

CENTER FOR ENVIRONMENTAL INNOVATION DESIGN
FOR SUSTAINABILITY, OSAKA UNIVERSITY

Newsletter

August, 2014

No. 6

CEIDS Newsletter No. 6 brings you the latest information on international and social/university collaboration being pursued at CEIDS. Our coverage includes a visit to the Massachusetts Institute of Technology (MIT), where we interviewed faculty members, and a review of the collaborative research we are conducting with Suita City. This issue also contains articles about some unique educational programs, including lectures for graduate students and basic seminars for undergraduate students at the Co-creative Design Laboratory for Sustainability of CEIDS. Take a look inside to learn more about the various research and educational activities taking place at CEIDS.

1. A Visit to MIT: A Dialogue on Educational Programs

In its advanced subprogram “Environmental Innovation Design for Sustainability”, the Center for Environmental Innovation Design for Sustainability (CEIDS) nurtures people to become leaders in environmental innovation. These leaders have panoramic and constructive understanding of a variety of academic disciplines relating to environmental and energy solutions, and achieving sustainable societies. As such, they can answer social needs and visions with appropriate scientific and technological seeds. The subprogram goes beyond courses with a classroom focus and aims to be practical by helping students grasp the heart of an issue while giving them specialized knowledge and comprehensive scientific understanding. In this manner, we develop in them the capacity to find solutions. A good example is Practice of Environmental Innovation Design, a course that teaches students practical methodologies for extracting issues from

specific regions and fields, and finding solutions for themselves. The course Sustainability D-lab, begun in 2014, actually puts students into the field as part of efforts to find solutions for revitalizing farming and mountain villages.

Universities outside Japan are also developing



Mr. Victor Grau Serrat of D-Lab explains research being done there

1. A Visit to MIT: A Dialogue on Educational Programs

(2)

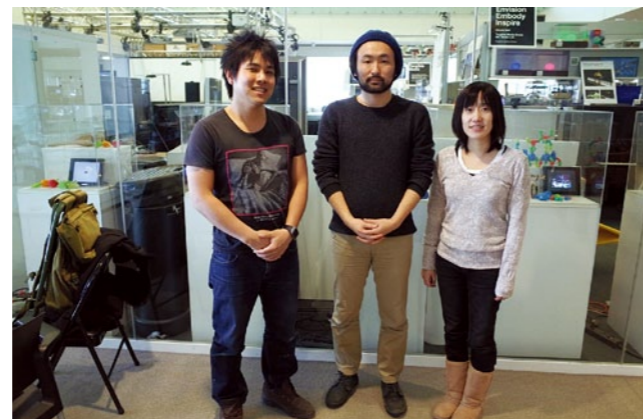
educational programs that send their students into the field in order to find regional solutions. Students in these programs learn methodologies for finding solutions by gathering a variety of real-world experiences. In recent years, MIT has gained the global spotlight for its pioneering work in practical education programs with a focus on finding solutions. For this reason, Assoc. Prof. Keishiro Hara of CEIDS and Asst. Prof. Kazutoshi Tsuda of the Creative Design Studio on Technology, Graduate School of Engineering paid a visit to MIT on March 4 and 5, 2014, where they observed a number of their programs related to practical and interdisciplinary educational and research activities. While there, they also interviewed and enjoyed conversations with MIT personnel in the hopes of soliciting suggestions for CEIDS' own education and research programs.

Our staff specifically interviewed personnel associated with three MIT interdisciplinary programs: the D-Lab, Media Lab, and Energy Initiative. They also caught up with Emer. Prof. Jeffrey I. Steinfeld, who previously served as a guest lecturer at Osaka University. Prof. Steinfeld had planned and implemented a sustainability education program at MIT for many years. During his interview, he and our staff discussed the current state of and outlook for interdisciplinary research and education at the two universities. A brief summary of the interview may be found below.

D-Lab (<http://d-lab.mit.edu/>) is an educational program dealing with appropriate technologies in the context of international development and with the development of solutions for achieving regional sustainability. The "D" in the name stands for a number of concepts, including "Development", "Dialogue", "Design", and "Dissemination". We spoke with co-director Victor Grau Serrat at the D-Lab office. Amy Smith, who is currently the other co-director, established D-Lab in 2002. The lab was launched out of the awareness of a problem. Namely, university research and educational activities were not leading to solutions to the social problems faced by people in underdeveloped countries.

The primary mission of the lab is to nurture

international networks among innovators and create and disseminate technologies for ending rampant world poverty. "Innovators" as used here includes university researchers, nongovernment organization (NGO) and non-profit organization staff members, local engineers, and even children. Several guidelines were decided upon for achieving this mission. One guideline is to propose technical solutions for people currently living in poverty, such as those living on no more than \$3 per day. The program works by bringing students from all over the world with all sorts of specialties together to work collaboratively and come up with proposals. Another feature of the program is that students learn through on-the-ground experience. More specifically, they go on field trips, becoming part of the region and community that they are studying and actually living in the area. During this time, they work to develop appropriate technologies through a process of co-creation with local partners. Through these activities, students learn methodologies and strategies for finding solutions to local problems. The program is designed to teach these skills through actual experience. Some of these activities have resulted in student-led ventures and business start-ups. The D-Lab program has much in common with the educational and research approach of CEIDS, which aims to find strategic connections between social issues (needs and visions) and research seeds. Our visit to the lab yielded some important suggestions for developing and improving our educational program.



