

vol.

Tohoku University International Research Institute of Disaster Science NEWSLETTER Conveying the results of practical disaster prevention research from TOHOKU to the World.



IRIDeS Quarterly

March 2016

Special Topic Practical disaster medicine: investigating the mental and physical health of people affected by the Nepal Earthquake 2015

Special Section



New disaster risk reduction studies tailored to society from the Tohoku disaster region.

The Tohoku University International Research Institute of Disaster Science (hereinafter referred to as "IRIDeS") conducts research by gathering 37 fields of study in seven divisions that transcend the border between physical and social sciences. IRIDeS promotes "practical disaster risk reduction studies" that can be useful in society and people's lives. IRIDeS aims to utilize its comprehensive knowledge to contribute to the recovery of disaster-affected areas and building a society that can withstand disasters.



Division Building disaster-resilient society by exploiting lessons from the 2011 Tohoku earthquake and tsunami disaster



Response Research Division

Researching the culture and history of domestic and international disasters, disaster cognition, and disaster mitigation/ recovery measures

Regional and Urban



Reconstruction Research Division Developing and researching various

technologies to create comm where people can live with peace of mind



Revealing the mechanisms behind disasters to forecast hazards



Science Division Multifaceted evaluation and

Disaster Medical

enhanced preparedness for health and medical care during disasters



Enhancing the record of the earthquake and assisting urban reconstruction



Enriching disaster research with private sector donations, etc Practical disaster medicine: investigating the mental and physical health of people affected by the Nepal Earthquake of 2015

On April 25th, 2015, an earthquake with an epicenter to the northwest of the capital of Kathmandu struck Nepal. Numbers of dead and lost rose above 8,500.

IRIDeS held an emergency meeting as soon as the earthquake struck and worked on gathering information. On May 8, 2015, IRIDeS held a report session on the Nepal Farthquake to release information such as fault movements which caused the earthquake and the distribution of building damage. The emergency survey taskforce first visited the area in July of 2015. Surveys were conducted by researchers involved in



fields such as disaster medicine, disaster risk science, and civil engineering.

This article focuses on the fact finding mission of medical and public health in Nepal Earthquake. When it comes to medical assistance, people usually focus on support immediately after a disaster, but IRIDeS also investigates on the preparedness before the disaster and medical needs of the people in a medium to long term perspective, based on what it learned from the Great East Japan Earthquake. The opinions of the three researchers that visited the area are introduced below.



Surveying the disaster area with researchers from various fields deepened interdisciplinary understanding.

"Overall, I got the impression that everything went very systematically. Nepal frequently experienced earthquakes. Upon speaking with researchers at Tribhuvan University, the oldest and largest university in Nepal, I found that they were very knowledgeable about earthquakes and had constructed systems for dealing with emergency situations. One thing that functioned particularly well

was the Hospital Preparedness for Emergencies (HOPE) learning program in disaster medicine. Since this program had already been adopted in universities and hospitals around the country, the program was able to operate independently in each location. This made it successful in dealing with traumas and infectious diseases. Since the country of Nepal does not have adequate water and sewerage systems, everybody feared an outbreak of infectious diseases. But such outbreak was avoided by the efforts of government and hospitals directly spreading information via radio and social medias.

They also systematically dealt with foreign medical teams (FMTs). The Nepalese government cooperated with the World Health Organization (WHO) to distribute medical and trauma care manuals, provide teams direction of which hospital to visit, and establish a health cluster meetings that enables the coordination of needs and help



relief

What is good for us at IRIDeS is being able to have researchers from different departments visit the area together. This makes surveys and research to be conducted from multi-sectoral perspectives in addition to medicine, such as the status of building damage, water and sewerage, and logistics all of which is essential to keep peoples health.

We do not know when, where, and how disasters will occur. It is better to conduct this type of surveys a bit later rather than immediately after a disaster. I believe that the role of IRIDeS is to objectively and scientifically analyze what went well and what did not."



Strengthening links with local medical institutions by developing a simple diagnosis kit

"In July 2015, I visited the Chitwan region in addition to Kathmandu. Since we already had a fair amount of information on infectious diseases in Kathmandu, I surveyed the local situation in Chitwan from various perspectives, because this was an area where few researchers had visited

I found that local hospitals did not have enough beds to handle

patient numbers, and patients were laying on the floor. I also thought that a simple diagnosis kit would be needed to deal with patients with unidentified fevers.

Overall, there were fewer infectious disease outbreaks than expected in both regions. This is because the government was distributing tools for preventing infectious disease, such as water filters. However, infectious disease such as diarrhea commonly occurred in remote mountainous areas that lacked the infrastructure found in urban areas, because of the difficulty in delivering goods and information.

I am already preparing an application form for conducting joint research together with the Nepalese government, but obtaining the budget for collecting samples is a pressing issue. I hope that a simple diagnosis kit for Dengue fever that is currently under development will be of use in dealing with infectious diseases during future disasters."



Building collaborative relationships between countries to improve the mental health of communities affected by the Nepal Earthquake

Especially mental health issue is quite specific to social, political, economic and cultural characteristics of communities and nations. We are not able to provide adequate mental health supports or assessments with universally fixed strategies to the communities affected by a disaster. For example infrastructure for mental health is guite different between Nepal and Japan



(e.x. a number of psychiatrists per 100,000 residents in Nepal is nearly one twentieth of that in Japan). Therefore, we did not choose strategies such as a visit-and-run type quick surveys nor supportive activities, but met key Nepali persons who take major roles for mental health care system in the Nation to see if we could collaborate in any way to promote mental health situation at the post-disaster settings. They have already realize the increasing needs for mental health after the disaster, and conducted intensive mental health care activities in the affected communities. They mentioned that up until now the status of mental health was not systematically surveyed in Nepal, and they would like to establish evidence-based mental health care system, through collaborations

We are planning to work together with them to survey the impact of the earthquake on the mental health condition, and to develop effective ways in mental health care in the affected communities.



It has been four years since the foundation of IRIDeS. It is time to examine our past and future.

Five years have passed since the 2011 Tohoku earthquake and tsunami and the disaster areas have been steadily changing. Just how should IRIDeS support those areas? We had six department heads and researchers discuss their achievements and how they envision things going in the future.

Reorganizing into a new project-based system to make our work more visible.

