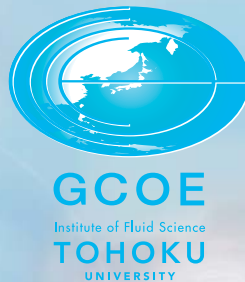




Tohoku University **Global COE** Program



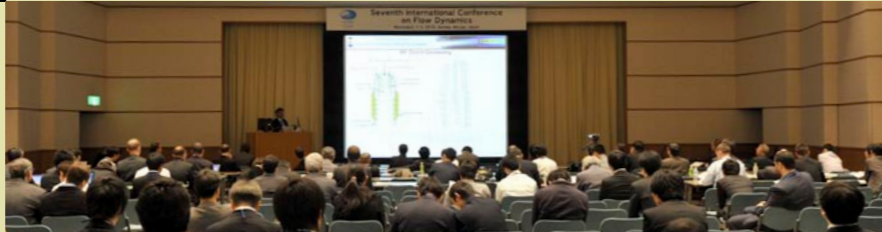
# Seventh International Conference on Flow Dynamics

**November 1-3, 2010**

**Sendai International Center, Sendai, Japan**



In early November, 2010, the 7th International Conference on Flow Dynamics was held in the Academic City, Sendai, fully covered with beautiful autumn leaves.



## Aiming to Establish the International Community on Flow Dynamics and to Drive Further Growth of the Network of Researchers



## Multi-physical Viewing of Vast Field of Flow Dynamics Ranging From Nano to Mega Scales

### Masami Nakano

Professor, Institute of Fluid Science, Tohoku University  
Chair of ICFD2010 : The 7th International Conference on Flow Dynamics

The International Conference on Flow Dynamics (ICFD) has been expanding its accomplishment year by year. The 7th International Conference on Flow Dynamics held this year was an unexpectedly great success with 749 participants including 241 researchers and students from 22 countries. Although the GCOE program's support will terminate in a couple of years, that can be a trigger to fuse various study fields of Flow Dynamics. I hope the ICFD will promote joint studies and interdisciplinary exchanges, and will spread across the world as a self-supporting international conference.

Last year, we included an alumni session with researchers who experienced Tohoku University's research faculty. Inviting these and other relevant researchers from both inside and outside Japan will create opportunities to expand the circle of

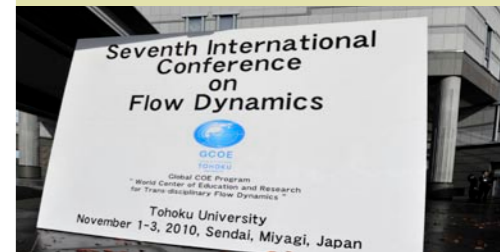
joint researches. We want to further broaden the bounds of the conference. Flow Dynamics' fields range from nano-scale flow dynamics of quantum, electron and ion to mega-scale flow dynamics of global-scale atmospheric flow. It also includes the enormous environmental field such as volcano and typhoon, and even the flow of information is entering within the scope of study. In addition, field fusion in chemistry, medical science, biotechnology and so on is in progress and then the Flow Dynamics will be growing as multi-physical view. To answer the social expectation for this new interdisciplinary study, we set up the Autumn school for young researchers to prepare for the future. Based on Sendai, ICFD will be the world center of Flow Dynamics that gathers various research members including repeaters.

## Tohoku University Global COE Program

## Seventh International Conference on Flow Dynamics (ICFD2010)

November 1-3, 2010

Sendai International Center, Sendai, Japan



## Program

### Monday November 1, 2010

- Opening Address
- Plenary Lectures
- General Session on Multi-Scale Flow Dynamics
- Fluid Dynamics Aspects of Environmentally Advantageous Hybrid Rockets
- Flow Dynamics in Fluid Machinery
- Flow Dynamics in Thermal Science & Technology
- The Sixth International Students / Young Birds Seminar on Multi-scale Flow Dynamics
- Workshop on Sustainable Atomization and Spray Technology (AFI/TFI-2010)
- 4th Functionality DEsign of the COntact Dynamics: (DECO2010)
- Nature Mini Seminar
- Students / Young Birds Friendship Night



### Tuesday November 2, 2010

- General Session on Multi-Scale Flow Dynamics
- Fluid Dynamics Aspects of Environmentally Advantageous Hybrid Rockets
- Aviation Research in Aspects of Environment
- Advanced Control of Smart Fluids and Fluid Flows
- Flow Dynamics in Fluid Machinery
- Molecular and Nanoscale Phenomena in Fluids and Interfaces
- Flow Dynamics in Thermal Science & Technology
- The Sixth International Students / Young Birds Seminar on Multi-scale Flow Dynamics
- Workshop on Functional Plasma Flow Dynamics and its Systems
- International Seminar on Maintenance Science and Technology for Nuclear Power Plants
- IFS Collaborative Research Forum (AFI/TFI-2010)
- International Scientific Committee Meeting
- Special Talk
- Liaison Office Session