Together with Japanese students studying at the MIT Media Lab

1. A Visit to MIT: A Dialogue on Educational Programs

(3)



Talking with Dr. Amanda C. Graham of the Energy Initiative



A talk with Emer. Prof. Jeffrey I. Steinfeld

Media Lab (<http://www.media.mit.edu/>) is an interdisciplinary and future-oriented research facility located in the MIT School of Architecture + Planning. In recent years, the Media Lab has become known in part because its Director is the venture capitalist and businessperson Joi Ito, who is joined by computer researcher Hiroshi Ishii as Associate Director. Each year, approximately 150 graduate students and more than 200 undergraduates take part in research here. On our visit, we talked with Akane Sano and Dan Sawada, two students from Japan working as research assistants.

One of the major features of Media Lab is that it cultivates interdisciplinary research, and one major element of this is the project format used. Currently, 25 research groups are pursuing more than 350 projects of various types. Many of the students are involved in more than one project at any one time. Researchers involved in Media Lab must have the ability to coordinate these multiple projects while pursuing creative research with other researchers and engineers. The lab uses a number of methods to bring researchers from a variety of specialties face to face. For example, participants are offered a free lunch every other week. These lunches provide an important forum that allows researchers to engage in dialogue in a relaxed environment. Another feature of Media Lab is the unique university-industry collaboration consisting of a group of nearly 80 companies that make up its member community and provides most of its independently funded annual

budget. This arrangement also benefits the corporate members in several ways. Media Lab continues to produce creative and influential research results because of its interdisciplinary nature and unique university-industry collaboration, and because of its active effort to brand itself in the eyes of the outside world.

We also visited the office of Dr. Amanda C. Graham, Director of the Education Program for the Energy Initiative (<http://mitei.mit.edu/>) where we interviewed her about the program philosophy, the nature of its current educational program, and how the educational program connects to research activities. The Energy Initiative started in 2006 as an interdisciplinary energy research, teaching, and practice platform transcending the boundaries between different school departments. It pursues three main activities: providing an educational program, conducting research, and running a practical program on campus (the Campus Energy Program). Participating faculty members all belong to different school departments, but form loose partnerships with each other to pursue interdisciplinary research.

On the education side, the Energy Initiative offers a graduate-level minor program in energy studies that is open to students throughout MIT. The core curriculum in the minor program consists of three domains: Energy Science Foundations, Social Science Foundations of Energy, and Energy Technology / Engineering in Context. Students take the core curriculum and also choose from among 24 elective courses. While

1. A Visit to MIT: A Dialogue on Educational Programs (4)

technological seeds and scientific and engineering theory are core parts of the program, students also receive a strong foundation in the social sciences. Moreover, the program is intended to develop a new generation of leaders who can use both their broad outlook and areas of specialization in order to address energy problems as a social issue. During our visit, we talked with Dr. Graham on such topics as designing a system for pursuing interdisciplinary educational programs and picked up some valuable suggestions for the educational program at CEIDS.

Our MIT visit also gave us a chance to meet and exchange information with Emer. Prof. Jeffrey I. Steinfeld for the first time in quite a while. Prof. Steinfeld, who originally specialized in chemistry, had spent time as a guest lecturer at Osaka University. Although currently an emeritus professor, he still finds time to come to his university office several times a week. Prof. Steinfeld, who has been involved in the MIT

sustainability and environmental education program for a long time, played a central role in advancing sustainability education and environmental research at MIT. We updated the professor on educational and research activities now taking place at CEIDS and traded views from various perspectives on the outlook for sustainability research, education, and interdisciplinary educational programs at the two universities.

During our visit and interviews, we learned that the two institutions' approaches to interdisciplinary education and research have several points in common, and we were greatly encouraged by our visit. We are looking forward to continuing to build our network and use it to further develop CEIDS' educational programs and related research.

(Keishiro Hara, Associate Professor, CEIDS)

Kazutoshi Tsuda, Assistant Professor, Creative Design Studio on Technology)

2. Report from Annual Meeting of the Japan Society of Energy and Resources

The 33rd Annual Meeting of the Japan Society of Energy and Resources was held at International House, Osaka June 10 and 11, 2014, which happened to be shortly after the April 11 decision by the Japanese Cabinet to adopt the Basic Energy Plan. Thus, there was plenty of discussion about Japan's new energy policy and energy systems in the aftermath of the Great East Japan Earthquake and the accidents at the Fukushima Daiichi Nuclear Power Plant of Tokyo Electric Power Company, Inc. (TEPCO). The meeting offered 77 presentations, including two special lectures and 75 regular sessions. The following is a brief overview of some of the presentations based on the author's recollection:

In the first special lecture, Prof. Hajimu Yamana, Professor at the Kyoto University Research Reactor

Institute (KURRI) and President of the International Research Institute for Nuclear Decommissioning (IRID), gave a talk entitled "The initiative to decommission the Fukushima Daiichi Nuclear Power Plant." Right now, TEPCO is trying to deal with contaminated water at Fukushima Daiichi, even though problems relating to the decommissioning have become hot topics worldwide. Prof. Yamana's presentation provided an update of the current measures to deal with contaminated water along with a roadmap for extracting the fuel debris (melted fuel) at the stricken plant. The professor indicated that it would take about 40 years or more to extract the fuel debris, dismantle the reactor facilities, and ultimately decommission the power plant. In the second special presentation, Prof. Shigeru Miyashita, Professor at the Fisheries Laboratory of Kinki University, spoke

2. Report from Annual Meeting of the Japan Society of Energy and Resources (2)

on the topic of "Cultivating the ocean: The world's first successful complete-cycle aquaculture of Pacific blue fin tuna." The university is deploying their tuna under the brand of "Kindai Maguro" (literally, Kinki University tuna). Two restaurants with "Kinki Daigaku Suisan Kenkyujo" (Kinki University Fisheries Laboratory) in their name and serving *Kindai Maguro* are now open: one in Grand Front Osaka located near the central station of Osaka and the other in Ginza, Tokyo. Both are reportedly constantly fully booked. In his speech, Prof. Miyashita recounted 32 years of trial and error experimentation; from the time the research began on the complete-cycle aquaculture of *Kindai Maguro* until it was successful. During those years, he and his fellow researchers faced a number of difficulties. In each case, they analyzed the problem until they found a solution and achieved their objectives. Perhaps the underlying factor of this achievement was the *shared tenacity* across all the generations of researchers.