This year-four years since the foundation of IRIDeS-marks the start of a new phase for the organization. All research we have done in various areas and fields in the past will remain as it is under our base research system. However, we will also be introducing a strategic research system known as the area unit system. This is a system aimed at organizing projects that match the needs of the areas affected by the disaster, regardless of field. This system will aim to produce results in either a three-year or six-year period. We expect we will be able to produce more visible results than before. Generally speaking, it is said that there are two types of technology development: seeds oriented and

needs oriented. The first type-seeds oriented-involves strengthening the foundations of your research and intensive studying. This would come under the area/field-type research system. The area unit system covers needs-oriented research. This is a process that involves finding out a region's needs and responding by delivering what they require to their area. In short, this is a practical application of one's knowledge. By utilizing this system, we will be able to better realize our goal of practical disaster prevention education. We hope to be able to present the results of our research in a meaningful way



Fumihiko Imamura Hazard and Risk Evalution Research Division Tsunami Engineering



Evaluation Research Division

Gathering, formulating, and disseminating research results on earthquake disasters

Associate Professor Susumu Ohno

("Ohno"): The reason why we could dispatch the integrated information about the cause of the earthquake and how the damage was affected is the 4 years accomplishment of ours. Professor Shunichi Koshimura

("Koshimura"): It was a success that we could solve the relation of tsunami and human reaction on the land. It was a huge progress of tsunami simulation and contributed to projecting the real time occurrence and advance of seismic observation network. I think it is significant

widely Ohno: I visited disaster areas all over the world diligently after the 3.11 in Japan Wherever I visit, the biggest damage is always in the blind spot of the disaster prevention plan. We must clarify the blind spot of the disaster and develop strategies. Koshimura:Our research must be utilized for further disasters. I think that we have to analyze the situation that may happen in the future by announcing the value of our data such as damages of tsunami or damaged buildings.

Ohno: The important thing is the process of generalizing information; we have to grasp the people's needs and understand how to provide information. Koshimura:Just showing off our findings is not sufficient and we are required to



Associate Professo Kanako luchi International Disaste Resilience

Response Research Division

Human and Social

Learning how to Build Back Better from those in the Tohoku disaster area

Associate Professor Kanako luchi("luchi"): The field of social science is extremely important when talking about recovery although it is not a field that has prominent scientific progress.

Professor Hiroaki Maruya("Maruya"): I

believe our field is on the front line of social research in disaster management studies. Many of our researchers participate in various types of projects and travel from one place to another. Results are emerging from interdisciplinary research bridging together humanities, sciences, and psychology as well as developing from international collaborations and

comparative studies. luchi: Our study fields' contribution includes assessment and publication of research results on recovery, suggesting that it is much complex and time-consuming than how it is often calculated, strategized, and planned out. Maruya: Such research topics are minimally studied and challenging academically, but I also believe it is increasingly important. luchi: Opportunities to share such results and lessons learned from Tohoku experience in other internationally disaster-stricken areas are also a significant step forward. Maruya: Reconstruction of the disaster areas is still under way. Yet, I trust there will continue to be various opportunities that we can contribute

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Shunichi Koshimura Remote Sensing and Geoinformatics for Disaster

Associate Profes Susumu Ohno Earthquake Engineering

to make the date generalized and spread it

coordinate the use of them for the policies. technologies, and disaster prevention plans. The perspective of the practical method of utilizing findings is necessary to go to the next step.

Ohno: From now on, it is necessary for urban development to prepare for the enormous disaster. I would like to make an effort to use my knowledge for disaster prevention in the local areas and generalize the knowledge.



luchi: Recovery in its real context is about to begin on the ground. I often re-realize the importance of livelihood support, besides housing and infrastructure investments, whenever I talk to local residents.

Maruya: With hastened aging and depopulation facing Tohoku, simply seeking further development as in the past in reconstruction is not the right direction. We need to keep reflecting our works to contribute in answering how we can increase the level of satisfaction of the affected people, and come up with a Tohoku definition of build back better. In this recovery, housing reconstruction is lagging and often resulting in people outside their original communities. Industries have lost recovery momentum as they lost their customers. Researching on ways to respond in such difficult time continues to be critical.



Regional and Urban Reconstruction Research Division

Making our research results tangible by collaboration and visualization

Professor Kenjiro Terada("Terada"): There are various methods of "Urban revitalization". Each researcher achieved results in various kinds of scenes such as buildings' reinforcement, many proportion of policies, theories and so forth. Professor Osamu Murao("Murao"): Some researchers focus on the field works and others regard numerical simulations and data analyses as a core of their research. I have an impression that what is significant is completing each other and collecting knowledge to be applied to the disaster areas. We must consider what is necessary to contribute to the regional revitalization by accumulating a variety of achievements. I think the collaboration of researchers is the key in that term. Terada: Indeed, For instance, there is a

Kenjiro Terada

Regional Safety

neering

multidimensional Visualization System at our laboratory, for which I am in charge of its hardware and a group of professor Murao focuses on its software's development.

Murao: The risk of urban areas can be indicated by applying the data concerning damages in each area that I had collected to the system that Professor Terada developed. That would be meaningful in terms of risk communication.

Terada: "Visualization" of each of our researches is truly valuable. Producing a result with "Visualization" has an enormous impact and is significant. Murao: If "Visualization" works well, more intriguing development can be expected. The method of releasing the findings would be an issue. The keywords must be "Visualization" and "Cooperation". The cooperation with other fields such as medical science and sociology would be necessary for combining the humanities with the sciences. In order to deepen the practical disaster prevention, we should carefully consider the strategies for inputting and outputting.

Professor

Osamu Murao

International Strategy for

Disaster Mitigation

Terada: I expect that better role sharing would be embodied in the framework od "Area•Unit system". Firstly, the cooperation should be deepened. Then, I would like to deliberate the effective method of practice. Murao: Disaster prevention is closely related to people's lives. I hope our studies can be visualized for the reconstruction of the areas.



Vigilantly measuring the earth's movement and evaluating future seismic risk

Professor Shinji Toda("Toda"): Each scientist studied their own research steadily for 5 years from 3.11. Professor Motoyuki Kido("Kido"): Science takes a very long time for research. Continuing observation and research in the long term and gathering the data is significant.

Toda: Our role is to provide the basic information of hazard by seeking natural phenomena. The accurate information depends on daily research. Kido: It takes time to deliver our research to people. Only when our analysis about

disaster risks and potential are utilized in

government and municipalities, it can be beneficial for people.