### Wednesday November 3, 2010

- Aviation Research in Aspects of Environment
- Advanced Control of Smart Fluids and Fluid Flows
- Molecular and Nanoscale Phenomena in Fluids and Interfaces
- Flow Dynamics in Thermal Science&Technology
- The Sixth International Students / Young Birds Seminar on Multi-scale Flow Dynamics
- International Seminar on Maintenance Science and Technology for Nuclear Power Plants



More information >>

[http://www.ifs.tohoku.ac.jp/gcoe/ICFD\\_html/ICFD2010\\_html/program/index.html](http://www.ifs.tohoku.ac.jp/gcoe/ICFD_html/ICFD2010_html/program/index.html)

# ISC (International Scientific Committee)

The International Scientific Committee (ISC) was organized for the first time this year to serve as a foundation of steady development of international exchange and further growth of ICFD and flow dynamics research in the future. It is expected that ISC will play an important role after termination of Global COE Program.



## Gian Piero Celata

ENEA: Italian National Agency for New Technologies, Energy and Sustainable Economic Development  
International Scientific Committee Member

### Flow Dynamics Research; An Opportunity to Improve the Sustainability to Young Generation

This is my first time attending the ICFD, but I was aware of the GCOE program from information received by Prof. Maruyama. I was also aware of the previous COE program due to my close co-operation with Prof. Nobuhide Kasagi, from the University of Tokyo. This conference is quite interesting and it is easy realizing that flow dynamics is everywhere, from domestic heating to coffee machines. Energy, environment... everything is effected by flow dynamics, so it is quite important to organize and attend a conference like this. More than 700 people are attending this conference and more than 200 people are from foreign countries so I think this conference is a top one, truly international and representing the state of the art of flow dynamics.

Many topics are covered spanning from biomedical and spacecraft applications providing also a very good mixture of experimental work and numerical simulation. Sometimes I am a bit concerned about numerical work, because people involved in numerical work tend just to run the calculation and say that "this is physics." Not very often they

compare the calculation with experiment. This is quite a good opportunity to bring numerical people and experimental people together.

Conference organization and scientific quality in Japan are always top ranking. I feel that rather than going down to 500 participants, it is important to keep a broad conference like this one. Student attendance is quite large and this is a unique opportunity for them. Either they are going to industries or staying in university for research work, it is important for them to have a broad scenario of what flow dynamics is in real life. Therefore, it is good to have many different topics discussed at the Conference. If anything can be suggested, I would recommend to focus on a specific topic a bit more. For instance, one year it can concentrate on energy, another year on transportation, and another year on environment. A large impact on environment is due to automotive transportation and transition to carbon free cars is very important.

Looking at the development of the conference, it has grown quite a lot in number of participants over the last few

years. Looking at the collaboration with associated center worldwide, we can conclude it is a huge success. Program is running smoothly and efficiently. If this kind of conference might offer some programs to students to have some short courses on specific discipline, it would be a great further benefit for them. Preparation of new generation is quite important and must be thoroughly and continuously pursued.

I think research is research and it is often driven by curiosity. Sometimes it is driven by the needs of industries. I think this conference has both.



## Patrick Bourgin

Ecole Centrale de Lyon, Director, Management Team  
International Scientific Committee Member

### Flow Dynamics Issues and the International Cooperation

I started relations with Tohoku University from 1990s. I think this conference is very well done. It is very important to promote the multi disciplinary approach of flow dynamics. In the future, it might be necessary to define tracks, e.g., energy, transportation, biology, etc.

Many young students attend and make presentation in this conference and I was very impressed by their session. We should promote this kind of presentation. Young people are our future.

Students of Tohoku University are perfect when they don't have any problems but once they got problems, they don't open themselves enough. But after 6 months or so, they get used to it and are fine.

As an individual, I'll support Tohoku

University by supporting this kind of conference and taking part in organizations, and as the head of ECL, I'll do the same and also more promotion. I believe that this conference could be connected to industry activities like transportations and energy. I'll also promote this to industrial companies.