The regular sessions touched upon an expansive range of topics: transportation; energy policy; resources and waste; global warming; natural forms of energy; consumer, workplace, and international energy supply and demand; heat pumps and environmental problems; solar energy; energy conservation; the economics of energy cogeneration; power systems; regional energy demand; home energy; energy storage; and reforming the energy market. There were three presentations given by CEIDS staff (fulltime and concurrent), including the author, as discussed below:

1. Yutaka Nomaguchi, Hiroki Tanaka, Akiyuki Sakakibara, Kikuo Fujita, Yusuke Kishita, Keishiro Hara, Michinori Uwasu, "Design and Evaluation of Scenarios in Cooperative Planning of Subsidy Systems and Power Grids toward Building Distributed Energy Systems - Case Study of Mishima Area, Osaka -, *Proceedings of the 33rd Annual Meeting of Japan Society of Energy and Resources, (2014), pp. 31-34.*
2. Keishiro Hara, Michinori Uwasu, Yusuke Kishita, Hiroyuki Takeda, "Electricity and Gas Consumption

Patterns and Saving Perceptions - Time-series Analysis in Suita City, Proceedings of the 33rd Annual Meeting of Japan Society of Energy and Resources, (2014), pp. 303-308.

3. Yusuke Kishita, Naoto Kurahashi, Naoki Iwai, Shinichi Fukushige, Yasushi Umeda, Yohei Yamaguchi, Yoshiyuki Shimoda, "Scenarios of the Electrical Grid in the Kansai Region in 2030 - Analyzing Influences by the Diffusion of Photovoltaics and Electric Vehicles, *Proceedings of the 33rd Annual Meeting of Japan Society of Energy and Resources, (2014), pp. 297-300.*

The first two presentations listed above were reports on collaborative research by Suita City (Osaka Prefecture) and CEIDS. The first concerned diffusion of photovoltaic (PV) systems, while the second was about consumer energy conservation behavior. The third concerned research performed as part of a Ministry of Economy, Trade and Industry (METI) project. Each presentation appeared to pique the interest of those attending, as there were quite a few questions afterwards. The attendees were not necessarily engineering specialists. Researchers from the fields of economics and policy science also attended and asked questions from a variety of perspectives. For example, in the first presentation listed above, there was a discussion about consumer preferences in respect to PV installation, as well as the impact that separating the functions of power generation and transmission would have upon PV diffusion. These discussions reminded us the importance of understanding how technology and society interact when designing energy systems, or any other system. This point also came across during the meso-level research that CEIDS has been practicing. We left the event with a greater awareness that applying research findings, such as those reported at this meeting, in actual society (in other words, social implementation of the research results) will be among our next major challenges.

(Yusuke Kishita, Assistant Professor, CEIDS)

3. CEIDS and Suita City Begin “Collaborative Research on Environmental Innovation”

In June 2014, CEIDS and Suita City began their “Collaborative Research on Environmental Innovation.” Researchers from Osaka University and employees and policymakers from Suita City are now meeting regularly to discuss the city’s environmental policies and various issues. The objective is to help the city draft policy and build its vision for the future.

Up to now, CEIDS has worked to strategically tie promising scientific and technological seeds to social visions, such as achieving a society that is low-carbon, recycling-based, and safe and secure. To accomplish this, we pursue what we call “meso-level research”, by which we mean research intended to promote environmental innovation. We believe that it is very important to work with the regional community and society to advance this new level of research. For that reason, CEIDS and the Suita City Environmental Bureau signed a memorandum to confirm collaborative research on environmental innovation in 2013. Under this arrangement, the two sides have pursued a variety of partnerships and exchanges, such as hosting joint symposiums and using the city as the venue for meso-level research. The recently begun collaborative research represents another step forward in such exchanges, as it is an effort in “cooperative knowledge creation” between a university and local government. Collaboration between researchers and policymakers for common objectives (such as finding solutions

and creating visions) and mechanisms and practices designed to let each side accumulate knowledge for finding solutions have been very limited up to now, despite the great need for them. CEIDS has begun a new undertaking intended to put such mechanisms in place.

About once every two months, Suita City will share some specific policy issues with the center. The two sides will also present relevant research to each other and discuss the issues from a number of angles. The first joint research meeting took place on Tuesday, June 24, at Suita City Hall. Osaka University sent CEIDS faculty and Graduate School of Engineering Assoc. Prof. Yutaka Nomaguchi, among others, while Suita City sent City Hall staff from various departments, including the environmental and roads and parks bureaus. The two sides enjoyed a spirited discussion. Assoc. Prof. Nomaguchi gave a presentation entitled “Research on writing and evaluating scenarios for the diffusion of distributed energy: a case study on the Mishima area of Osaka Prefecture” in which he covered a number of topics, including policy and technology options that Suita City should consider based upon his analysis of scenarios for the renewable energy diffusion. Representatives from the city presented their views on current high-priority policy issues such as dealing with the heat island effect, and other items that need to be considered.



A CEIDS/Suita City collaborative research meeting (Suita City Hall)



A presentation by Graduate School of Engineering Assoc. Prof. Yutaka Nomaguchi

3. CEIDS and Suita City Begin “Collaborative Research on Environmental Innovation”

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The second joint research meeting is due to take place on Monday, August 25 at the Suita Campus of Osaka University. CEIDS faculty and Suita City employees will take part to discuss “convenience and community development”. The two sides hope to continue holding research and discussion meetings with a specific theme for each session. The theory is that, by working together, Osaka University researchers and Suita City employees can produce results that lead to a vision for a better Suita City.