Toda: You are right. Our Japanese disaster prevention system is quite organized. So what we need to do after the disaster occurs is to explain to the people ; we need to describe simply but also focusing on research activities in the university. Kido: Also I feel government required us to be pioneers of disaster in the future. Toda: I would like to announce my recent work journal articles, etc essay to the public and contribute the progress of science. My assignment is to educate the young scientists.

Kido: I would like to develop the system for the young scientists that they can focus on their research feeling at ease. We need the circumstances to study for the long term with no restriction. Toda: Those kinds of environments create the individual characteristics. For instance "The study of IRIDeS has their own style." I think that is ideal.

Kido: Choosing and strengthening their own strong fields would be fruitful. Toda: Because of the new research building, I have more chances to communicate with people from other branches than before. That helps me develop different points of view. We are a foundational department of IRIDeS. I hope that every scientist continues to observe their own research steadily.

Disaster Medical Science Division

Scientific research on disasters and health. We hope to further strengthen cooperation across multiple fields of research

Professor Shinichi Egawa("Egawa"): IRIDeS is the first research institute in Japan to combine disasters and medical science. Having a Medical Science Division that grasps the disaster impacts on peoples' health in a scientific way and transmits information across multiple sectors is very meaningful.

Professor Hiroaki Tomita("Tomita"): Before the earthquake, medical doctors and related professionals tended to focus on post-disaster response. However, we have been focusing more on the physical and mental health of the people in the disaster

area, and analyzing preparedness for healthy living from a scientific perspective. This has been very fruitful for me. Egawa: Disaster medicine evolves each time there's a major earthquake disaster. According to the Great Hanshin-Awaji Earthquake, psychosocial care was carried out from the early stages after the Great East Japan Earthquake. Continuing policy proposals are necessary to apply the lessons for the next disaster. Tomita: Our achievement will form disaster medicine in the future, on a global level. I hope to widen our outlook and build our foundations through various initiatives. Egawa: The impact of a disaster cannot be expressed by casualties and financial damage alone. Health is an important indicator. I hope the Global Centre for Disaster Statistics will consider adding



Public Collaboration Division

Our role is to establish a connection between the people of disaster areas and IRIDeS.

Professor Takeshi Sato("Sato"): In this department, there are many researchers who actually visit the affected areas and engage in direct contact there. Associate Professor Shibayama Akihiro ("Shibayama"): That's right. People

become members of advisory councils and hold workshops. Ours is a practical field, so we have to conduct research in the actual affected areas. It is centered around Miyagi Prefecture, and In this department, researchers are expanding the field of activity to places like lwate and Fukushima. These regions all have different situations as far as disaster and recovery progress.

We try to understand the current situation in the region and then provide advice utilizing resources in that region. Sato: There have also been a lot of overseas-directed efforts in these past four years. We have proactively made knowledge-sharing and international cooperation efforts in places like Aceh, Nepal and the Philippines. Shibayama: I can now see things from a global perspective. I hope to put this to good use in the areas affected by the Great East Japan Earthquake. Sato: Lam hoping we can deepen our academic links with researchers in other disciplines as well. Releasing the academic results of our projects in the form of co-authored theses is also important. In addition, I hope we can promote some deeper relationships. I think we can make

Special Section

y Professor Shinichi Egawa International Cooperation for Disaster Medicine

> health indicators to its records. Tomita: In the past few years, I've accumulated a tremendous amount of health survey data. This was not possible without trust between Tohoku University and local people. I'm hoping our results will be beneficial for health promotion and disaster preparedness and useful to make policy proposals. We will promote cooperation with other research fields, for example, using GIS to analyze how evacuation distance and height above sea level affected the people's mental health. Egawa: We went the overseas emergency disaster investigation with researchers in different research fields, and I was able to get a better vision on disaster medicine from various perspectives. IRIDeS is a very unique environment for such collaboration.



connections among ourselves as researchers.

Shibayama: One of our strengths is the high number of researchers who actually go to the disaster areas. This gives us a chance to communicate directly with officials and understand the needs that are present. We can introduce researchers to help fulfill those needs, and see what effects the researchers' results actually have in the affected area. We also play a sort of translation role between the experts and the general public. I want to emphasize that people should first contact our division. We are the contact windows for disaster areas.

Sato: IRIDeS is equipped with a system that allows immediate onsite collaboration. We hope to launch a variety of efforts to connect the seeds of IRIDeS research with local needs.

History of IRIDeS

2007

"The Tohoku University Research Group on Disaster Prevention and Management" established.

Tohoku University gathered a team of experts from 19 faculties and established "The Tohoku University Research Group on Disaster Prevention and Management" as a preparation for Miyagikenn-oki earthquake. It was a predecessor of International Research Institute of Disaster Science (IRIDeS).

2011	
March 11th	The Great East Japan Earthquake. Immediately after the disaster, we started to conduct surveys and research. Released our knowledge to the citizens widely, and encouraged administration and state to become more aware of that. Enforced restoration support of distressed disaster areas as well.
April 11th	An urgent briefing symposium a month after the Great East Japan Earthquake. An urgent briefing session after a month of the Great East Japan Earthquake Disaster. Announced 21 issues focusing on rapid reporting features under an unstable situation. The real reports with presence were noticed from multifarious areas, especially "A comparison between Jogan-earthquake Tsunami and this case" generated publicity.
June 11th	An urgent briefing symposium 3 months after the Great East Japan Earthquake. We made 27 presentations based on the 3 themes: "The actual situation of damages caused by Tsunami and its mechanism", "Earthquake•seismic motion and vibrational damage" and "Challenges surrounding local communities".
September 13th	A briefing symposium 6 months after the Great East Japan Earthquake. Invited the researchers from Fukushima University and Iwate University, keynote report by Miyagi Prefecture and a lecture by Kobe City Disaster Risk Management Officer were also delivered as well as the research reports.
	The Official start of an archive project of the Great East Japan Earthquake "Michinoku-shinrokuden".
	The project was established to collect the pictures and the movies, the verbal evidence and the document records about earthquake. They were announced at home and abroad, and were utilized for the studies of the further huge earthquakes and restoration of disaster areas. That would be continued until 2021.
2012	
March 11th	A briefing symposium a year after the Great East Japan Earthquake. A keynote report by the principal of National Defense Academy, invited lecture by a professor of Tohoku Institute of Technology, and the reports by 8 researchers were delivered. Further social problems and the tasks which would be expected in disaster areas were indicated, let alone their academic meanings.
April 1st	Established IRIDeS. Director Arata Hirakawa and Deputy director Fumihiko Imamura. Established International Research Institute of Disaster Science (hereinafter referred to IRIDeS) in order to release the method of problem solution, the knowledge and the experiences of the Great East Japan Earthquake Disaster widely. An organization which is consisted by 7 divisions: 37 fields was composed.
July 3rd – 4th	The World Ministerial Conference on Disaster Risk Reduction in Tohoku. Participated subcommittee meeting.
	Representatives of over 80 countries and the international organizations assembled in Tohoku, shared the experiences and the lessons about the Great East Japan Earthquake Disaster and recent large-scale natural disasters and participated in the subcommittee meeting which discusses disaster prevention.
2013	
	IRIDeS "Ikiruchikara" Civic activist project published. "Disaster prevention notebook for all".
	Created the record book in order to improve the ability of judgment and taking action to survive an emergency.
February	Rapid site assessment on Jakarta flood.
February 8th	Entering agreement on cooperation with Tagajo and other cities. (The first batch of agreement with municipality)
)	Worked on tradition of earthquake experiences and the records with Tagajo city since July 2012. Also, the agreements with each affected municipalities were concluded starting with Tagajo city in order to promote cooperation with them and make it more scrupulous during the advance of recovery and reconstruction.

