



21st Century COE Program  
International COE of Flow Dynamics

Fourth International  
Conference on

# Flow Dynamics

September 26-28, 2007

Sendai International Center, Sendai, Japan

## Newsletter

### CONTENTS

Introduction	1
Overview of Fourth International Conference on Flow Dynamics	2
Academic Session	4
Student Session	5
Home-coming Session	6
Liaison Office Session	8

## Introduction



Shigenao Maruyama  
Program Leader  
21st Century COE Program  
"International COE of Flow  
Dynamics"

It is my pleasure to have an opportunity to report that the Fourth International Conference on Flow Dynamics was held from September 26 to 28, 2007. Looking back on the history of the International Conference on Flow Dynamics, the First Conference was completed successfully with so many participants; 375 people from 9 countries, the Second one, 563 people from 21 countries, and the Third One, 229 people from 12 countries. Having fruitful discussion on flow dynamics, this time, the Fourth Conference was also held successfully with 412 participants from 26 countries.

I believe it is very meaningful to have held an international conference here in Sendai, in which many researchers from all over the world renewed their friendships and shared the latest information on flow dynamics while establishing new friendships.

This international conference bore remarkable fruit in that we had discussions on research cooperation through Liaison Offices which were set up in the international research bases that should be international cores of flow dynamics study, and in that it provided overseas students and students of our university with an opportunity to promote good fellowship and to grow to be international researchers by exchanging information on flow dynamics with graduate school students from various research bases through the students session. It is specifically remarkable that students who were sent abroad under the international internship program gave presentations about their studies in the Home-coming Session and impressed us all with information about their research activities at educational institutions around the world.

I would like sincerely to express our gratitude to executive committee chair, Professor Michio Tokuyama, and members of the committee, who dedicated a great effort to the preparation and the management of this conference, as well as to all the participants.

## Address by Chair of the Executive Committee



Michio Tokuyama  
Chair of the Executive Committee  
"Fourth International  
Conference on Flow Dynamics"

This Fourth International Conference on Flow Dynamics was the last conference hosted by our 21 Century COE Program. We prepared for this conference to be best fitting and appropriate as the last of the series by referring to and learning from the previous three conferences.

The aim of this conference was to deepen our knowledge and discussion concerning the following five themes, including "Nano-Mega Scale Flow Dynamics in Energy System," "Nano-Mega Scale Flow Dynamics in Highly Coupled Systems," "Nano-Mega Scale Flow Dynamics for Advanced Aerospace Technology," "Nano-Mega Scale Flow Dynamics in Complex Systems," and "Role of Water in the Research on Energy and Environment," from the perspective of establishing an academic principle. These themes were organized and decided upon to become the foundation for the COE lecture series that is expected to be published this year, and we were able to listen to high quality lectures and participate in active discussions. Moreover, following the last conference, we were able to host the two special features of the COE, the "Mini Symposium designed and managed by Graduate Students" and the "Special Session by the Liaison Office", thus resulting in an international conference duly appropriate as the last of the series.

Lastly, I would like to take this time to thank once again the professors who moderated the organized sessions as well as staff members. I have no doubt that various international exchanges in the form of joint research and/or education have been promoted through the series of conferences, and am certain that the circle of active exchange will continue to grow and expand.

# Fourth International Conference on Flow Dynamics Overview

21st Century COE Program  
"International COE of Flow Dynamics"

Aiming at developing to be a leading base of flow study in the world, the 21st Century COE Program "International COE of Flow Dynamics" (Graduate School of Environmental Studies and Graduate School of Engineering, Institute of Fluid Science, Tohoku University) has kept actively striving for advancement in the field.

As part of the activities of our base, the COE hosted an international conference, the "Fourth International Conference on Flow Dynamics" at Sendai International Center (Sendai, Miyagi) from September 26 to 28, 2007.

With the participants being 412 domestic and international researchers from 26 countries, the conference opened the new commitment of the 21st Century COE Program "International COE of Flow Dynamics" to the world, as well as introduced cutting edge research results on flow dynamics by the world's leading researchers.



Venue: Sendai International Center



OS4: Keynote Lecture by Prof. Pierre Proulx

## Plenary Lecture

### 1) "New Results on Water in Bulk, Nanoconfined, and Biological Environments"

Professor H. Eugene Stanley (Boston University, U.S.A.)

Chairperson: Professor Hajime Tanaka  
(University of Tokyo)

September 26, 11:00-12:00 'SHIRAKASHI1'

"Professor Stanley, a theoretical physicist, who is an authority on

Liquid-Liquid Phase Transitions, presented his latest findings and raised issues for future discussion."



Prof. H.E. Stanley



Prof. Thomas C. Corke

### 2) "Plasma Enhanced Aerodynamics: Concepts, Optimization and Applications"

Professor Thomas C. Corke (University of Notre Dame, U.S.A.)

