ニュース

【受賞】博士課程教育リーディングプログラム フォーラム2017にて牧野嶋文泰さん、小川剛史さんがAcademia/Industrial Future Leader Awardを受賞しました(発表資料、賞状 追加：11月13日)

[Topics] 2017年10月21日

平成29年10月20日（金）～21日（土）に名古屋マリオットアソシアホテルにて開催された「博士課程教育リーディングプログラム フォーラム2017」に、７名のプログラム院生（金子亮介、牧野嶋文泰、小川剛史、野村怜佳、栗田陽子、赤尾津翔大、石橋信治）が参加しました。

同フォーラムにでは、学生ポスター発表セッションが設けられており、これに参加した牧野嶋文泰さん、小川剛史さんの発表が、
Academia Future Leader Award（牧野嶋）およびIndustrial Future Leader Award（小川）にそれぞれ選定されました。

同賞は、総計約１００名を超える発表者の中から、リーディングプログラム担当者の審査の元、各テーマに付き１０名程度が選定・授与されるものとなっております。

Program for Leading Graduate Schools Forum 2017

Academia Future Leader Award

Presented to

Fumiyasu Makinoshima

Awarded on October 20, 2017

Professor Dr. Masayoshi MAESHIMA, Vice President
Nagoya University, Japan

名古屋大学
NAGOYA UNIVERSITY

Program for Leading Graduate Schools Forum 2017

Industrial Future Leader Award

Presented to

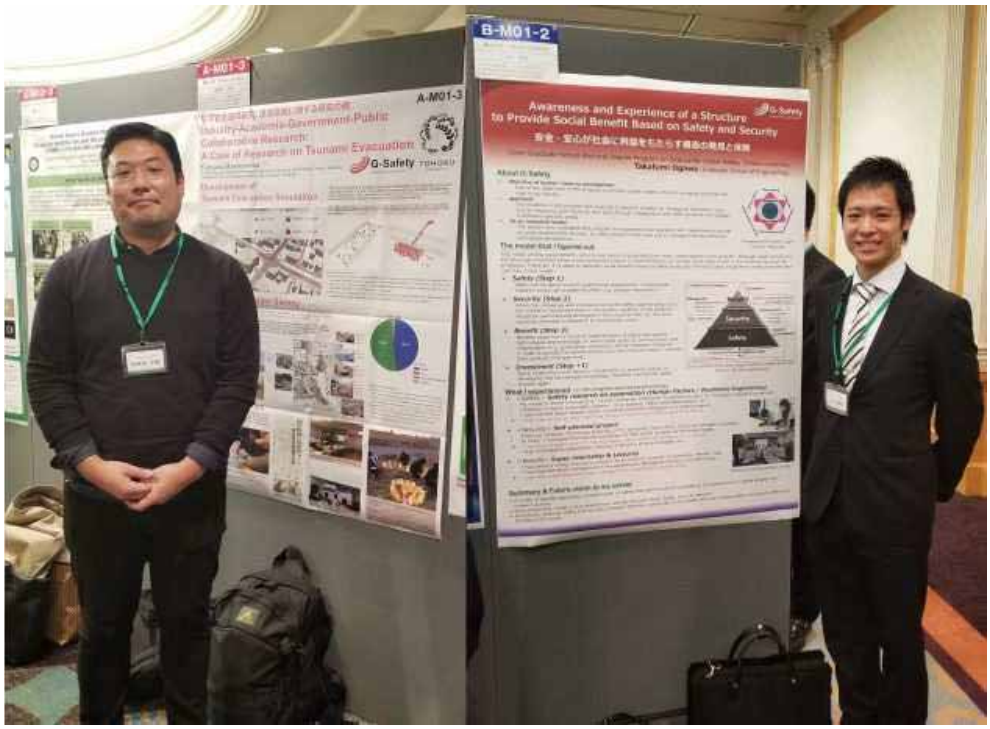
Takafumi Ogawa

Awarded on October 20, 2017

Professor Dr. Masayoshi MAESHIMA, Vice President
Nagoya University, Japan

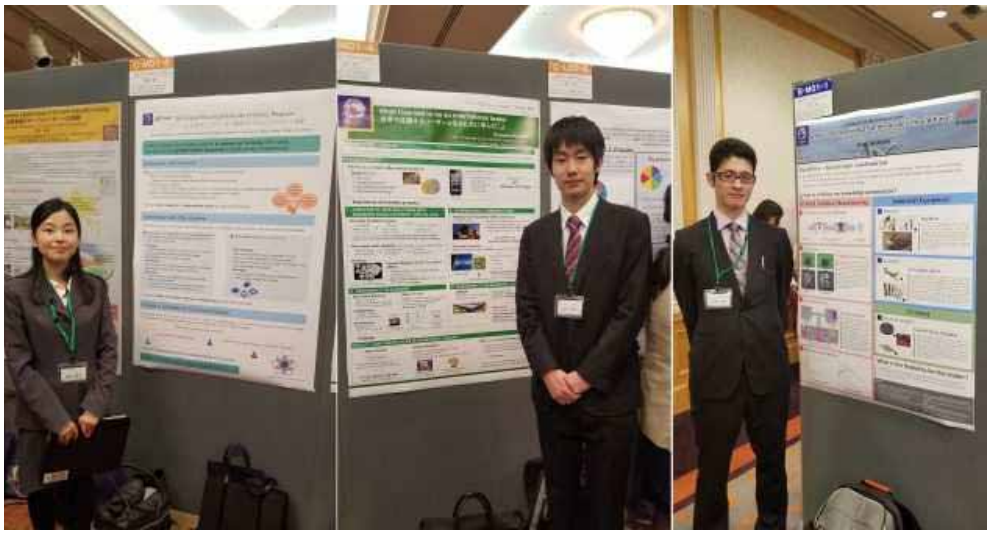
名古屋大学
NAGOYA UNIVERSITY

■フォーラム会場にて
（参加学生，湯上プログラムコーディネーター及び静谷リーディングプログラム部門長）



■受賞者ポスター（左：牧野嶋文泰、右：小川剛史）

受賞者の各発表ポスターはこちら
LeadingForum_makinoshima.pdf (109 ダウンロード)
LeadingForum_Ogawa.pdf (106 ダウンロード)



■ポスターセッション参加者（左：栗田陽子、中：金子亮介、右：石橋信治）

各発表ポスターはこちら
LeadingForum_Kurita.pdf (108 ダウンロード)
LeadingForum_Kaneko.pdf (122 ダウンロード)
LeadingForum_ishibashi.pdf (92 ダウンロード)