2013 March Second anniversary symposiu **Book publication titled "Analy** June 12th Published 2 books based on the content The mechanism of earthquake • Tsunam records. Those books assume the vital July Rapid site assessment on Yan August Rapid site assessment on Aki February Rapid site assessment on Jak November Typhoon Haiyan crosses Philip 6th – 9th 2014 Symposium on disaster prevent February 16th Established "Tsunami disaster preventi of an immediate evacuation to protect workshops in each places with the syst activity. Third symposium of the Great March 9th New directors. Director Fumih April and Deputy director Makoto C **Radiation Emergency Medicir** July Tohoku University is designated as a m Medicine Promotion Center" was estab Rapid site assessment on Yan August July Rapid site assessment on Yur Rapid site assessment on the November November Inauguration of the IRIDeS bu 10th 2015 Pre-event of the World Conference on Disaster Risk Reduction. March 10th A memorial of the Great East Japan Earthquake Disaster was held. (Fourth anniversary symposium of the Great East Japan Earthquake Disaster•3D movie "The massive Tsunami 3.11: Memories to the future" was screened.) The Third World Conference on Disaster Risk Reduction. March 14th – 18th Participated in the events such as the public forum, the projects exhibition and the inspection as well as the main conference. Worked on those activities in order to release the research of IRIDeS to the world and lead the reconstruction of Tohoku to the finer future. **Global Center for Disaster Statistics established in IRIDeS** April in association with UNDP. 1st Contribution to disaster prevention's goal monitoring decided by Sendai Framework for Disaster Risk Reduction. Nepal Gorkha earthquake. April 25th A briefing symposium on Nepa May 8th Kanto Tohoku heavy rains (Typhoon No. 17th and 18th.), Rapid site assessment, symposium. September 11th Held a briefing session about Rapid site assessment centered around Miyagi Prefecture, the surveys, the analysis and information.

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rzing the Great East Japan Earthquake". nts of 5 briefing sessions and the accumulation of the researches after that: 1. ni and the actual situation of damages. 2. Earthquake and people • communities • I roles in spreading the activity of IRIDeS widely.						
nagata flood.						
ta · Iwate cataract and the sediment disaster.						
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ppines. December – Rapid site assessment on January 2014 Typhoon Haiyan.						
tion and disaster reduction for Tsunami evacuation. ion action to save the lives and communities: Rush up! Japan" under the theme the lives from huge Tsunami. Also, conducted the emergency drills and the tem of industry-government-academia. The seminar was held as a part of the						
East Japan Earthquake.						
niko Imamura Dkumura.						
ne Promotion Center established. nedical institution of secondary radiation exposure and "Radiation Emergency polished as a centric organization about radiation emergency medicine.						
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al Gorkha earthquake.	July	Rapid site assessment.

Feature-1

Analyzing what kinds of stories leave an impression on people

"I think stories that include emotions such as happiness and sadness tend to leave an impression on the listener."



1 The villagers were focused on preparing for the festival eve

Gohee suddenly set fire to one of the rice sheaves

The elderly people, women, and children chased

3 Gohee thought that a tsunami would come

Analyzing elements included in

a truly great number of things. Many

that we felt and talked about contain

important information that must be

unfortunately not all stories remain in

those that disappear? This is what

Disaster-Related Cognitive Science

people's memories.

department

to remember."

a story using a psychological method

That earthquake caused us to experience

people saw sights that they never would in

the course of their daily lives, and received

bitter memories and lessons. All the things

conveyed to future generations. However,

What is the difference between stories

that remain in memory for a long time and

Professor Toshiaki Muramoto, a specialist

in cognitive psychology, researches at the

"Every story or experience includes

different meanings and lessons for that

person. I use experimental psychological

methods to scientifically test what types of information make stories easy for people

First of all, Prof. Muramoto's research

team asked 20 people living in disaster

areas in Miyagi prefecture to freely talk

earthquake, and analyzed what kind of

"Feelings and lessons were the most

common things talked about other than

the actual things that were experienced."

about their experiences during the

elements constituted their stories.

says Prof. Muramoto.

after the youth

- 2 The villagers never noticed the preceding earthquake 2 All the villagers came together

the villagers would come

- The villagers came to their senses O The villagers realized that they were saved by the fire
- 1 The villagers knelt down in front of Gohee

6 Gohee told them not to extinguish the fire so that all

Rate of recollection after reading "Inamura no Hi"

The graph indicates which parts of "Inamura no Hi" were recalled by students in China after reading the story. Although the rate of recollection was high for parts relating to the flow of the story, the rate was low for parts relating to the arrival of the tsunami

Sympathy is the key to establishing

Prof. Muramoto believes that of the constituent elements of stories. "feelings" are especially important. This is because feelings have a strong effect on the listener.