Chairperson: Professor Keisuke Asai (Tohoku University)

September 26, 14:10-15:10 'SHIRAKASHI1'

"The Plenary Lecture was presented by Professor Thomas Corke of Notre Dame University, U.S., who is a pioneer in the development of the plasma actuator, which is a fluid control device. The latest results on the principles and application of the plasma actuator were introduced."

### 3) "Addressing Unsolved Mysteries of Polymer Viscoelasticity"

Professor R. G. Larson (University of Michigan, U.S.A.)

Chairperson: Professor Dieter Richter (Forschungszentrum Jülich GmbH, Germany)

September 27, 15:20-16:20 'SHIRAKASHI1'

"Professor Larson, who is an authority of Society of Rheology, presented various proposals and analyses on how polymer dynamics can be theoretically understood."



*Prof. R.G. Larson*

### Organized Session

[OS1] Nano-mega Scale Flow Dynamics in Energy Systems  
September 26 - 27, 'SAKURA2'

[OS2] Nano-mega Scale Dynamics in Highly Coupled Systems  
September 26 - 27, 'ROOM4'

[OS3] Nano-mega Scale Flow Dynamics for Advanced Aerospace Technology  
September 26 - 28, 'ROOM6'



*Prof. R.G. Larson at the lecture*



*OS4: Question-and-answer session*

[OS4] Nano-mega Scale Flow Dynamics in Complex Systems  
September 26 - 28, 'ROOM7'

[OS5] International Workshop on Water Dynamics  
September 26 - 27, 'HAGI'

[OS6] Complex Systems  
September 25 - 28, 'SHIRAKASHI1&2', 'ROOM1&2'

[OS7] The Third International Students/Young Birds Seminar on Multi-scale Flow Dynamics  
September 26 - 27, 'TACHIBANA'

### Students / Young Birds Friendship Night

September 26, 19:00 - 20:45, 'SAKURA 2'

### Special Session

September 26, 13 : 10 - 13 : 45, 'SHIRAKASHI 1'

### Home-coming Session

September 27, 13 : 00 - 15 : 00, ' ROOM1'

### Liaison Office Session

September 27, 16 : 40 - 18 : 40, ' ROOM1'

### Banquet

September 27, 19 : 00 - 20 : 50, ' SAKURA 1'



*Student receiving an award at the banquet hall*

# Academic Session

On the Academic Session OS1  
"Nano-mega Scale  
Flow Dynamics in Energy Systems"

OS1 was organized for researchers and engineers who are working on transdisciplinary areas in energy conversions. We held the session in the form of one venue oral presentations for encouraging new interactions beyond those of ordinal specialized meeting. It covers reactive flows and fuel technology including fuel cells, hydrogen production systems, catalytic conversion and new concepts in combustion, commonly focusing on effective energy usage.

Five invited and special lectures were conducted by our honorable guests. Professor Paul D. Ronney from University of Southern California presented a lecture on the latest trend of the micro energy source research. Professor Stuart Adler from Washington State University talked on the oxygen reduction mechanism of solid oxide fuel cell cathode. Professor Toshihisa Ueda from Keio University lectured on chaos of reactive flows. Professor S. S. Shy from Taiwan National Central University introduced educational programs for human resource by integrating different fields targeted for a green technology by Taiwanese Department of Education. Professor Yu-Wen Chen also from Taiwan National Central University gave a lecture on selective reaction of carbon monoxide from hydrogen flow with Au catalyst.

It is indeed regrettable that we cannot list all the participants' names here, but the session was finished with great success thanks to the participation of many prominent researchers from China, Korea, India, Russia, U.S. and Japan though the duration was just two days.

Finally, Mr. Taegy Kim from the research group of Professor Sejin Kwon from KAIST, Korea was selected for the Best Presentation

Award for Student. His research was an outstanding one in which he succeeded in the automatic flight of an unmanned flight vehicle for five hours, having constructed everything including the fuel cell, source of power after devoting many years to this research.

## OS1 Organizers

Junichiro Mizusaki, Professor,

Institute of Multidisciplinary Research for Advanced Materials

Kaoru Maruta, Professor, Institute of Fluid Science



*Lecture at OS1*



*Lecture at OS3*



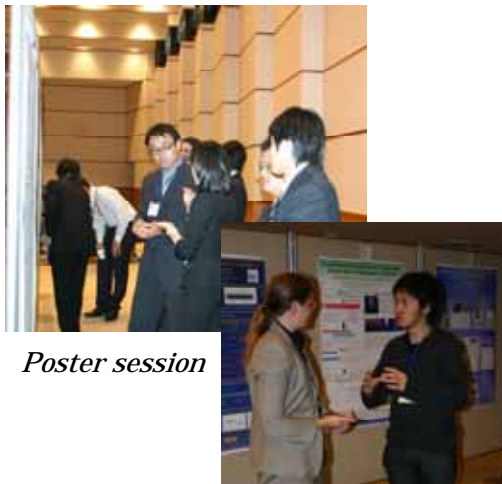
*A scene from the fellowship banquet*

# Student Session

On the Third International Students/Young Birds Seminar on Multi-scale Flow Dynamics