東北大学

G-Safety グローバル安全学トップリーダー育成プログラム

取組例 人・社会・学問の多様性をテーマとした研修や講義の実施

【研修】スタンフォード大学とのリスク・安全・安心・不平等をテーマとしたサマースクール

- 性別、国籍、人種、民族、宗教、性的指向などの社会階層と不平等の問題を学ぶ。
- アメリカでの滞在を通して多文化理解を深めるグローバルな環境
- 文系と理系の様々な学問分野を専門とする学生・教員が参加する異分野交流環境

➢ 発表・議論により、社会の様々な社会階層と不平等の問題や関連を多面的に理解する。

【講義】社会の多様性を踏まえた災害対応を実践に活かすための講義

- 災害における宗教やジェンダーの問題を学ぶ。
- 問題の歴史的・文化的背景を学ぶ。
- 子ども、高齢者、障がい者、多様な性、マイノリティにも関心を持つ。

➢ 講義・議論により、災害時の問題が平時の人と社会の多様性の問題に起因することを理解する。

効果

- 様々な個人の集まりとしての社会を学び、専門とする学問分野が対象とする人や社会に対する認識が変化した。
- 多様なバックグラウンドの人々を受け入れる重要性を理解し、技術者として多様性を踏まえた社会の構築に貢献する意識を持つようになった。

■学生による「ダイバーシティ・マネジメント」に関する事前議論
（野村怜佳、赤尾津翔大）

当日のプレゼン資料はこちら
M01・東北大学ダイバーシティ取組み.pdf (109 ダウンロード)

産学官民連携研究：津波避難に関する研究の例

Industry-Academia-Government-Public Collaborative Research: A Case of Research on Tsunami Evacuation

Fumiyasu Makinoshima*1*2
*1 Inter-Graduate School Doctoral Degree Program on Science for Global Safety, Tohoku University
*2 Research Fellow of the Japan Society for the Promotion of Science

G-Safety SCIENCE FOR GLOBAL SAFETY

TOHOKU UNIVERSITY

Development of Tsunami Evacuation Simulation

Not publicly available

We are developing a tsunami evacuation simulation for evaluating tsunami avacuation risks in local communities and enhancing disaster awareness and preparations. This research includes interdisciplinary disciplines such as social science, disaster science and computer science.