Researchers have had opportunities in the past, through mechanisms such as councils of governmental

bodies, to get involved in solving national and regional policy issues. Now, however, on top of these traditional mechanisms, new initiatives are needed to help local governments formulate visions and find solutions for social problems. Those mechanisms must specifically include collaborative research and work by all types of stakeholders, including researchers. It is our hope that the collaborative research that CEIDS and Suita City have begun will become a model for such new collaborations.

(Keishiro Hara, Associate Professor, CEIDS)

4. Community Development Innovation

Starting this academic year, CEIDS offers courses for graduate students at the Co-creative Design Laboratory for Sustainability of CEIDS at Grand Front Osaka. In the first semester, we offered the course Community Development Innovation. This course, taught by lecturers from the university and beyond, introduced how community revitalization and urban management are perceived from various points of view, including enterprise/government/university and business/management/research. At the close of the lecture series, a workshop was offered on the theme of “Thinking about Community Development in Osaka and Phase 2 at Umekita.”

The first lecture touched on current city conditions and how they came about, as well as initiatives being taken to revitalize the community. The lecturers were Prof. Atsuko Kaga of Osaka University and Asst. Prof. Hiroyuki Takeda of CEIDS. The second lecture concerned business improvement districts (BID), which are attracting attention, especially in Osaka City, as a new method for area management. Prof. Kaga gave an overview of BIDs and Mr. Yasuo Tatsumi of the Osaka City Urban Planning Department talked about the Osaka City Area Management Activity Promotion Ordinance,

established this year. In the third lecture, Mr. Mitsuhiro Matsuzuka of the Kansai Electric Power Co., Inc. and Asst. Prof. Hiroyuki Takeda of CEIDS gave concrete examples of recent community development activities in central urban areas by private enterprise, as well as housing development that fosters community spirit. In the fourth lecture, Mr. Taiki Toriyama of Bird Design House, who is involved in regional branding strategies that rely mainly on graphics, talked about how citizen initiatives can develop into community development. Prof. Nobuhiko Matsumura of Ehime University talked about his onsite research into citizen initiatives for area design. At the fifth and final lecture, Mr. Hiroyuki Uematsu of Hankyu Railway, a company involved in the development of Grand Front Osaka, was joined by Mr. Yuji Suzuki of Grand Front Osaka TMO, who currently oversees area management at Grand Front Osaka. Their talk included a site visit.

During the sixth and seventh sessions, students took part in a workshop in which they considered future community development in Osaka and the Kansai region, using what they had learned from the lectures. Then, they discussed what concepts should guide development of the Umekita neighborhood in its second

4. Community Development Innovation

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phase. The class was then divided into two groups, each with a mix of student types (liberal arts/science, Japanese/international students). Some members were a bit perplexed, but both groups had lively discussions. I think especially for the Japanese students, the fresh viewpoint and ideas of the international students gave them a good opportunity to reconsider Japanese community development and consequently Japanese culture and ideas.

In the second semester, CEIDS will offer omnibus-style lectures on “Society and Energy” at the Co-creative Design Laboratory for Sustainability. See the syllabus for details. In closing, I would like to express my thanks to all the lecturers who helped with the course.

(Hiroyuki Takeda, Assistant Professor, CEIDS)

Theme and lecturers for each session

#1	June 6 (Fri.) 18:00-21:00	A Sustainable Urban Structure Prof. Atsuko Kaga, Osaka University Graduate School of Engineering Asst. Prof. Hiroyuki Takeda, CEIDS, Osaka University
#2	June 13 (Fri.) 18:00-21:00	Town Management for Community Revitalization Mr. Yasuo Tatsumi, Osaka City Urban Planning Department Prof. Atsuko Kaga, Osaka University Graduate School of Engineering
#3	June 20 (Fri.) 18:00-21:00	Community Revitalization and the Real Estate Business Mr. Mitsuhiro Matsuzuka, Kansai Electric Power Co., Inc. Asst. Prof. Hiroyuki Takeda, CEIDS, Osaka University
#4	June 27 (Fri.) 18:00-21:00	Citizen-Led Community Development Activities Mr. Taiki Toriyama, Bird Design House Prof. Nobuhiko Matsumura, Graduate School of Science and Engineering, Ehime University
#5	July 4 (Fri.) 18:00-21:00	Community Revitalization in Umekita Yuji Suzuki of Grand Front Osaka TMO Hiroyuki Uematsu of Hankyu Railway
#6	July 11 (Fri.) 18:00-21:00	Workshops Thinking about Community Development in Osaka and Phase 2 at Umekita
#7	July 18 (Fri.) 18:00-21:00	



The first lecture at Co-creative Design Laboratory for Sustainability



Explanation of area management initiatives at one site (fifth lecture)

5. Basic Seminar Held: The Environment and Global Sustainability as Seen in Cities and Rural Communities

CEIDS held a basic seminar for first-year undergraduate students entitled “The Environment and Global Sustainability as Seen in Cities and Rural Communities” August 6 to 8 on the Toyonaka Campus. To deal with sustainability problems, it is important to have a comprehensive view of a variety of phenomena, since these problems deal with the environment, social economics, and many other sorts of issues. This course consists of lectures that provide a panoramic view of sustainability from the perspective of urban cities and agricultural communities, the environment and social economics, and global (world) and local (Japan) viewpoints, as well as group work during which students come up with their own suggestions for selected issues based on their own research.