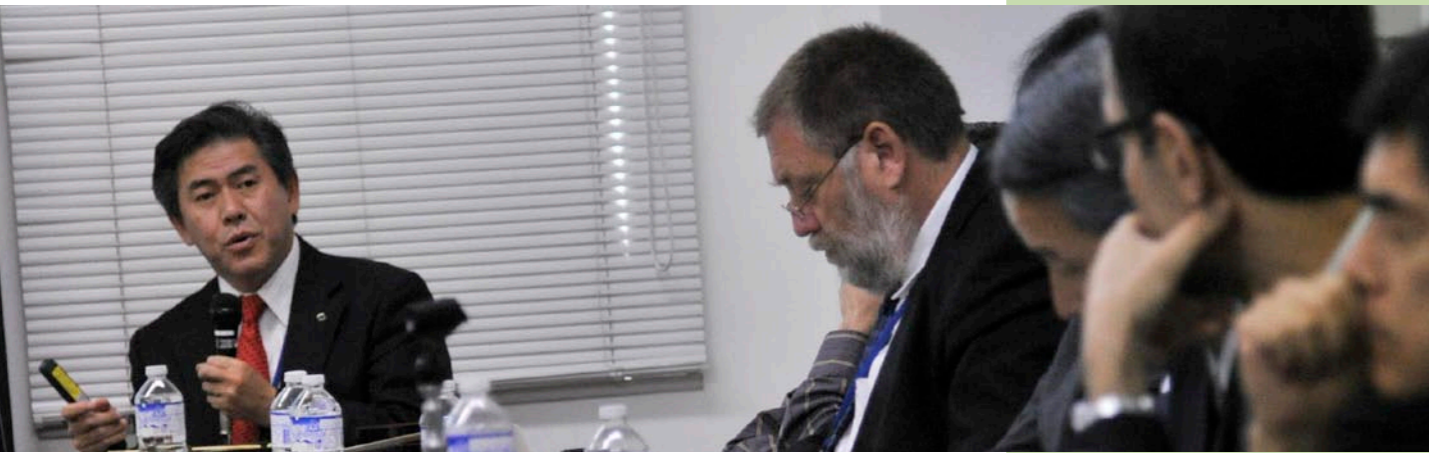
The first 5 years of this project was quite fruitful. The goal was to promote the multi disciplinary approach of flow dynamics and it reached in a good direction. The next challenge is to attract more students from abroad and Japanese students should stay longer in Lyon or other places, using the network all over the world. Build a nice network of research so that people know each other and invite students in good condition.

The plan is to define the tracks of the

research topics. It is necessary to keep high expertise of flow dynamics itself, not to lose expertise in international level. Flow dynamics can contribute in 2 ways. One is to concentrate on environment and climate change by improving engines and energy savings. Second is to mix people, that is, mix the way of thinking and approaches, compare the Western and Eastern way of thinking.



# Liaison Office Session & Global Network



**Akihiro Sasoh**

Professor, Nagoya University  
International Scientific Committee Member

## Eagerly Expecting Amazing Competence That Japan Transmits “New” Future of Flow Dynamics

Nagoya University that I work for and Tohoku University are in really good partnership. ICFD on Flow Dynamics and Fluid is very unique in the world and increasing its participants year by year. World-renowned researchers are actively participating. I hope that, as the Conference further matures, even the classification of researchers and students will become unnecessary.

I joined the Aviation field’s session of this Conference. Material weight reduction and composite materials are still the main topics in the industry, particularly among makers. I think it would be also ideal for flow dynamics if its “seed” potential for breaking through this status to come out in a form visible to the industry in three to five years, winning active involvement of

businesses in ten years.

At the same time, I am wondering what role academia can be functional in bridging between basic research and applied research, in other words, in academia side of academic-industry partnership. In the U.S., request for research activities from maker side of the aviation industry is no uncommon, whether by sounding or pushing. I wish that ICFD will trigger active exchange between academia and industry.

I also expect students that they, after finishing doctor course, engage in more academic jobs or demonstrate rich originality in makers. And I expect that Japan will become where new things are invented in.



Following the previous year, Liaison Office Session was held. GCOE has actively promoted exchanges across the world through the liaison offices situated in Australia, Russia, Korea, U.S., France and Sweden as well as joint laboratories. With the promotion, a system to support the “Flow Dynamics” research is becoming more and more stable. The enhanced support system will be a drive for further evolution and growth of the researchers’ network.



# Plenary Lectures

## Hitozukuri and Monozukuri: Centuries' Old Eastern Philosophy to Seek Harmony with Nature

**Kozo Saito**

Professor and Director, Institute of Research for Technology Development (IR4TD)  
Tennessee Valley Authority Professor in Mechanical Engineering College of  
Engineering, University of Kentucky, USA



### Mission Set Up by IR4TD

The Institute of Research for Technology Development ("IR4TD") of the University of Kentucky I worked for has close partnership with industries. Our motto is "win-win" relation. The IR4TD's core value is "ICU (Innovative, Creative, and Unique)" and its mission is Education, Applied Research, and Basic Research. Further, we are challenging to create and maintain a self-driven fiscally-independent system.