We offer outcomes of research to local governments that would be useful for making evacuation planning. A new collaborative research project has just begun with universities, an IT company and a local government.

Not publicly available

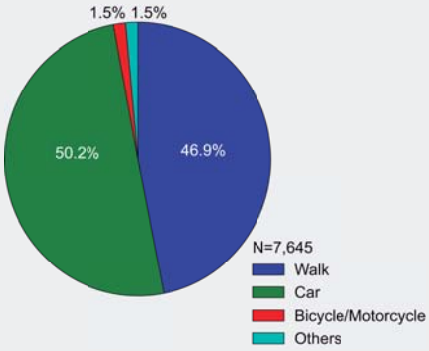
Corresponding publications
(1) Makinoshima, F., Imamura, F., Abe, Y. "Development of Tsunami Evacuation Simualtion Considering Ped-Car Intercation -Validation in the 2011 Evacuation Event at Kesennuma City-," *J. JSCE Ser B2*, 1645-1650, 2015.
(2) Makinoshima, F., Imamura, F., Abe, Y. "A Stochastic Evacuation Risk Evaluation by Multi-scenario Tsunami Evacuation Simualtion," *J. JSCE Ser B2*, 2017. (in press)
(3) Makinoshima, F., Imamura, F., Abe, Y. "Enhancing a Tsunami Evacuation Simulation for a Multiscale/scenario Analysis using Parallel Computing," *Simulation Modelling Practice and Theory*, (in revision)

Tsunami Evacuation Survey

We conducted tsuami evacuation survey at Kesennuma collaborating with a consultant company and the local government. Since previous surveys lack the detail information, we collected various medias recording actual scenes from broadcasting companies, newspaper companies and individuals.

In addition to the macroscopic survey in Kesennnuma, one by one detail interview survey has been conducting in Ishinomaki City. Since the survey need deep consideration of local residents' mind, we are collaborating with NPO in Ishinomaki. The survey is expected to contribute to understand relationship between individual conception and behaviour during mega disasters.

公益社団法人 みらいサポート石巻 Ishinomaki Future Support Association



Corresponding publications
(1) Makinoshima, F., Imamura, F., Abe, Y. "Behavior from Tsunami Recorded in Multimedia Sources at Kesennuma City in the 2011 Tohoku Tsunami and Its Simulation by Using Evacuation Model with Pedestrian-Car Interaction," *Coast. Eng. J.*, 1640023, 2016.
(2) Makinoshima, F., Abe, Y., Imamura, F., Machida, G., Takeshita, Y. "Possible Factors Promoting Car Evacuation in the 2011 Tohoku Tsunami Revealed by Analyzing a Massive Questionnaire Survey," *Geosciences*, 2017. (in revision)

Practical Activities

I am also working for various practical activities. As a part of G-safety programme, I contributed to the development of a novel disaster educational tool named "Gensai Action Card Game" and other volantary works. As a researcher, I gave some lectures for publics.

Disaster education using the "Gensai Action Card Game" (2014/07/19)

We got the patent for the card game with Tohoku University. Now the card game is commercially available from Tohoku University.

http://www.tohoku.u-coop.or.jp/shopping/goods/

Newspaper (2014/09/18)

Public lecture at Kesennuma (2016/07/16)

Lecture for high school students at Ishinomaki 2017/08/03

Volantary work for 3.11 memorial at Ishinomaki (2017/03/11)

This was a collaborative project with multiple leading programs and universities. Members from G-safety in Tohoku University, RESPECT in Osaka University and DNGL in University of Kochi participated in this project.