This year’s event drew participation from 24 students, including two senior high school students, as well as undergraduates from the schools of Foreign Studies, Law, Economics, Science, Human Sciences, Letters, Engineering, and Engineering Science. The students broke up into five groups to work on the themes of sustainable cities, poverty reduction, and depopulation. After the students received a basic overview and perspective in the classroom on sustainability and problems of the environment and poverty in cities and agricultural communities, each group was asked to pick a problem and recommend solutions. Because the group members had different areas of expertise, their own interests and awareness of conditions were different. After reading up on the issues from the Internet, printed reports, and other materials, the students held energetic discussions of what is important in terms of sustainability, and how the issues can be addressed. As they did so, they put together PowerPoint presentations. While some groups struggled to make progress, in the end, everyone, including the senior high school students, gave their own presentations, which were followed by spirited question and answer sessions.

Although this basic seminar has now been held for three years, each year it is a matter of trial and



Group work



A question-and-answer session after a presentation

error to figure out how to present such a broad theme. For many students, this seminar is their first time even to hear the word “sustainability”, but the group work and all-group discussions appear to give them a sustainability perspective on poverty in industrializing nations, along with urban issues and depopulation in Japan’s semi-mountainous areas. Although each student will go on to pursue his or her own specialty, we hope that, as they go forward in their student life and academic career, they will remember the sustainability perspective that they learned during these three intensive days. In closing, we would like to thank the teachers who led the lectures and group work for their great effort.

(Michinori Uwasu, Associate Professor, CEIDS)

6. CEIDS Research 4: Research on Sustainable Forest Management in Partnership with Osaka Prefecture Forest Owners Association

The Cabinet of Japan adopted its Basic Energy Plan in April 2014, which gave a boost to renewable energy initiatives. However, in 2006, long before this plan had been formulated, the Ministry of Agriculture, Forestry and Fisheries (MAFF) had begun its Biomass Town Concept, which set forth a comprehensive system for using biomass. Under that system, concerned parties over a wide region would partner to form efficient processes, bringing together everything from the generation to the use of biomass. Presently, such initiatives are going forward in 318 zones throughout Japan, but many have gotten no further than the conceptual stage or failed to reach the implementation, evaluation, and re-implementation stage, and there have not been any particularly prominent successes. Thus, there would appear to be a number of implementation and sustainability-related factors that need to be resolved in projects that expect to use biomass. Implementation will require not only a conceptual examination of regional characteristics, policy, work efficiency, and local production for local consumption, but also a comprehensive understanding of a number of concepts, such as environmental burden and economics, in order to design scenarios for success. Moreover, one of the reasons that the concept has not been realized is the fact that theory does not always overlap with practice. It is well known how difficult it can be to commercialize the results of research and development, but it is extremely important to establish techniques that allow such results to start taking effect in actual society. For this research, researchers (the University) and business people (a forest owners association) set up a collaborative research organization designed to study the current state of biomass production on the ground and stakeholders in the local community. This allows any problems or advantages that they discover during the process of study, analysis, and evaluation to be immediately reflected as improvements and solutions. The knowledge learned from such analysis, trial, and reconsideration will be used to build a “woody biomass fuel diffusion scenario” in Takatsuki City, Osaka

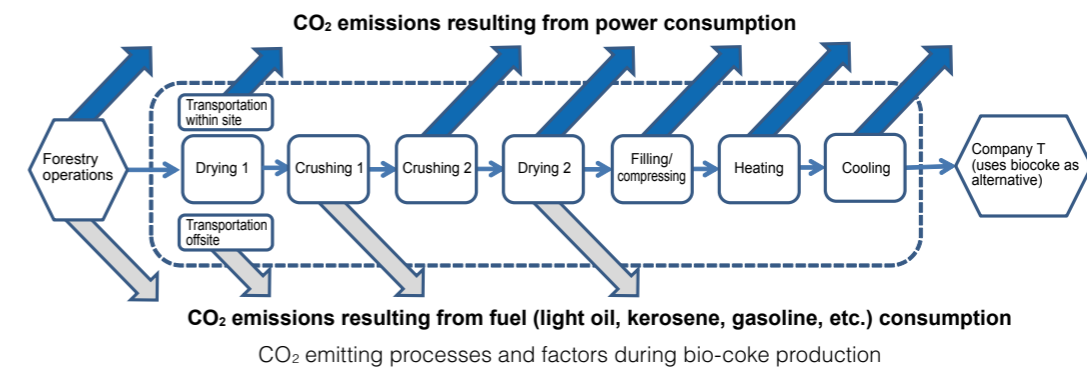
Prefecture. The objective of the research is to suggest a theory and mechanism for promoting efficient use of woody biomass regionally. The collaborative study with the Osaka Prefecture Forest Owners Association uses Takatsuki City as a case study for sustainable forest management. It began last fiscal year with the objective of both reducing environmental burden and achieving economic efficiency. The owners association is the only enterprise in Japan to produce bio-coke, or coke derived by heating and compressing biomass resources. The owners association is taking an advanced initiative in the field of woody biomass fuel diffusion.

Last academic year, the partnership conducted an economic evaluation of the project. It considered the economy and efficiency of forestry operations based on a comparison of actual income with maximum possible income. This year, to evaluate the environmental burden, it estimated the CO₂ emissions of producing woody biomass fuel (bio-coke and pellets) in Takatsuki City. The results were compared with emissions from using fossil fuels to determine how much the environmental burden could be reduced. The figure shows the processes and factors involved in CO₂ emissions during bio-coke production. The researchers have also interviewed a business using bio-coke in place of fossil fuels (conventional coke derived from coal). Based on this interview, they are learning how much of each fuel is being used, how far it is transported, and the implementation status of alternative fuel. From this, in turn, they are calculating how much actual CO₂ reduction results from the use of the alternative. Comparing CO₂ emissions derived from the production and transportation of woody biomass fuel and CO₂ emissions resulting from use of the alternative, the project is specifically quantifying the reduction of environmental burden resulting from the use of woody biomass fuel.