### Introduction of IR4TD Technology Highlights

IR4TD is engaged in six technical themes. Among them I introduce here the painting technology for automobiles focusing on green technology, which has been developed jointly with industry.

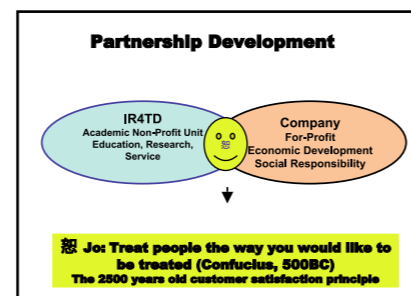
Painting is not a simple manufacturing process, but involves a variety of implications such as material science, production engineering, quality, and environment. We came up with our idea from flow pattern around a sand dune and successfully develop the highly-energy saving technique.

### Mind of "Jo"

There is difference between western and eastern view and method of thinking. The former is represented as "Science" and the latter as "Kufu." In problem solving, both take different approach.

IR4TD as an academic institute is a non profit unit focusing on education, research, and service while industry is for-profit and assumes responsibility for economic development and society. We emphasize the part where the above two

overlap (common interests). That is where "Jo," a teaching of eastern philosopher Confucius, plays an important role. "Jo" means that you treat people the way you would like to be treated, in other words, mutually respectful concept to esteem compassion to others. Academia and industry can have a common objectives and a common goal. One plus one can become three, and even four.



Plenary lectures were given by three international scientists who are leading their research fields in flow dynamics.

## Toward Green IT: Petaflop Supercomputers Cooled with Warm Water Combine Microcooling Technologies with Waste Heat Reuse and Set a New Standard

**Dimos Poulikakos**

Professor and Director, Laboratory of Thermodynamics in Emerging Technologies, Institute of Energy Technology Department of Mechanical and Process Engineering, ETH Zurich

Director, Joint ETH Zurich-IBM Corporation  
Nanoscale Technologies Exploratory Research Laboratory (NETL), Switzerland

### For Realization of Green High Performance Computing Datacenters

The challenge toward zero emission, high performance and low-energy "green" datacenters requires such novel technologies as Ultra High Heat Flux Electronics Cooling, Integration of Water Cooling Systems into 3D Chip Stacks and Nanoscale Manufacturing of low power electronics. Petaflop computer centers, for instance, require 10-20MW electric power, and their waste heat is not reused. Converting one 10MW datacenter to "zero emission" could result in a 50 % energy saving and could provide heat for 800-homes.

### Required Technologies and Inspiration Behind Them

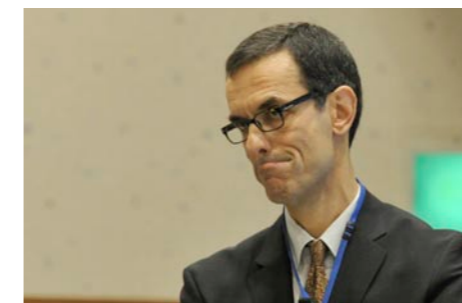
The vision of a green datacenter consists

of : district heating or process industries as possible users of the produced heat; cooling with warm thermally recycled water eliminating the need for chillers; and bio-inspired small scale, chip level, ultra high heat flux heat exchangers. To put this technology to practical use, a manifold micro-channel heat sink, whose parallel coolant channels enable impinging liquid jets emanating through their bottom wall for cooling, is a promising solution in terms of space/energy saving and energy re-use. If the coolant is designed as an emulsion, higher heat transport efficiency will be obtained. Additional ideas are inspired by red blood cells running in capillary blood vessels and lotus leaf-like hydrophobic surfaces for pressure drop reduction. Also important are nano-scale studies of contact thermal resistance and the heat transfer mechanism at solid-liquid interfaces, which are to help the

enhancement of heat conduction at the near transistor region. At the same time, cooling 3D-stacked computer chips with water will set a new norm.

### Technology Improvement and Energy Demand

Increased green consciousness and the rising cost of power are green datacenter market drivers. Simultaneously, the actual situation is that the IT industry's energy demand outpaces the technology improvement. Given the fact that the energy consumed in high performance computing at a wide palette of length scales starting at the level of tiny 0.1 μm transistors is a significant contributor to exergy waste and global warming, global solutions are urgently needed, in which the IT industry must be directly involved and be a major contributor.