Awareness and Experience of a Structure to Provide Social Benefit Based on Safety and Security

安全・安心が社会に利益をもたらす構造の発見と体験

Inter-Graduate School Doctoral Degree Program on Science for Global Safety, Tohoku University
Takafumi Ogawa (Graduate School of Engineering)

About G-Safety

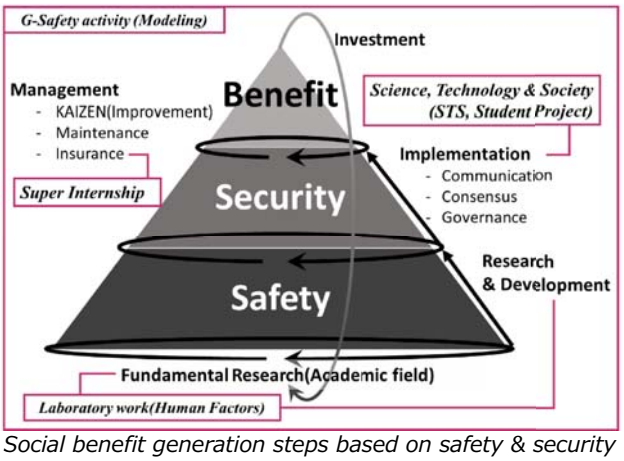
- ***Objective of human resource development*** :
  One of the objectives of this program is to foster global leaders who can recognize and deal with risks in our society.
- ***Approach*** :
  The students in this program are expected to become a leader as "hexagonal (*Kompeito*) type" human resources (see figure on the right) through collaboration with other students who engage in different specialty areas.
- ***As an industrial leader*** :
  The leaders who completed this program are supposed to be equipped with capabilities to provide accurate assessments of risks, to make solution to the risks and to manage business continuity with global perspectives.

"Hexagonal(Kompeito) type" human resources

The model that I figured out

This model among social benefit, security and safety is generated from what I have learned in this program. Although safety and security are obviously important when a new/advanced system is implemented to our society, some steps shown in the following figure will be embodied. There are 3+1 steps to generate social benefits based on safety & security. For each steps, industries or institutions have their own role in this model.

- ***Safety (Step 1)***
  Safety can be determined by quantitative assessments. Fundamental research works can broaden this field (e.g. disaster mechanism).
- ***Security (Step 2)***
  When the companies and institutions bring the safety-applied products to the market or implement them in the society, reliability of the products should be examined and developed in the industrial field. So, this area would be extended by Research & Development works.
- ***Benefit (Step 3)***
  Benefits come from a result of implementation of safety and security technologies and knowledge. In some cases, kinds of communication with stakeholders (e.g. governance, consensus) will be necessary. Moreover, in order to provide the benefit continuously, the producers need to maintain their products (management).
- ***Investment (Step +1)***
  Some of benefits would become "investment". It would be utilized for developing new technologies/knowledge, therefore it drives the model process again.



Social benefit generation steps based on safety & security (Boxed: My own experience)

What I experienced (in the program and research activity)

- *<Safety>* ***Safety research on automation (Human Factors / Resilience Engineering)***
  - My research theme is focusing on "Human-Computer Interaction" to prevent accident by "mismatch" between human and computer in highly–automated systems. (e.g. airplane, highly-automated vehicle, etc.)
  - I have learned about disaster topics, including prevention/mitigation in G-Safety program.
  - → I can now recognize what risks exist among a system and facilities more than before.

- *<Security>* ***Self-planned project***
  - I had run "Science, Technology & Society (STS) Workshop" twice (2015, 2016) with program members.
  - In 2016, I managed international workshops for high school students as the project leader.
  - → I can now recognize that STS has significant role to implement anything to our society.
    (e.g. investigating stakeholders' feelings of security, social acceptability etc.)

Photos of STS workshops (2016)

- *<Benefit>* ***Super internship & Lectures***
  - I had joined a foreign insurance company as an intern for a month to experience "Benefit" step.
  - I have learned about management in my department (Management Science and Technology).
  - → I can now understand why (risk) management is important for sustainability.

Summary & Future vision to my career

- A model of benefits generation process based on safety and security can be proposed by my experience of G-Safety program and research activity.
- According to this model, I have experienced and learned each steps (Safety, Security, Benefit)
- Sometimes, although safety and security contradict benefits, I would like to be a leader who can manage safety and security getting the benefits in the future.

My Impact Received from the G-Safety Program

「グローバル安全学トップリーダー育成プログラム」から受けた影響

Yoko Kurita(Inter-Graduate School Doctoral Degree Program on Science for Global Safety, Tohoku University)

In 2015, I joined the G-Safety program **to extend my horizons** of the world.
I am approaching **global human resources** through variety of experiences.

Cooperation with the world

◆ Many lectures which are different from my major (cultural anthropology).
- ✓Risks of natural/human disasters
  →I began to considering about disaster from various perspectives.
- ✓How to become a leader
  →What I need to be a leader: having a vision, foreseeing the future, sympathizing with people.
- ✓Global communication skills: How to explain my research in English.
  →I began actively joining international conferences.