At present, only one business is purchasing and using bio-coke as an alternative to coke made from coal. Moreover, since most of the unused material that provides the raw material for bio-coke comes

6. CEIDS Research 4: Research on Sustainable Forest Management in Partnership with Osaka Prefecture Forest Owners Association

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from thinned wood obtained from owners association operations, bio-coke cannot be said to significantly promote the use of unused wood resources over the region as a whole. If the environmental burden reduction effect of bio-coke could be clearly shown, it would likely cause enterprises to consider using it, and then the economic merits of the fuel would likely lead to actual use. Naturally, if the number of businesses using bio-coke were to increase, it would also encourage forest maintenance in the region and revitalize related industries such as distribution. Thus, this research seeks to stimulate the creation of both a recycling society and a revitalized regional economy by creating a mechanism for environmental measures based on regional partnerships.

- Keishiro Hara, CEIDS, OsakaUniversity
- Michinori Uwasu, CEIDS, OsakaUniversity
- Shuji Kurimoto, CEIDS, OsakaUniversity
- Koichiro Tsuge, Mishima branch, Osaka Prefecture Forest Owners Association
- Tateo Kita, Mishima branch, Osaka Prefecture Forest Owners Association

(Yukari Fuchigami, Project Researcher, CEIDS)



Unused wood, the raw material of bio-coke, is crushed

bio-coke

- List of main research members
Yukari Fuchigami, CEIDS, Osaka University

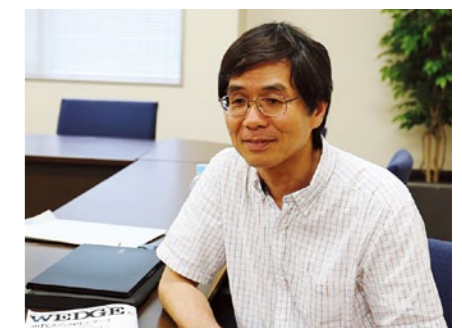
7. Researcher Interview No. 4, “Methodology and Practice of Future Design”

Prof. **Tatsuyoshi Saijo** (Professor, School of Management, Kochi University of Technology; Visiting Professor, CEIDS)

Visited: May 26, 2014

Visited by: Keishiro Hara, Yukari Fuchigami

Hara: Tell us about your specialty, and how your research themes have changed over time.



7. Researcher Interview No. 4, “Methodology and Practice of Future Design”

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The starting point of my research was when I was involved in mechanism design at the University of Minnesota. First, let me give you an overview of my research field as a whole. In the first half of the 20th century, there was a great deal of conflict over socialism (i.e., the question of whether capitalism or socialism is better). That debate led a number of researchers to begin research that treated institutions themselves as variables. One of those researchers was Prof. Leonid Hurwicz, who was a mentor to me. One of the key concepts for these researchers was “incentive”. Their intention was to build mechanisms capable of keeping people motivated while achieving societal goals like fairness and efficiency. Now that I am working with CEIDS, we talk about “intergenerational fairness”, but at the time we were not thinking about it at all. At first, the conversation was to create good conditions (a fair and efficient society) for the present generation and then create mechanisms so that people always have incentives. The initial result was an impossibility theorem called the Hurwicz theorem. If you ask why we use the term “impossibility”, it is because the aim was to fulfill incentive compatibility (acting in accordance with one’s own actual preferences) after first maintaining efficiency and fulfilling individual rationality (ensuring that things do not get worse than they presently are for the individual). However, it is impossible to create a society that fulfills incentive compatibility, in other words, a society where honesty is the best course of action. My field of research begins with the recognition that this is impossible. It says that it is not possible to create a good society easily. To give an example, a major topic at the time was the “competitive system”. Such a system fulfills both efficiency and individual rationality, but is incapable of fulfilling incentive compatibility. In light of this discovery, in its attempt to somehow create good mechanisms, the field of research moved in a different direction. Specifically, it decided to abandon the condition of incentive compatibility, the state in which honesty is best. This was because, in our society, we exchange such information as price and product specifications but preferences are not stated.

The new starting point for the research was the famous Maskin’s theorem, advocated by Eric Maskin in 1977. As I said, the original goal of this field of research was a system capable of keeping people motivated while achieving societal aims such as fairness and efficiency. This is possible if we actually design mechanisms for it. In other words, “if certain conditions are met, it is possible to create mechanisms such that societal aims can be achieved.” However, there was not sufficient proof of this theorem, so I affirmatively proved it by designing a new mechanism. I published my paper in 1988 in *Econometrica*. Based on my findings, Maskin formulated the basic theorem of mechanism design. In 2007, he received the Nobel Prize for Economics, together with Hurwicz and Roger Myerson. However, the mechanism was still complicated and mystifying to most, and was not so easy to implement in an actual society. Accordingly, I set about to create a more easily understood mechanism for achieving societal aims based more on economics, that is, price and quantity.

Hara: Can you explain to us concretely the aims you were trying to achieve?

This is economics after all, so at the very least, the mechanism must be able to achieve efficiency. One additional condition is that the mechanism must make things better than they are now for all people. I conducted numerous experiments during which I combined these two conditions with various other conditions. In the process, we in the field began to get the uneasy feeling that the mechanisms that we were creating looked good on paper but might not do so well in actual society. Therefore, we started to verify our theory by experimenting with human subjects. I had begun doing experiments with human subjects in the mid-1980s trying to prove the well-known Vickrey mechanism (named after the 1996 winner of the Nobel Prize for Economics), but my efforts did not go well at all. It really hit me that not even a well-known mechanism such as this one could be simply implemented in an actual society, and I wanted to build a mechanism that would go well in experiments while

7. Researcher Interview No. 4, “Methodology and Practice of Future Design”

(3)

remaining scientific.