## Radio Frequency Thermal Plasma: The Cutting Edge Technology in Production of Single-Walled Carbon Nanotubes

### Javad Mostaghimi

Professor and Director, Centre for Advanced Coating Technologies  
Department of Mechanical and Industrial Engineering  
Distinguished Professor in Plasma Engineering, University of Toronto, Canada

#### Remarkable Properties of Single-Walled Carbon Nanotube

Single-Walled Carbon Nanotube (SWCNT), one of the most revolutionary discoveries in the nanotechnology, is expected to be applied in many fields such as engineering and medical application because of its outstanding electronic, mechanical, optical, and chemical properties. However, the costly manufacturing process of high-quality SWCNT has hindered the practical applications. Thus, an innovation is essential to develop economically-effective synthesis methods to produce SWCNT of high quality.

#### To Improve Manufacturing Technology

The current techniques include arc discharge, laser ablation, chemical vapor deposition, flame synthesis and arc-jet plasma. Most recently, it is found that radio frequency (RF) thermal plasma

method has a definite advantage exceeding the aforesaid conventional competitive technologies. Using the RF plasma configuration, the synthesis rate of SWCNT can reach as high as 100 g/h, while the quality of the tubes is comparable to those from laser ablation methods.

#### Metallic Nanoparticle Catalyst

In the meantime, growth process of metallic nanoparticles of catalyst necessary for SWCNT synthesis is represented as a formula of the general dynamic equation (GDE). In solving the GDE, there are two methods. We calculated the nucleation and growth of SWCNT for each method. The mean diameters of the droplets were predicted to be around 10 nm at the exit of the reactor system, which is in fairly good agreement with the TEM images of the SWCNT soot.

#### Targeted Goal

Our research is addressing the RF

plasma method in synthesis of SWCNT, the existing numerical approach to model the nucleation and growth of these nanomaterial, the shortcomings of the existing model, and the possible improvements to the numerical model.

The RF inductively coupled with plasma technique is a new method now, but must bring promising production method of such materials as SWCNT at industrial scale.



# Special Talk

Special presentation was given by world renowned Prof. Hui Meng who is the foremost researcher of intravascular treatment. In the presentation, Prof. Hui Meng introduced, for the first time in the world, the latest treatment of cerebral aneurysm and medical engineering technology to support stroke-therapy.



### Hui Meng

Professor, Mechanical & Aerospace Engineering, The State University of New York Buffalo, USA

#### Merging Different Fields

The connection of Aerospace Engineering and Neurosurgery is "fluid flow." Having previously done research projects for NASA and Air Force, about 9 year ago I started to shift my focus to the study of blood flow and vascular diseases such as brain aneurysms. The new field was not only more interesting but also highly motivating because I could see my research directly impacting human health.

This conference is amazing because it enjoys a global scale and is truly trans-disciplinary. All three plenary lectures gave us the glimpse of the future. It impacts most of our technologies and it is integrating academia and industry. I think the reason why I was invited to give the special talk was that my work integrated previously largely separated fields.

Whether more people will be involved in fluid dynamics research or not will depend on whether universities will reach out and educate the public, high-school and university students more to make them aware of this fascinating discipline and its importance. Anything

from automobile manufacturing, energy, environment, and human body all involves "fluid flow." Flow is everywhere. One of the presentations said that a large part of the cost of making cars is the spray paint and that is a flow problem (from plenary session). Removing the generated heat in high-performance supercomputers is also a flow problem.

Traditional fluid mechanics is pretty established and matured, but applied to new territories (such as medicine, renewable energy, and nanotechnology), it will continue to innovate. Tohoku University is already playing a key role in this front. I visited many countries but the Institute for Fluid Science is one of a kind, and it is one of the biggest. The GCOE is very unique as well. Tohoku University organizing such an international conference shows that it is leading the many different fields and applications of flow dynamics. I'd like to continue collaborating with Tohoku University.

Japanese students are much more self-

driven and better work ethics and take the work seriously and respect teachers. But I'd like to see more independence. You are so polite and sometimes it seems that you are afraid of challenging professors. Having a combination of Eastern and Western values and characters might produce better future leaders.

When venturing into a new field (such as medical application of fluid dynamics), it is important to understand the needs from the application end. Start from their problems (starting from the ends) and find what kinds of tools you have to address the problems, and sometimes you have to reach out to find new tools in order to solve the problems (thus driving innovation). Starting from and stick with tools you already have without focusing on the ends, you will not stay relevant for very long and thus will have difficulties to make meaningful progresses in the long run. To do so in medicine, start from the needs of patients. So trans-disciplinary "collaboration" is important.

