:00-14:00. Please see us while we are there.
2. Before having dinner, you have to return back to the meeting point: in front of the Tohoku Shinkansen South Transfer Gate along the Central Passage of JR Tokyo Station no later than 18:00 in the group of at least two.
3. Before getting on the Shinkansen, we will meet at the same gate at 19:45.

Note: You are required to submit your return route to the meeting point and schedule to Profs. Kasukabe and Ohuchi by e-mail by June 21.

**Miraikan:** <http://www.miraikan.jst.go.jp/en/>

Miraikan is a place where we can understand the things happening in our world today from a scientific point of view, and have discussions while considering the future that awaits us. In addition to exhibitions that provide people with a chance to enjoy hands-on experience with science and technology, Miraikan's colorful line-up of offerings includes experienced based classes and talks. Visitors can experience the technological progress of today, from simple day-to-day questions, to the latest technologies, the global environment, space exploration and life science.

Miraikan captures science and technology from the broad perspectives of human beings, space, innovation, and information society. The permanent exhibitions are separated into three zones, all of which were produced under the supervision of scientists and engineers working at the forefront of their respective fields.

#### (1) Explore the frontiers

Why are we here now? This zone allows you to explore space, your solar system, the Earth and all life there on a wide variety of scales.

#### (2) Create your future

How should humans apply and evolve sustainable prosperity? This zone welcomes you to first imagine a future society and lifestyle that you want, and then think on how you can make your dream future a reality.

### (3) Discover your Earth

How much do we know about the Earth? Using the latest scientific data and tools, discover your planet, how all life is connected, and how to sustain your home, this beautiful Earth.

### Activities

Engage yourself and take full advantage of Miraikan where these areas and the activities there are organized so you can fully enjoy Miraikan, through performances, hands-on learning programs, and applications.

Note: Please download “Miraikan Notebook App” in your smartphone to help you find out “why” and confirm your idea. With the App, you will enjoy Miraikan even more



National Museum of Emerging Science and Innovation (日本科学未来館)  
2-3-6, Aomi, Koto-ku, Tokyo 135-0064 (〒135-0064 東京都江東区青海2丁目3-6)

## **Field trip to City of Shiroishi**

**June 26, Tuesday 8:30-17:00**

Shiroishi city is a city south of Sendai in Miyagi prefecture. Here you will visit some historical Japanese architecture and observe and try yourself the traditional craftsmanship. Of course, enjoy the local cuisine, Shiroishi style Japanese wheat noodle, Wumen.

8:30: departure

9:30 – 11:30: Visit to Shiroishi castle (try putting on Samurai armors and helmet, and kimono)

12:00-13:00: lunch at Japanese traditional noodle shop (savor a local Shiroishi style wheat noodle Wumen)

13:30 – 14:45: Visit to Japanese swordsmith shop (Mr. Akimori Miyagi, Japanese sword (Katana) master or Katana-kaji in Japaense)

15:30-16:00: Visit to a local Japanese wood doll (Kokeshi) museum to paint your own Kokeshi doll.

17:00 arrival at the hotel

## **Field trip to Ichinoseki city and Toyota automobile factory in Ohira village**

**July 3, Tuesday 8:00-16:30**

We will visit a traditional Japanese craftsmanship in city of Ichino-seki which is located north of Sendai and in Iwate prefecture. Ichino-seki is rich in history where a series of historical sites such as Motsu-ji (temple) and Tyuson-ji (temple) is designated as the world heritage site are nearby. Then we will return to Miyagi prefecture to visit an automobile factory of Toyota Co, one of the major drivers of Japanese industry.

8:00 departure

9:30-11:00 Visit to traditional Japanese dye house. Get hands on experience by dying your own face towel

13:30-15:20 Visit to a factory of Toyota Motor Co.at Ohira village located north of Sendai in Miyagi prefecture. Proper clothing for safety reason in the factory is required. Please see further information on

16:30: arrival at the hotel



## Field trip to Disaster-affected area: Experience in disaster affected areas

June 30, Saturday 8:30-18:00

### **Professor Takeshi KAKEGAWA**

Natural Resources and Environmental Geochemistry Research Group  
Department of Earth Science  
Graduate School of Science

### **Research fields**

- Environments and Life on the Early Earth
- Origin of Life

### **Destinations and Schedule**

Sendai (8:30)- Utatsu (10:30) - Minimi Sanriku (12:30 lunch) - Arahama elementary school in Sendai (15:30) - Yuriage (16:30)- Sendai

### **Outline of the fieldwork**

March 11<sup>th</sup> of 2011 becomes unforgettable date for people in the Tohoku region. The earthquake hit Sendai at 14: 46 p.m. on that day. Around 4 p.m., Tsunami washed away cities and towns along the Pacific coast, sacrificing about 20000 people's life. Such tragedies may happen anytime allover the world. One of duties here at Tohoku University is to keep telling people what we learned from the March 11<sup>th</sup> disaster, so that people can prepare for future natural disasters.

In this filed excursion, we will visit ruined towns by Tsunami at several



localities and see how they are recovering. For instance, significant amounts of new landfill changed the view of Minami Sanriku town, and local people started to build new houses at high elevation areas. At Arahama, there was a 4<sup>th</sup> floored elementary school. Tsunami reached to 2<sup>nd</sup> floor. Many local people escaped to upper floors and stayed there for a few days until a rescue team arrived. This building is now becoming a museum to tell what happened on March 11<sup>th</sup>. You may experience how danger Tsunami was. We will have a group discussion for strategies to rebuild towns during this field excursion.

## Field Trip to GINAX (Fukushima) and J-PARC (Tokai)

July 6, Friday 7:45-19:00

10:00-11:00 Animation Museum (GAINAX

Fukushima)

13:00-15:00 Guided tour of J-PARC

15:00-18:30 Back to our hotel



### GINAX Fukushima (animation museum)

Animation studio Gainax (Neon Genesis Evangelion, Gurren Lagann, Panty & Stocking with Garterbelt) has opened a new studio and museum in Miharu, Fukushima since March, 2015. Gainax established the "Fukushima Gainax" managing company to run the new location. The newly-established branch will be taking more commissioned work from overseas. Locals hope that the museum and studio will draw tourists from abroad as well as from within Japan, and help revive Fukushima tourism in the wake of the Fukushima Daiichi nuclear disaster in 2011. The new studio and museum makes use of a closed junior high school building.

Some of the works can be viewed at [http://fukushimagainax.co.jp/?page\\_id=3700](http://fukushimagainax.co.jp/?page_id=3700)

### Japan Accelerator Research Complex (J-PARC)

J-PARC consists of a series of world-class proton accelerators and the experimental facilities that make use of the high-intensity proton beams. Open to users from around the world. J-PARC is a multi-purpose and multidisciplinary facility that is unique in the variety of secondary-particle beams produced and put to use in cutting-edge research across a wide range of scientific fields. Neutron, pion, kaon and neutrino beams are all produced at J-PARC via collisions between the proton beams and target materials (spallation reactions). The applications of these beams include fundamental nuclear and particle physics, materials and life science, and nuclear technology.

It is the intensity of the secondary-particle beams that makes J-PARC special. Responding to the ever-increasing demands of modern experiments, the high-intensity makes possible the impossible and unlocks the door to new and exciting research endeavors.