"When we read something or listen to a story, we have a pseudo experience in our mind based on the things we see or hear. Furthermore, the closer these actions are to the main character of the story or the storyteller, the stronger the feeling of reality, which leads to a stronger memory. One of these elements that carries the story is emotions." When the listener knows the feelings of the storyteller, such as their "happiness" or "sadness", it makes it easier for the listener to imagine the story, which in turn makes it easier for them to feel something.

This "sympathy" makes the story remembered as something more impressionable

"I believe that increasing stories that can be recalled even without trying is the key to preventing memories of the disaster from being lost. I want to convey the idea that these feelings are important for recording experiences."

memories

Professor

Human and Social Response

Research Division

educational psychology

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How to widely share specific images

The story called "Inamura no Hi" is based on a true story about a man that burned rice sheaves to warn villagers of a coming tsunami. Prof. Muramoto conducted an experiment where he got high school students in China to read this story and check which parts of the story were remembered by the students.

"The Chinese high school students generally remembered the important parts of the story well, and were able to recall them easily. However, they were mostly unable to recall the scene where the tsunami struck.

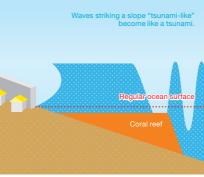
The people of China do not have much knowledge regarding tsunamis. Prof. Muramoto believes that being unable to imagine exactly what a tsunami is like may have been what caused this result.

This means that being able to imagine more realistic images and feelings leads to memories being established. "I want to scientifically test this in the future, as I believe that systemizing this may enable it to be utilized in fields such as education on disaster risk reduction and archiving." says Prof. Muramoto, who wishes to continue his research. The future results of this research look hopeful.

Feature-2

Large waves caused by an extremely strong typhoon became "tsunami-like" due to the presence of a coral reef

"This research disproves previous theories, and is expected o be utilized in Japan and around the world."



Several consecutive waves breaking at the reef slope group together over the coral reef

Unprecedented video of destructive "tsunami-like" waves

In November 2013, super typhoon Haiyan struck the Levte island of the Philippines and caused a large storm surge in places such as Tacloban. A video captured by a development aid worker in Hernani at the east coast of Samar showed terrifying tsunami-like waves, which destroyed the village. Researchers around the world viewed this video with surprise, since the wave in the video was very different from a typical storm wave.

"Normally under storm surge conditions, the water slowly rises up like a flood. However, in the case of the east coast of Samar, the ocean was rushing over the coastal zone almost like a tsunami. Since no earthquake was recorded, there was no possibility that a tsunami had actually occurred. This was a phenomenon that had never before been captured on video," says Assistant Professor Volker Roeber.

How did such a wave phenomenon occur? Prof. Roeber and Associate Professor Jeremy D. Bricker's research group started to analyze the topography of the seabed and recomputed the typhoon event with their numerical models. "Extremely large typhoons like the one that struck the east coast of Samar are believed to occur more frequently. We thought that understanding the mechanism of the tsunami-like destructive waves would be helpful for future disaster risk reduction in Japan." says Prof. Bricker.

Assistant Professor Volker Roeber Hazard and Risk Evaluati

Research Division Technology for Global Disaster Risk

After completing his MS degree in Coastal Geosciences & Engineering at Kiel University in Germany, He worked as an intern at Petrobrás Petróleo Brasiléiro S.A. (Braziliar oil and gas company) in Brazil He then completed his Ph. D. in Ocean & Resources

Engineering at the University of Hawaii, before assuming his current position in 2013.

Large storm waves became "tsunami-like" due to the steep slope

The research group first measured the topography of the area around the east coast of Samar, and also collected data of inundated areas. They then developed a numerical model for calculating the propagation of the extreme waves and analyzed the flood risk based on various model scenarios.

As a result, the team found that coasts with a steep slopes formed by coral reefs, etc. can favor the formation of powerful tsunami-like waves, as a result of abrupt wave breaking over the reef. These long waves can lead to hazardous and destructive waves on land comparable to a tsunami. This research disproves the myth that coral reefs always protect from hazardous waves. "Previous theories were based on heuristics studies rather than computations. In reality, the energy of most typhoon waves (up to 10 m) can be efficiently absorbed by coral reefs." says Prof. Roeber. "However, this is not the case anymore for extreme events such as Typhoon Haiyan. If waves in the range of 15 to 19 m in height break over a coral reef, consecutive high

waves can group together to form something like a tsunami."

This phenomenon had already been published by Professor Nakaza of the University of the Ryukyus. However, the current research focused on the topographical characteristics and explained the mechanisms behind it.



Associate Professo Jeremy D. Bricker

Hazard and Risk Evaluation **Research Division** Technology for Global Disaster Risk

After completing his Ph. D. in civil engineering at Stanford University, he worked as a consultant in a hydraulics and coastal engineering company in the United States. He held a visiting associate professor position at the Department of Civil Engineering in the Graduate School of Science and Engineering at the Tokyo Institute of Technology, before assuming his current position in 2013.



Application of numeric models for a more accurate hazard map

This research made internationally impact and was published in the UK scientific journal "Nature Communications" on August 6th, 2015.

Prof. Roeber stresses that this work applies to locations all over the world. "In the United States, it can be applied to places such as Puerto Rico, Florida, and Hawaii. Even if there is no coral reef. similar topography can cause the same destructive wave processes to happen. This research is applicable not only in tropical regions, but also to coasts such as found around Europe.'

"In Japan, places such as Okinawa feature this kind of topography. With typhoons getting stronger, I believe the need to research waves of unprecedented size is becoming important. I hope numerical models such as ours are being utilized in creating accurate hazard maps." says Prof. Bricker.

The two professors say that they also plan to conduct computations for other topographies in the future. "Doing so may lead to results that disprove other existing theories. We want to carry out detailed surveys regarding what type of coastline wave phenomena depend on.

" This research will further reduce the risk of unexpected disasters.

Feature-3

Fully preparing for nuclear accidents

"In creating the Radiation Emergency Medicine Promotion Center, we aimed for getting a functional medical intake system up and running"



Hospital dispatching training – local staff on site in each region

Learning from the nuclear incident to develop a functional medical system

The Great Eastern Japan Earthquake triggered the accident at the Tokyo Electric Power Company Fukushima Dai-ichi Nuclear Power Plant. A hydrogen explosion in the reactor building released radioactive iodine, cesium, and strontium into the atmosphere. The radiation released was, in some cases, fatal. Even before this incident, Japan had been developing an emergency radiation response system. Unfortunately, the medical intake systems in Fukushima did not function properly during the incident.