I learned **over-viewing** and **international sense** through these lectures.

Collaboration with other students

"Self-planed project": Students in the G-Safety program can establish projects relating risks and safety by themselves.

◆ Preparation and verification of manual guidelines for management of temporary housing (since 2015)
**I am a leader of this year*

Our goal
To tell the lessons about management of temporary housing learned from the Great East Japan Earthquake in 2011 to other regions.
The feature
Collaboration with other leading programs' students (University of Kochi and Osaka University).
Activities
- ✓ Interviewing to six affected local governments
- ✓ Making case studies
- ✓ Excursions in Kumamoto prefecture (October 2016) and Kochi prefecture (October 2017)

◆ Global News Seminar (since 2016)

Our purpose
Discussing world issues, especially human disasters, with students of various majors.
We cherish to think "what caused the matter" and "how we solve the problem".
Activities
- ✓ Learning the mechanisms of the problems
- ✓ Discussing about the solution

I improved **ability of problem setting** and **leadership** through those activities.

Increase of motivation to my doctoral research

My doctoral research is "Modernization in Bhutan", and I am studying about "Bhutanese technical intern trainees" in Japan.
I am inspired from discussions with students and my advisors of the G-Safety program.

I learned **communication skill** and **sense of ethics** to my research.

I will be "Confeito-type" human resources soon!

"Confeito-type" human resources

What I learned to be an international leader
世界で活躍するリーダーとなるために学んだこと

Ryosuke Kaneko
Inter-Graduate School Doctoral Degree Program
on Science for Global Safety, Tohoku University

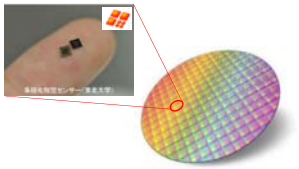
INTERNATIONAL LEADERS

International leaders are people who have an ability to solve social issues with people from various countries and specialty

RESEARCH FIELD

MEMS (Micro Electro Mechanical Systems)

Small sensors
= Low cost
= Large productivity
= Low power consumption
= High level technology



iPhone5

Example: MEMS in iPhone

- Acceleration sensor
- Gyro sensor
- Electric compass
- Microphones
- Acoustic filter

Key device for
IoT
(Internet of Things)

Experience at G-safety program

Ⅰ. CREATION OF NEW SOLUTIONS WITH STUDENTS FROM DIFFERENT SPECIALITIES

Set clear problems & goal

Knowledge	+	Situation	Risks ⇨	Disaster mitigation
・Mitigation actions ・Tsunami warning		・People around? ・Close to the sea?		・Go higher place ・Appeal people to run

This process is difficult for **junior school and junior high school students**.
How can we train these students to promote thinking in disaster situation?

Discussion with students (from Disaster, Science, Literature dep.)

Making ideas from wide field + Everyone joins discussion + Find new things & ideas

Solution

27 cards
for quick response to disaster

Disaster Mitigation Action Card game (DMAC)

- Teaching material to promote **quick thinking** in disaster situation
- Simple rules & Questions
- **Share disaster mitigation ideas** with other players
- Card design with **pictogram**

Ⅱ. EXPERIENCE AS A LEADER

Set vision & policy
What is our goal?
What are problems for the goal?
How do we solve the problems?

Leadership
Leading members to solve the problems

Scheduling
Management of original plan & progress

⇨ **DMAC FY2016**

- **Platform** of DMAC (Manuals, homepage)
- DMAC **for meteorological disaster**
- Questionnaire survey of DMAC **for foreigner student**

Manuals for beginner & disaster leaders

DMAC for meteorological disaster

Presentation at JPGU2016 (Journal in future)

Ⅲ. INTERNATIONAL COMMUNICATION

Research at Fraunhofer ENAS (Germany)
2015/04/01~08/31

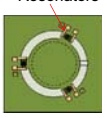
- Research of MEMS packaging technology
- Lecture of micro fabrication process
- **Different research & life style** from Japan
- Good chance to practice English skills

⇩

A confidence as a global research student

Doctoral research
New sensing principle of MEMS microphone for voice recognition

Sound detection in meter order!