# Student Session

The Sixth International Students/Young Birds Seminar on Multi-Scale Flow Dynamics

This is a three-day student session organized by students themselves. The session consisting of the short oral presentation and poster presentation was actively carried out by students from the world and excellent presentations were selected for the Best Award and Outstanding Award.



## What I Learned As an Organizer

We were able to play our role supported by many people including Research Assistants (RAs) of GCOE, secretariats of GCOE and advisors consisting of Professors.

It was very hard for us to conduct this session since it was huge session contained 109 participants. However I thought I was able to gain valuable experience as an organizer, which must be rare for students. Especially participation in ICFD was a valuable experience for me as one of promoters to drive the project because I want to continue and deepen my research on flow dynamics.

I hope that I will experience research activity abroad once at least so I learned a lot by having talks with researchers abroad and foreign students at Friendship Night.

I hope that ICFD will grow to an active forum of exchange by gathering many and a variety of students.

Student Session Organizer

**Yu Nishio**

Tohoku University School of Engineering D2

## ICFD — the Cross-Cultural Exchange

I had been in New Zealand to study from the 2nd grade of high school, and I am now a student at the University of Sydney. I am engaged in the research of natural convection. I am very delighted to receive the Award in the Conference. I think that, in comparison to the University of Sydney, Tohoku University has better experimental facilities. In addition, I found that students in a laboratory have very strong bonds between each other at Tohoku University.

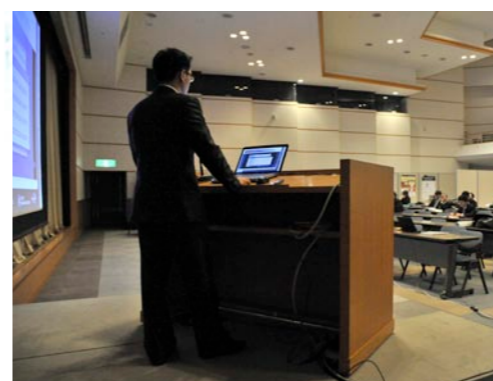
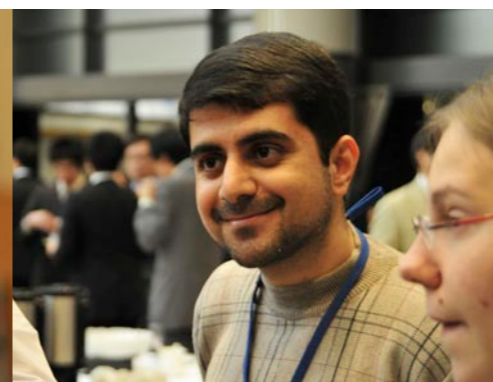
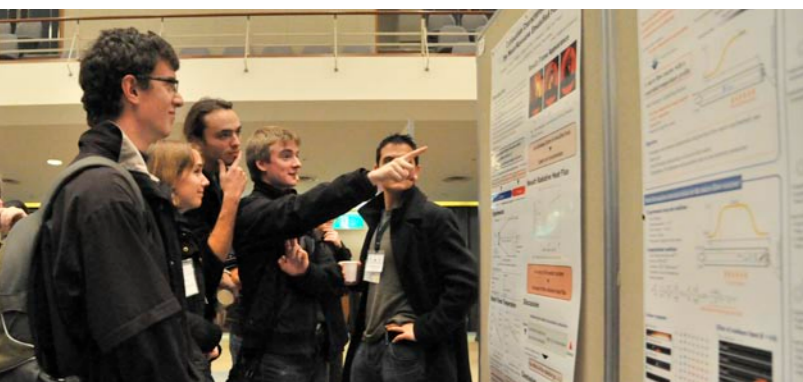
In this ICFD, I had great opportunities to meet and discuss with many people with different backgrounds. By this, I could obtain new ideas and viewpoints which I never had before. I respect Japanese researchers for their dedicated attitudes against research. They are diligent and forbearing. I suppose Japanese people would become more competitive and contributive to the world if they become more open-minded in the international arena. I wish to continue my research with keeping in mind this Japanese enthusiasm.

## Winner of "Best Award" and "Outstanding Award"

Numerical Study of a Transitional Natural Ventilation Flow Driven by a Line Source Plume with Varied Reynolds Number and Prandtl Number

**Tae Hattori**

The University of Sydney D2  
School of Aerospace, Mechanical and Mechatronic Engineering





### Hydrogen Energy and GCOE/ICFD

I completed my undergraduate studies at the Ehime University and started my research at the Tohoku University from master's course. I am now engaged in the research on hydrogen production using the solar radiation. I am not a GCOE researcher, but have joined several sessions related to my research field of this Conference as a Researcher Fellow of the Japan Society for the Promotion of Science (JSPS). I am interested in presentations of quantum molecular dynamics computation and thermal radiation fields.