Reflecting on lessons learned from the incident, Tohoku University established the Radiation Emergency Medicine Promotion Center at IRIDeS on July 1, 2014. Professor Yoshio Hosoi, specialist in radiation medicine, played a central role in this process. "The center was created to make the radiation response more effective. The reason Fukushima's primary and secondary medical radiation response systems failed to work properly was because they were not built around the premise of a large-scale disaster like the one at the Fukushima plant. Tohoku University Hospital is designated as a treatment site for secondary radiation exposure from the Onagawa Nuclear Power Plant and Fukushima Dai-ichi Power Plant. We are undergoing training and education measures to ensure that we can effectively respond to when patients are brought in during emergencies."

Realistic training achieves clear division of roles

The center has thus far launched two training programs for early response measures to radiation exposure. The program held in September of 2015 was built around the premise of five personnel at Fukushima Dai-ichi sustaining fall iniuries and one of them being dispatched to Tohoku University. The training saw them getting an emergency radiation headquarters up and running within ten minutes and commencing secondary exposure protection within twenty-five minutes, a smooth response. The program involved clearly delineating where patients should be taken in, in what way, and what roles each staff member is responsible for. Prof. Hosoi says, "We learned a lot of things by launching this pilot – such as how to guarantine the hospital and other patients when doing intake for patients exposed to radiation. We are very pleased to have established a clear division of roles within Tohoku University Hospital."

Another effort being undertaken is training and education of personnel, "One thing that happened with this disaster was that, in some cases, doctors abandoned examinations of patients out of fear of radiation exposure. This fear can be alleviated through proper education and the creation of clear patient intake procedures. By increasing the training and practical exposure that doctors get, we can create a properly-functioning medical ecosystem."

Niigata University and at the Research Institute for Radiation Biology and Medicine, Hiroshima University, went on to professorial position in radiation

Professor

Yoshio Hosoi

Disaster Medical Science Division Radiation Disaster Medicine

Born in 1959. Master's degree from Graduate School of Medicine, Tohoku

Following post-doctorate at UCSF and Stanford Research Institute

professor in basic radiation research at Graduate School of Medicine, the

University of Tokyo. After positions as an instructor in dental medicine at

biology at Tohoku University School of

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University School of Medicine.

International, became assistant

Distribution of stable iodine supplements - preparing for emergency

Prof. Hosoi is a specialist in radiation treatment. After the disaster. Prof. Hosoi went to the emergency evacuation center in Minamisoma and saw in person what had happened. "They were understaffed, and patients were left to languish. Transport of patients was also delayed, and people were on the brink of death. felt we have to establish a proper medical structure." Prof. Hosoi has also been urging municipalities to distribute stable iodine supplements. Supplementsare slated to be distributed to residents within a 5km radius of the Tohoku Electric Onagawa Nuclear Power Plant. In addition, Professor Hosoi wants to push for installation of more body counters used to measure radiation exposure. "We have to establish a system - at the administrative level - for the accurate appraisal of residents' radiation exposure and for the prevention of further exposure. It is imperative that Japan sets up an emergency management system." Prof. Hosoi adds that medical students should be required to study radiation. "Proper understanding of radiation requires a wide range of knowledge. Physicians are on the front lines of patient intake, so they need accurate knowledge. I want to shore up the medical system to have knowledgeable personnel ready for any emergency." It will take several dozens of years before the Fukushima incident is resolved. Prof. Hosoi's efforts thus continue, ready for an emergency

Feature-4

An analysis of the changing conditions at sandy beaches, conducted in cooperation with a variety of researchers

"I want to guantify the role sandy beaches play in our lives through a cross-disciplinary effort"



Aerial images of Yamamoto Coast in southern Sendai Bay, 1968-2012

In the postwar decades, erosion of the sandy beaches along the Yamamoto Coast has proceeded rapidly, but the erosion stemming from the 2011 tsunami has made the situation far more serious. Rapid recovery was observed in the several months after the tsunami, but the recovery later slowed, and now, with restoration of the beaches insufficient, embankments are being constructed

Erosion of sandy beaches proceeding because of various constructions to prevent disasters

In Japan, it would not be amiss to say that the sea is associated in nearly everyone's mind with the idea of sandy beaches. But how are these beaches created, and how are they changing? Keiko Udo, Associate Professor of Disaster Potential Study, Hazard and Risk Evaluation Research Division, has been conducting the research necessary to answer these questions. One of her recent research topics examines the impact of disasters and climate change on the topography of sandy beaches-to see how much it is altered by tsunamis, high waves, sea-level changes caused by warming climates, and other phenomena.

Prof. Udo explains: "Sandy beaches are formed over many long years, using sediment supplied from the mountains, moved via rivers to the sea. However, postwar erosion & sediment-control projects, as well as dam & harbor construction and coastal maintenance, have cut off that supply of sediment, leading to the rapid acceleration of beach erosion. These projects have been hugely effective in flood control and disaster prevention, but sufficient measures have not been taken to prevent beach erosion. We want to research how the sediment cycle, this movement of sediment from the mountains to the sea. impacts the changes occurring at sandy beaches, but we don't yet have enough data to quantify this phenomenon."

Assessing sediment transport through interdisciplinary research

One reason for this, Prof. Udo explains, is that the research necessary for such a task is divided between separate fields of science: "The issue of how much sediment is being discharged in the mountains by rainfall is covered by researchers specializing in hydrology. The rivers are the domain of fluvial engineering, and the sandy beaches are being covered by coastal engineering specialists, like me. The mountains, rivers, and seas all impact the sediment environment through manmade action, so in order to determine how sandy beaches are impacted by those changes, we need to proceed in a cross-disciplinary manner. I think we need to gather together experts from each field and conduct an interdisciplinary investigation."

Recent years have also seen an increasing number of natural disasters on a previously-unimagined scale. "In the Great East Japan Earthquake of five years ago, embankments were destroyed by the tsunami, which eroded up to several hundred meters inland at its maximum. I'd like to investigate what sort of an impact short-term erosion by tsunamis and high waves makes over the long term. Rising sea levels due to global warming are also an important aspect to be noted. The topography of sandy beaches is very mild; even if the sea level changes by only one meter, the coastline can shift by dozens of meters. We need to monitor any changes that are occurring carefully."