Resonators

Phase 1: Verifying performance
Design ⇦
Fabrication
Evaluation

Phase 2: Optimization
Feedback phase 1
Reliability

German group leader

⇨ **Many situation to use English**
One of my group leader is German.
Report, discussion, meeting, …

Ⅳ. INTERNSHIP AT AN INDUSTRIAL COMPANY

OMRON
Keihannna innovation center
2017/07/10-07/28

- Sensor application for **factory automation**
- Experience of **R&D at a company**

⇩

- **Team work** (Collaboration and Communication)
- **Time management**
- **MEMS business from industrial point of view**

Future

HOW DO I CONTRIBUTE AS AN INTERNATIONAL LEADER?

Next society

Social issues

Energy, Medical & Hearth care,
Human source, big data & security, …

⇩

IoT, AI, robotics, big data
MEMS is a key device!

Today's situation

- Business of MEMS companies in Japan strongly depend on iPhone
- Foreigner start-ups grows rapidly (SiTime, Chirp, …)

MEMS based silicon oscillator (SiTime)

Micromachined Ultrasonic Transducers (Chirp)

What is a sensing of next generation?

- Solution for the today's social issues
- Knowledge & ideas from other field
- Collaboration with international leaders

⇨ **Innovation**

I would like to create a sensing system of next generation as an international leader

Leading Forum 2017 Industrial Leader

What is the flexibility that the leader should have?

リーダーに求められる柔軟性とは？

Shinji ISHIBASHI

Inter-Graduate School Doctoral Degree Program on Science for Global Safety
Department of Mechanical Systems Engineering, Tohoku University
Email: shinji.ishibashi.q2@dc.tohoku.ac.jp

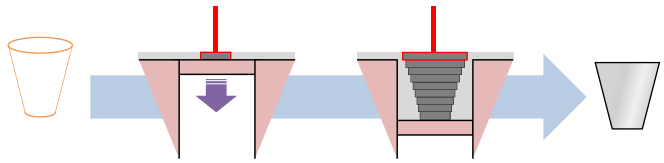
Flexibility = Knowledge combination

It is impossible to solve a complicated industrial issue with only one knowledge. Therefore, a person trying to solve the complicated issue such as a industrial leader has to not only have wide-range knowledge but also be able to combine the individual knowledge.

How to enhance my knowledge combination?

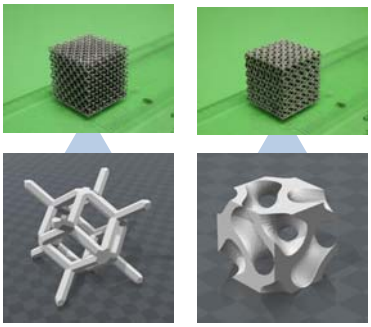
3D Metal Additive Manufacturing

SLM: Selective Laser Melting



CAD data — Sintering process — Product

Structures

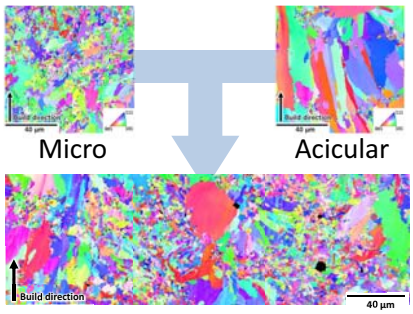


Lattice — Gyroid

Complex structure

The feature of SLM is to be able to create a complex structure which can not be fabricated using conventional process called removal machining like cutting, casting, or wrought. The left images shows two types of porous structures fabricated via SLM. Both structures are designed based on the basic structure called Unit Cell. Each Unit Cell is showed in lower image. By controlling the number and size of them, it is possible to achieve low elasticity modulus and weight reduction[1].

Microstructures



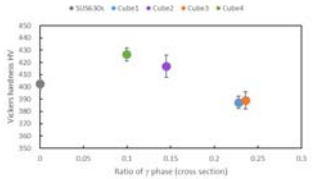
Micro — Acicular

Multi microstructure

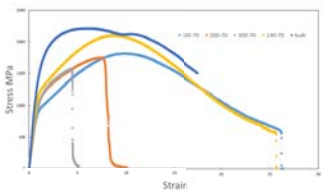
Texture control

It is known that the microstructure is closely related to the mechanical properties of metal products such as elasticity modulus, hardness, or yield stress. The left images show the cross section microstructures of SLM fabricated specimens observed by EBSD (Electron backscatter diffraction). Three specimens fabricated under various building conditions have different microstructures. If the microstructures will be controlled, we can create a graded structure whose mechanical properties change continuously.