I will stay at the University to continue my research on development of hydrogen energy resource as renewable energy, and reduction in energy consumption and highly-efficient hydrogen production by optimally tuning spectral properties called spectrally controlled thermal radiation.

I hope to train my ability of discussion, expression, and presentation in English through international conferences such as ICFD.

### Yuriko Maegami

Tohoku University School of Engineering D2

### Six-year Student Life in Sendai is the Greatest Experience in My Youth Looking Back at the Participation in ICFD and Research Life at Sendai

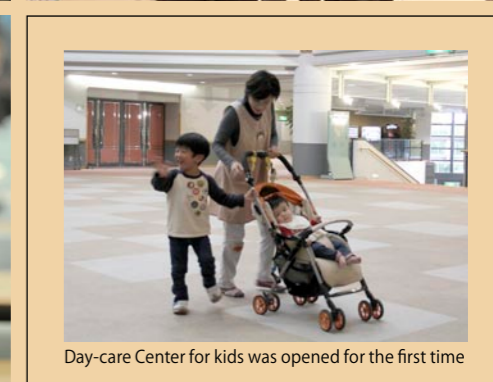
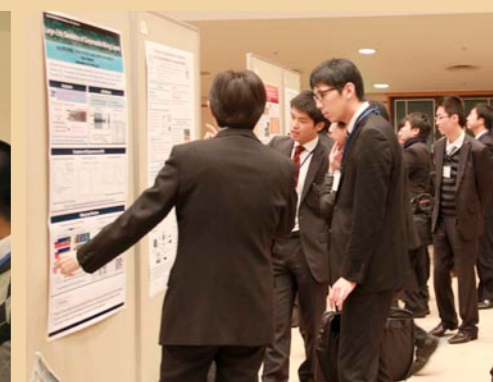
I came to Japan from Colombia in 2004. From next year I will aim to receive academic degrees from the Tohoku University and the ECL (Ecole Centrale de Lyon) through the double degree program. Right now, I am researching on measurement of diffusion coefficients of high-molecular-weight materials such as proteins. Finally, I would like to conduct top class research in my home country, Colombia.

I noticed that research attitude of Japanese differs a little from that of foreigners. Many foreign researchers come early in morning and go home early, while many Japanese come a bit late and continue their research until late at night. My life in Tohoku University for six years has been the greatest because Sendai is rich in nature and very comfortable to live in. The research environment is the greatest as well.

Academic conferences like ICFD are very stimulating for me. When I read papers of some of the presenters to later actually have discussions with them in person, I recognize my shortcomings and lack of knowledge in certain fields. I also obtain some valuable ideas that are applicable to my research from other research fields.

### Juan Felipe Torres

Tohoku University School of Engineering M2



Day-care Center for kids was opened for the first time



# ElyT School in Sendai-Autumn

This year, students of the ElyT School participated in ICFD. Most of these students had experienced neither international conference nor visit to Japan before. This arrangement is an educational aspect of ICFD and we successfully provided the young researchers with a stage of international conference.



## ElyT School in Sendai - Autumn 2010

Tohoku University's Global COE "World Center of Educational and Research for Trans-disciplinary Flow Dynamics", held ElyT School in Sendai-Autumn 2010 organized by Professor Naoto Wada cooperatively with two renowned universities in France: Institut National des Sciences Appliquées de Lyon (INSA-Lyon) and Ecole Centrale de Lyon (ECL).

We invited 23-graduate students from France, Australia, Sweden, Russia and China for 11-day school from Oct. 24 to Nov. 3. ElyT School curriculum included: academic lectures by distinguished professors from Tohoku University, INSA-Lyon and ECL; research presentations by the students; introduction of Tohoku University and its laboratories; participation in laboratory seminars; and facility tours of nuclear power plant, JR Maintenance Center, etc.



### Cyril Mauger

Ecole Centrale de Lyon

This is my first time to stay in Japan, very interesting country. Relationship with professors and modernity is very different from us. JR plant was interesting because I used to work as an engineer in a firm dealing with integrated HVAC system for railway applications. So I have visited similar facilities in France. The facilities of two countries are very different. It is more organized in Japan. In Japan, revision of the facilities is after 36 months but in France is after 20 years, different functioning and interesting. Food is very good and enjoying the stay in Japan. I haven't had a lot of opportunity with students, only one or two.

Facilities and labs are different in Tohoku University. There are more means for experimental research.