After I started these verification tests, I learned something interesting. Similar experiments were taking place in various countries besides Japan, such as the United States, China, Mongolia, and South Korea. However, for some reason, only in Japan did we find a certain percentage of subjects with a unique behavior: they would get in the way of other people, even if it came at some loss to themselves. I was doing research on a project called “Are Japanese spiteful?” It turned out that such people were enough to alter the overall trend in Japan. For example, suppose that someone takes an unfair head start over others. In Japan, the moment other people see this happen, they block the person who got the unfair head start, even if it means incurring a disadvantage for themselves. When that happens, the person who attempted to gain unfair advantage learns that “free riding” will not work, and simply accepts that there is nothing to be done except cooperate fairly with others. In Japan, it is widely believed that humans are fundamentally depraved, but that if you step out of line, others will get in your way (or as we like to say, the nail that sticks out gets hammered down). For that reason, Japanese people strive to cooperate with each other. Or to put it conversely, the racial or national characteristics of Japan are better suited than others for dealing with problems of providing public goods (problems such as climate change and global warming).

Hara: Tell us how you started to incorporate environmental issues into your research.

After the Kyoto Protocol was adopted in 1997, I became a member of a project to design mechanisms related to it. That is when I began to learn a great deal about the environment. One of the major principles of the Kyoto Protocol was so-called emissions trading. With assistance from the Research Institute of Economy, Trade and Industry, we started to conduct verification tests to see how well such a mechanism would actually work. Our finding was that “if there is uncertainty about the future and investment is irreversible, emissions trading will not be very successful.” To give an

example, at the time the European Union (EU) had begun emissions trading. This was known as the EU Emissions Trading System. As soon as the details were disclosed quantitatively, the market reacted and the price of emissions credits dropped all at once. “Emissions trading market control” is now a very important research issue. After that, I went on to take a concurrent teaching post at the Osaka University Research Institute for Sustainability Science (the forerunner to CEIDS) in 2006. There, I became involved in researching energy resources with Prof. Yoshiyuki Shimoda of the School of Engineering, among others. One of our findings was that solar water heaters were substantially more effective than solar power generation for reducing CO₂ emissions. However, we also learned that even if you show people this, they tend to be more attracted to solar power.

Of course, I continue to do theoretical research on mechanism design now, not just research on environmental problems. In particular, I am working to create game models for solutions of social dilemmas and am testing these models with human subjects. I am also developing mechanisms that may be simple but appear likely to go well, and I am gradually seeing some success. It is all very fine if the mechanism works well in theory and experimentation, but it is still relatively abstract and it does seem to me that what I have developed deviates a bit from actual social conditions.

Hara: Right now you are a leader in Future Design research. Can you tell us about that?

The thing that made this research really take form for me was something that happened after a presentation I gave at the University of Massachusetts in March 2012 on the topic of social dilemmas. I was at a dinner party when the talk turned to a topic that philosophers and economists had been discussing. Namely, there are problems such that decisions we make today have a major influence on future generations, but those future generations cannot negotiate with us, because they do not exist yet. At the time, I suggested that perhaps

7. Researcher Interview No. 4, “Methodology and Practice of Future Design”

(4)

we should set up a group that exists in the current generation but which thinks only of future generations. I was told by the wife (Laura) of John Stranlund, a student of mine at the University of California, about the Iroquois Indians, who thought about the future in 1000-year units when they acted. I was greatly surprised to think that if we take the Iroquois as a case study, it may be possible for the present generation to negotiate with future generations. That was a major influence on me, and that is how my Future Design research was born. Another important factor was that some young researchers at Osaka University endorsed the idea of having people in the present generation who think only of future generations. That helped to form connections between older and younger researchers. Then, in April 2012, working with researchers from CEIDS at Osaka University, I started to develop a mechanism for creating a group that would exist in the present generation but think only of future generations. We called this mechanism the “Ministry of the Future”. Through it, we are endeavoring to design what the future should be, looking at it from a number of angles, such as problems of energy, water, population, the forest, and urban structure. Since then, we have changed the name to Future Design, and we are working on a project to sum it up in a book.

One point that I had not paid much attention to until this project began was the problem of markets. Markets allocate resources without any thought for future generations. When a market is a mechanism that freely steals resources from future generations, we need to bring it under control. That is, we need to develop methods and mechanisms for skillfully taming such markets. Let us take emissions trading as an example. To keep CO₂ emissions from exceeding some established amount, we have to use the market skillfully. Numerous people praise the “logic of market competition”. I am not refuting competition itself, but I feel that if we do not take future generations into account when we consider how future markets should act, the various conflicts between generations will not go away. Another major perspective is democracy.

I did some research into national constitutions from around the world and found that hardly any of them mentioned the terms “future” and “generations”. At the time that those constitutions were being framed, the intent was to create a democratic constitution in the wake of a democratic revolution. It was not a time to be thinking about future generations. However, we have now reached an age suitable for incorporating future generations into our political systems and constitutions. Government has to change, and our market mechanisms need to give way to something new. If we do not do so, we will not be well prepared to solve climate change or other environmental problems. Our concept starts with more than just penalizing those who emit excessive amounts of greenhouse gases, or conversely, rewarding those who omit little. Rather, the point is to change the entire world.

To take this discussion a little further, we are considering the idea of creating something like a School of Future Studies in universities as a mechanism for developing people who consider future generations. I do not know whether we can really create a society capable of achieving such things, but if things continue as they are now, there may well be a “revolution for the future” at some point. As climate change occurs and we start seeing flooding, drought, and famine close up, people will finally start to accept that things cannot be allowed to continue this way. I fear that there will be unrest, called a revolution. That is the reason we do the research we do.