Mechanical properties



Vickers hardness



Bend strength

Industrial Equipment

Medical



Implants

In a medical care field, inserting a medical implant in bone defect part caused by an accident or disease were carried out for improving a patient QOL. However, due to the difference in the elasticity between a metal implant and living bone, decreasing bone density is occurred around a metal implant. The phenomenon called stress shielding[5]. In order to prevent this problem, a metal implant containing pores adequately is fabricated via SLM to reduce its elasticity modulus.

Airplane

Jet engine parts

To improve fuel efficiency and safety, the parts or materials adopted into jet engine are developed to have higher heat resistance, strength and longer fatigue life. Additionally, reducing weight or the number of components are also desired. SLM or other metal additive manufacturing method have attracted attention from various companies as a innovative method advancing that desire. For example, in the case of General Electric Company (GE), a fuel nozzle of a jet engine manufactured by metal 3D printing achieved reduction in the number of parts, weight reduction and also improvement of fuel efficiency[8].

G-Safety

Student project

Global News Seminar

I belong Global News Seminar, a student project of G-Safety. Because this project focuses on the importance that a researcher should be concerned with global issue like a terrorism, refugee, trade, election, etc., we discussed the theme, “Propose a joint research project to avoid/prevent war”. Thorough the discussion, we learned that our paper or achievement always have possibility not only to contribute a human society but also to be misused to harm someone.

What is the flexibility for the leader?

The flexibility is having the ability to combined various high-level knowledge. It is the most important value for the industrial leader because a industrial issue will be more and more complex.

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8. https://www.ge.com/reports/mind-meld-ge-3d-printing-visionary-joined-forces/
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10. http://www.nature.com/nature/journal/v482/n7384/images/482156a-i1.0.jpg
11. http://www.kayakujapan.co.jp/sale/img/photo_dynamite2.jpg

東北大学

グローバル安全学トップリーダー育成プログラム

取組例　人・社会・学問の多様性をテーマとした研修や講義の実施

【研 修】スタンフォード大学とのリスク・安全・安心・不平等をテーマとしたサマースクール

- 性別、国籍、人種、民族、宗教、性的指向などの社会階層と不平等の問題を学ぶ。
- アメリカでの滞在を通して多文化理解を深めるグローバルな環境
- 文系と理系の様々な学問分野を専門とする学生・教員が参加する異分野交流環境

➢ 発表・議論により、社会の様々な社会階層と不平等の問題や関連を多面的に理解する。

【講 義】社会の多様性を踏まえた災害対応を実践に活かすための講義

- 災害における宗教やジェンダーの問題を学ぶ。
- 問題の歴史的・文化的背景を学ぶ。
- 子ども、高齢者、障がい者、多様な性、マイノリティにも関心を持つ。

➢ 講義・議論により、災害時の問題が平時の人と社会の多様性の問題に起因することを理解する。

効 果

- 様々な個人の集まりとしての社会を学び、専門とする学問分野が対象とする人や社会に対する認識が変化した。
- 多様なバックグラウンドの人々を受け入れる重要性を理解し、技術者として多様性を踏まえた社会の構築に貢献する意識を持つようになった。

Inter-Graduate School Doctoral Degree Program on Science for Global Safety

Tohoku University

Example

Training and Lecture about Diversity of People, Societies, and Academic Disciplines

【Training】Summer School under Themes of Risk, Safety, Security, and Inequality with Stanford University

- Learn problems related to social stratification and inequality such as gender, nationality, race, ethnic group, religion, and sexuality.
- Global environment to understand cultural diversity through the stay in the U.S.
- Interdisciplinary environment

➢ Understand various problems and relations of social stratification and inequality in society from various aspects through presentations and discussions.

【Lecture】Basic knowledge to put disaster responses in diverse society into action

- Learn problems related to religion and gender in disasters.
- Learn their historical and cultural background.
- Expand interests in children, elderly people, disable people, various sexuality, and minority.

➢ Understand that problems in disasters come from diversity problems of people and society in peacetime through lectures and discussions.

Outcome

- Students learned society consisting of various people and changed their recognition of people and society as objects of science and engineering in their own majors.
- Students understood the importance of acceptance of people from various backgrounds and raised their motivation to contribute to building diverse society as engineer.