Associate Professor Keiko Udo Hazard and Risk Evaluation Research Division

Disaster Potential Study

In 2003, Udo completed her doctoral program in Engineering Mechanics, Graduate School of Engineering at the University of Tsukuba. She is currently at this position after working at the Littoral Drift Division, Marine Environment and Engineering Department of the Independent Administrative Institution Port and Airport Research Institute as a research officer and the Disaster Control Research Center of the Graduate School of Tohoku University as Assistant Professor and then Ass Professor.

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Quantifying the value of sandy beaches from a scientific perspective

Sandy beaches are also important from the standpoint of disaster prevention. Wave energy is weakened by sandy beaches, which provide a buffer zone that prevents damage to the coastal zone.

"From a disaster-prevention standpoint. there's a tendency to emphasize manmade structures like breakwaters and embankments over beaches. However, beaches are the heart and soul of the public, and they're indispensable to the tourism industry. They also foster their own unique ecosystems. Their value can also change as the environment around us changes, so it's difficult to quantify-so that's one of the crucial research tasks we're tackling. I believe it's important to research the advantages there are in preserving our sandy beaches, the value that's created, from a scientific standpoint," Prof. Udo notes. "We also need to assess the value of sandy beaches from a financial standpoint as well. Preserving sandy beach environments also incurs costs. We need to consider how to strike a balance between the advantages gained by preserving sandy beaches and the costs involved. I'd like to reach across fields and disciplines, get a variety of researchers together working on this issue jointly, and expand this field of research."

News & Topics



A trench excavation survey conducted in Yamada Town, Iwate Prefecture succeeded in confirming traces of tsunamis over the past 4000 years

Carefully interpreting topography to select the appropriate location for surveying

There are two main methods for discovering the time and size of tsunamis in the past. One is checking historical and observational materials, and the other is excavating the earth to survey sediment. In 2012, Assistant Professor Daisuke Ishimura excavated a trench approximately 12 m long, 3 m wide, and 2 m deep in Koyadori, Yamada in Iwate Prefecture to conduct a survey. Excavation surveys often involve boring, but this has the problem of making the continuity of tsunami deposits uncertain. On the other hand, a trench survey enables the entire wall to be exposed, and the continuity of tsunami deposits can be checked over a wide range (see photo).

Assistant professor Ishimura interpreted the topography in advance and decided

upon conducting the survey at a site around Koyadori, Yamada, as it was expected to retain traces of past tsunamis. As a result of this trench survey, the 10 layers of tsunami deposits were confirmed, including that of the Sanriku Tsunami in the Meiji period.* "The time and size identified from the tsunami deposits mostly agree with information found in historical records. Next I want to conduct a more detailed analysis of the data to clarify the size of the tsunamis and crustal movement, etc." says assistant professor Ishimura.

It is difficult to survey sediment in disaster areas due to construction that is elevating the land, etc, and reconstruction is also currently underway in Yamada. This survey will become an important material for conveying the traces of past tsunamis to future generations.

* Ishimura and Miyauchi (2015) Historical and paleo-tsunami deposits during the last 4000 years and their correlations with historical tsunami events in Koyadori on the Sanriku Coast, northeastern Japan. PEPS.

Trench excavated in Koyadori, Yamada in 2012



The whitish layers seen in the wall are tsunami sediments. The near side is the mountain side and the far side is the sea side.

Assistant Professor Daisuke Ishimura **Disaster Science Division** Natural Disaster Research



Research Result

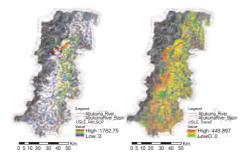
Using a geographic information system (GIS) to visualize the amount of contaminated soil loss in **Fukushima Prefecture**

Predicting the amount of loss soil contaminated with cesium 137 using a GIS

Assistant Professor Carine J. Yi of International Strategy for Disaster Mitigation uses Geographic Information System (GIS) to perform disaster analysis. Prof. Yi uses the calculation function of the GIS to calculate the Cesium 137 contaminated soil erosion in the Abukuma River Basin. "Since the amount of soil loss is influenced by things such as rainfall, topography, vegetation, soil types, and land usage, I first applied a standard of Universal Soil Loss Equation (USLE), which has been widely used to estimate soil losses from erosion. Then, I predicted the losses of 137Cs-contaminated soil. For this calculation, a 137Cs-soil transfer factor was applied in place of a crop factor, and it yielded an average contaminated-soil loss rate. In the result, contaminated soil may

be deposited along a comparatively flat area, such as that on the east side of the river. Since topographical changes and the status of soil losses can be visualized with a GIS interface, I believe this will be useful for identifying hotspots of radioactive material and formulating decontamination policies." Prof. Yi says that she wants to create proposals based on risk engineering that are easy for local government to understand and applicable to policies, and to promote risk management that transcends fields. "In order to research wide-area disasters due to climate change, it is always necessary to understand the entire picture. I aim to construct a practical crisis management system by linking to a wide range of fields and taking into account not only engineering survey results, but also the effect on human society and the fact that everyone would become a victim of any kind of disasters."

Predicted volume of soil contaminated with cesium 137 using USLE



(Left) Standard result of USLE calculation (Right) Result of USLE calculation with transfer coefficient of cesium 137 applied

Assistant Professo Carine J. Yi Regional and Urban Reconstruction Researc Division International Strategy for Disaster Mitigation



More detailed data via geographical methods.

Analyzing statistical data to understand the needs of local residents

The goal of this research is to utilize statistical data and geographical methods to make a detailed determination of what kind of people live in which regions. One researcher pursuing this research is Assistant Professor Kazumasa Hanaoka. His research aims to use statistical methods to gain a better understanding of the habits of residents of a region, an area that previously has not been well understood. Based on data concerning gender, age, household makeup, place of work, presence or absence of elderly household members and type of residence, including some data publically available from the Japanese census, he superimposes the data on maps to create visual representations of the characteristics of residents of different areas. "Plotting data down to a

neighborhood-by-neighborhood level of detail can yield information that can then be used for public policy." One thing that recently became clear in the course of his research is that a high proportion of elderly household heads own homes in coastal areas. "We were able to show the issues related to an increasing average age and independent home reconstruction in disaster-affected areas," says Prof. Hanaoka. The results are expected to be instrumental in prioritizing the development of public housing and reconstruction plans. "Preparing these kind of maps ahead of time will be useful in allowing us to come up with effective reconstruction plans in case of a disaster," says Prof. Hanaoka. "In addition, I hope we can continue to analyze how the population distribution changes over the next 10 and 20 years and have that data to take advantage of in case of a large-scale disaster."