I like Japanese food. Japan is very organized, disciplined, safe and interesting.

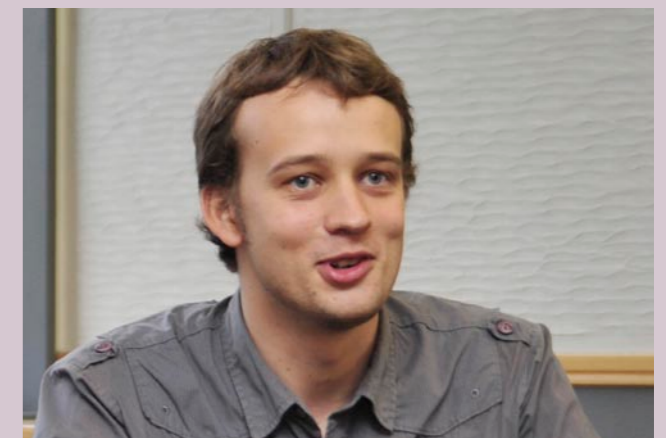


### Léa Bello

Ecole Normale Supérieure de Lyon

This is my first time in Japan. I met students of Tohoku University for the first time here (not in Lyon). In my lab, one of my professors told me about this conference but I am not specialized in flow dynamics. But I'm studying a little bit from mechanics. After the master course, I'll go to PhD and want to do something international. Tohoku University and ENS is not so different. I was happy here that the students and professors were welcoming.

I like Zen spirit. I'm not a Buddhist but I like the architecture. The research here is very developed. This time we are staying only 11 days so it's very short.



### Sergii Tutashkonko

INSA-Lyon

This is my first visit to Japan. I liked visiting the facilities in Japan, especially the nuclear power plant.

Comparing with France, Canada and Ukraine, there is a different kind of communication between Japanese students and their supervisors. Teachers are a big authority for students and professors trust students a lot. I like that.

Before coming to Japan, I didn't know much about modern Japanese culture. After staying for 2 weeks, I know how Manga and Anime appeared and got interested.



Here,  
 Wisdoms' dance raises gentle breeze  
 To bring bracing morning to future talents  
 Research site where something new is born  
 every moment  
 Won't you join the brilliant festival  
 Dedicated to the future?

## Toward Establishment of Continued International Community Shigenao Maruyama

Distinguished Professor, Tohoku University  
 Program Leader of Tohoku University Global COE Program:  
 World Center of Education and Research for Trans-disciplinary Flow Dynamics

The 7th International Conference on Flow Dynamics (ICFD) chaired by Prof. Masami Nakano was held in the largest scale in the ICFD history with a total of 749 participants including 241 foreigners from 22 countries in the world. Participants of the conference this time were almost doubled because the number of the previous one was 448. We believed that ICFD has become recognized widely and internationally, raising it to one level higher international conference.

The Institute of Fluid Science has established its first international organization called the "International Science Committee" (ISC) to serve as a global foothold to present

researchers and students over the world a new scientific field called "Flow Dynamics." We expect that ISC will function as the core part of the new Flow Dynamics' scientific contributions. International Conference on Flow Dynamics (ICFD) is a pleasant space where researchers from all over the world gather and share joy of scientific interests. I wish is that Tohoku University, or Sendai, will become the supply base of such a space and opportunity.

This particular ICFD is supported by the Global COE Program. I hope that the future ICFDs will be growing principally on their contents' attractiveness whether or not financial support is available. I hope that a visit to Sendai for the conference will be an opportunity to experience information exchange with researchers from various fields, unexpected start of a joint research team, and acquisition of various pieces of helpful information; even a lounge conversation may include a chance of great success.

We have special consideration for the young generation. We are actively receiving students of mutual cooperation programs

through liaison offices of Tohoku University, and inviting students from Tsinghua University (China) and other Asian countries. These students are promising media of information exchange, and they are making steady progress with their study results domestically and internationally. The autumn school inviting student from France and other countries was a very encouraging proof of interdisciplinary activity's effect, showing how young students with their own fields can be inspired by other fields.

Flow Dynamics is a fully diverse field of science. Many phenomena and events in all scientific fields are related with the flow dynamic phenomena. Based on this understanding, the scientific fields with GCOE are now engrossed in ultimate academic efforts of analysis and elucidation of phenomena in all these fields. We hope that Flow Dynamics will develop to influence industrial sector and encourage new business challenges. We also hope that it will continue forward, opening up new scientific fields and that those new fields will be established with ambitious participation of students and young researchers.





**GCOE**  
Institute of Fluid Science  
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**World Center of Education and Research for Trans-disciplinary Flow Dynamics**

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