Hara: So “future generations” is an important keyword for you.

I guess the story of the Iroquois Indians was a major influence on me. I was shocked to hear that there were already people who think seven generations ahead when they make decisions. I thought, “This is exactly what we are aiming for.” Actually, even before that, I had thought of the idea of creating something like a Ministry of the Future and developing people who think of the future, but learning about the Iroquois reinforced the idea and led me to step up the pace of this research.

7. Researcher Interview No. 4, “Methodology and Practice of Future Design”

(5)

There will be difficulties such as we have never faced before, for example, social conditions that interfere with sustainability. To deal with these problems skillfully and maintain sustainable conditions, we will have to design a variety of social systems that take the future into account. It is not possible for everyone to be a leader who acts with consideration for the future, so I think it would be a good idea to incorporate consideration for the future into social mechanisms from the very start. We have to create a mechanism whereby “people who think only of the future” can help to make decisions within society. How about, for example, a “House of the Future” in addition to the present House of Representatives? Unless some of the tasks aimed at considering the future are assigned to the political system, it is unlikely this function will ever take root, no matter how much concern people express about environmental problems and social conditions in industrializing nations. Right now must be the time to innovate by setting up a Ministry of the Future, House of the Future, or School of Future Studies. If we fail to do so, I cannot help but feel that the human race will not be able to continue.

In that sense, “Future Studies” would not mean a certain field filled by specialists. More than just a technical discipline, Future Studies would have to consider the viewpoint of future generations by bringing in a variety of perspectives, including economics and government. Of course, specialists will be necessary, but we also need to nurture numerous people who can see things comprehensively.

Hara: So it seems that, as a society, we need to see “future-thinking” as a type of career.

Yes, that is one of the issues that we are dealing with. There is no easy way to achieve things such as sustainability unless society as a whole creates that type of atmosphere. We should not just follow our leaders. Rather, we need to make leaders in our social mechanisms. Moreover, in our idea of Future Design, we are not trying to create leaders for a decade from now. We are trying to create people capable of thinking

about how leaders a decade from now will think. This is what the Iroquois were thinking so long ago. So I expect that there are others in the world who think the same way.

The Iroquois way of thinking contains roots of something other than Western democracy. The founders of the United States of America used plenty of Iroquois ideas, but the US Constitution itself does not contain the Iroquois notion of democracy. That is a terrible shame. If the US had adopted the Iroquois concept of democracy, the world would have changed even more. So now is the time to create a new mechanism that emulates the Iroquois and incorporates their way of thinking.

Hara: As a final question, tell us what you will be working on going forward in your Future Design research.

The mechanisms of Future Design cannot just be assembled logically. So I hope to verify them through rigorous testing. I hope to see the day when the Ministry of the Future and the School of Future Studies are born. But unless we build a society where these can be realized, we could end up having a destructive “revolution for the future” someday. This is a key issue going forward. I do not know whether it will happen in my lifetime, but I plan to work on building those social mechanisms that make it possible.

(Keishiro Hara, Associate Professor, CEIDS;
Yukari Fuchigami, Project Researcher, CEIDS)

8. Introduction of New Member

A young faculty member who joined CEIDS in FY2013 introduces himself.

Assist. Prof. Takashi Michikawa

My name is Takashi Michikawa, and I have joined CEIDS since April 1. I graduated from Keio University (Bachelor of Environment and Information Studies and Master of Media and Governance) and The University of Tokyo (Doctor of Engineering). Then I worked for RIKEN and Research Center for Advanced Science and Technology (RCAST) at The University of Tokyo before I joined CEIDS.

My research interests lies in the field of geometric modeling and its applications to industrial problems. In my last position, I was engaged in a research on geometry processing of mechanical objects scanned by CT scanner in order to improve manufacturing processes by measuring and evaluating actual objects and providing feedback. My contribution of this field is to

develop automatic algorithms for surface reconstruction of mechanical objects and quantitative analysis defect structures. In addition, I worked on issues in a wide range of fields relating to geometric modeling, such as digital mockup (DMU), geographic information system, and quantitative analysis of fossil crania.

Based on these experiences, I am exploring the possibilities of geometric modeling in the fields of civil engineering and urban planning. Recent progress of measurement technologies such as LIDAR and mobile mapping systems (MMS) have made it possible to scan large scenes such as cities as point cloud data. Such “actual object” data are important clues for realizing a sustainable society. However, many technological gaps still exist in order to use the measurement data for actual problems. I would like to use my experience so far to help close these gaps. I will appreciate your guidance and support.

9. Announcements from CEIDS

1 CEIDS faculty member receives Osaka University Presidential Awards for Outstanding Contribution in Research

CEIDS Assoc. Prof. Keishiro Hara has won the Osaka University Presidential Awards for Outstanding Contribution in Research for the 2014 academic year. The award goes to younger faculty members who are expected to play an active part in their fields, judged in part by recognition that they have gained for their work in education and research. (Osaka University web site: <http://www.osaka-u.ac.jp/en/oumode/commendation/deed/h26encourage>).

Going forward, the faculty of CEIDS is fully devoted to our research and educational activities.



2 “Reading Session on just two pages” selects book *Pioneering Sustainability Science towards*

Environmental Innovation

The “Reading Session on just two pages,” hosted by the Support Office for Large-Scale Education and Research Projects, held its third session September 10 at Resona Bank Umeda Branch / Private Salon Re LUXE. The theme of this session was “What is dialogue? Viewed from clinical philosophy and sustainability science.” The group picked the book *Pioneering Sustainability Science towards Environmental Innovation*, edited by Keishiro Hara and Yasushi Umeda of CEIDS, and supervised by CEIDS. For details, see <http://www.ura.osaka-u.ac.jp/2pages.html>.

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