Supporting the rescue of 800 historical documents In Ibaragi Prefecture after Tohoku · Kanto heavy rains.

Freeze-drying wet historical documents.

Great damages in Kanto and Tohoku region were caused by "Kanto Tohoku heavy rains in 2015". Assistant professor Masashi Amano from Preservation of Historical Materials field conducted rescue activity of drying and keeping the historical materials in the disaster areas: Shimozuma City and Joso City. "I was asked to assist the activity by a local researcher," said assistant professor Amano.

The equipment and know-how to rescue the historical documents distinguish IRIDeS in Eastern Japan. They visited the field immediately to response the crisis of the closely Prefecture.

The amount of the rescued historical documents was approximately 600 in Joso and 200 in Shimozuma City this time. Some of them were the works of a painter

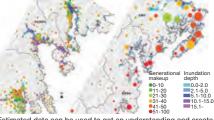
Rescued historical documents were kept

from the end of the Edo Era to Meiji Era and others were land registers. Although historical documents in Joso City were found in a private house, ones in Shimozuma city were owned by a local museum. "Even public institutions that were originally secure were affected by the disaster of unexpected scale. I think further expansion of measures is necessary." in a freezer, freeze-dried with a dedicated machine and drained of their water. "Apart from that, there are other methods of making it dried in the sun or a warm current of air, each of them has its advantages and disadvantages. I hope this case would be one of the model ones." Approximately 60 materials had been dealt with so far. I continue the rescue conducting the research to rid the materials of residue and stench simultaneously.

Latest research results



Great Eastern Japan Earthquake Nankai Trough (Ise-Shima



Estimated data can be used to get an understanding and cr

Assistant Professor Kazumasa Hanaoka Regional and Urban

Reconstruction Researcl Division Planning Technology for Urban Revitalization



A dedicated machine to freeze-dry historical documents.





Human and Social Response Research Division Preservation of Historica



Researcher Introduction

Urban development focusing on scenery for better restoration

'My hometown is Nagoya City which is called 'An honor student' of urban design. I grew up in a city which was organized artificially and I was impressed at Shibuya when I visited there for the first time. I thought the city's being crowded like a labyrinth was extremely exciting. The origin of my research is still there. '



The research object of my Doctoral thesis was 'the study of street facades massage'. I considered that is why old cities such as Shibuya and Kappabashi are attractive and worked on a task that what decides the impression of city is not the 'shape' of building but 'messages' from signs and display of goods. This was a study from a new perspective. Currently I have been



working on to the reconstruction in urban development. What I found by having worked as a coordinator is there are various kinds of constradictions in the administration system. The current system is based on the division of roles of a generation which lacks infrastructure. It should be reconstructed drastically along with the new generation. In order to develop attractive cities, perspectives such as 'Scenery' and 'being Cross-cutting' is necessity. I would like to apply my view as a specialist of civil engineering and urban design for the recovery of the city.'

Awards



Assistant professor Shosuke Sato

Disaster Information Management and Public Collaboration Division

Japan Society for Natural Disaster Science 'Awarded Academic excellent presentation award 2015' and Japan Society for Disaster Information Studies 'Kawata Award'.

Shosuke Sato At '34th Japan Society for Natural Disaster Science Academic Seminar', a presentation about the analysis of Tsunami monument and place name which is originated from Tsunami and their influence on damage reduction was awarded 'Academic excellent presentation award 2015'. Also, analyzed the contents tweeted before and after the Great East Japan Earthquake on Twitter and verified their effectiveness' authenticity from the perspective of disaster response at Japan Society for Disaster Information Studies and it awarded 'Kawata Award'

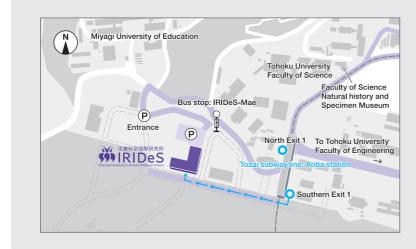


Assistant Professor Daisuke Ishimura

Disaster Science Division Natural Disaster Research Research on the 2014 Nagano earthquake receives Japanese Society for Active Fault Studies Outstanding Young Lecturer Presentation Award

people around me.

In the Fall 2015 convention of the Japanese Society for Active Fault Studies, Assistant Professor Daisuke Ishimura et al received the Outstanding Young Lecturer Presentation Award for their presentation on "Surface rupture associated with the 22 November 2014 Nagano-ken-hokubu earthquake and ground deformation estimated from the geomorphic image analysis based on LiDAR data obtained before and after the earthquake" At the same convention, Professor Shinji Toda, Assistant Professor Yuichi Niwa and Assistant Professor Ishimura also presented a preliminary report of a trenching survey conducted on the Kamishiro fault. A lively discussion followed.



IRIDes is now more accessible with Tozai Subway Line.

The Sendai Municipal Subway Tozai Line opened in December 2015. The station closest to IRIDeS is "Aobayama Station." Located only about 10 minutes from Sendai Station, it is now more accessible.



data management I like watching movies and plays and was aspired to work in the field when I was a

Solving current problems in the method of

Another theme of my research at IRIDeS is the promotion of backup

verifying a system of Miyagi Medical and Welfare Information Network for

their better use during disasters, as well as in daily clinical activity. I believe it

is helpful for doctors to share important patient information among hospitals

and clinics. I think I am the type of person who is eager to find solutions to

any problems. I would like to keep moving forward in cooperation with other

systems for clinical data in case of large-scale disasters. I have been

aspired to work in the field when I was a student. My favorite film is "Lorenzo's Oil." It is based on a true story of parents, who had struggled to find a cause and therapy to save their son suffering an incurable disease. I strongly sympathized with their continuous efforts to find a cure even in a difficult situation.

Medical informatics is currently at the center of my research. I am in charge of the electronic medical record (EMR) system in Tohoku University Hospital. EMR gives us benefit of collecting medical information easily from tons of clinical data. It will improve the efficiency of clinical research.



Professor Masaharu Nakayama Disaster Medical Science Division Disaster Medical Informatics



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