*Short oral presentation*



*Poster session*

Among the 7 organized sessions in which the lectures were delivered at the 4th International Conference on Flow Dynamics, OS7 was unique since it was a session organized and carried out by students, which has been continued since the 2nd International Conference in 2005. Four PhD candidates, Hidemi Takahashi, Masatsugu Oishi, Takashi Nakamura, and Kentaro Yoshinaga were the organizers for this year's student organized session. The 34 presentations from a wide range of research areas from Japan, Korea, US, Russia, Sweden, India and Australia, which were restricted to undergraduate students, graduate students, and young researchers such as postdoctoral fellows, consisted of a combination of a 6 minute short oral presentation together with a 30 minute poster presentation. The unique aspect of this format is that the speakers are able to explain their own research in front of their well prepared poster using body gestures when necessary, as well as using intriguing presentation materials for the short oral presentation, even if they do not have complete fluency in spoken English. This student session is the third one of its kind, and we have seen vast improvement in terms of the student organizers' efficiency as well as the quality of the

presentations and posters, which clearly shows the effect of one of our COE's objectives, that is bringing up an international leader in training young hopeful and talented researchers.

Moreover, we hosted a beer party, "Students/Young Birds Friendship Night", for all students who participated in the COE international conference on the first night of the 2-day OS7. This party was also organized and managed by the student organizers of OS7, and 5 other colleagues who went on the overseas exchange student internship and were invited to the Home-coming Session of this conference, attended and introduced their activities from the past and present using PowerPoint. Everyone enjoyed the party as people came together, transcending the boundaries of nationality and research area.

The total number of presentations by students was over 140 in the 7 organized sessions during the 3-day conference. In total 12 students from the 7 organized sessions were finally selected for their excellent presentations as the "Best Presentation Award for Student." At the banquet on the 2nd day, the awards were presented to the 10 students from the sessions in which the selection was completed. The recipients of the award were congratulated and awarded by the representative of the COE, Professor Maruyama, in front of all those who attended the banquet, which I am sure was a great encouragement to the recipients. The names of the recipients are listed on the website of our COE program.

The training of young talented researchers with international experience and a wide perspective was one of the most important objectives of our 5-year COE program. We believe that we were able to realize this objective through the numerous presentations by students, by continuously hosting student sessions organized and managed by the students themselves, and by international exchange through parties, as well as by awards to students at the international conference organized by our COE program.

OS7 Organizers:

Hideaki Kobayashi, Professor, Institute of Fluid Science  
Hidemi Takahashi, PhD candidate  
Masatsugu Oishi, PhD candidate  
Takashi Nakamura, PhD candidate  
Kentaro Yoshinaga, PhD candidate

# Home-coming Session

Overview of International Internship Program “ Home-coming Session ”

The International Internship Program “Home-coming Session” was held from 13:00 to 15:00 on September 27, 2007 at Sendai International Center. Our COE program has conducted an International Internship Program, sending 33 graduates of our school to overseas institutions and accepting 42 international graduates to our school. The “Home-coming Session” was planned with a view to summing up the previous activities in the international program and to review how this program should be in the future. Among the students sent out and in, the following five students who “graduated” from this program presented lectures and held discussions.

*International Internship  
Alumni*

James Gregory (United States Air Force Academy, U.S.A.)

Wataru Yamazaki (ONERA, France)

Takeshi Okuyama (Tohoku University, Japan)

Ryuta Ibuki (Miyagi University, Japan)

Takanori Takeno (Tohoku University, Japan)

First, Professor Toshiyuki Takagi, general manager of international collaboration promotion of the COE Program, explained the purpose and overview of the International Internship Program, and details up to the present. Then, the five students who had “graduated” from this program lectured on (1) research and life during the internship, (2) the relation between the present research and internship, and (3) suggestions on the International Internship Program. After that, faculty who had accepted the graduates or supervisors in Japan made comments on the stay of the graduates and suggested advice on this program.

Although the length of stay during the internship and research career afterwards vary depending on the graduates, there are cases where this program has led to organic solidarity between the graduates and the faculty laboratories and organizations that accepted them, and cases where they have kept cooperation afterwards and started-up joint research projects. In addition, faculty who accepted overseas students under the internship pointed out that students in the laboratory were willing to try to communicate with the overseas students, which changed the atmosphere. It was a common opinion that the experience of coming in touch with different cultures and histories and trying to communicate with students and faculty by any means possible was productive.

Moreover, there were some opinions suggesting that we should also invite undergraduate students and conduct a joint design project of aircrafts, and that we should seek for subsidy offered by overseas organizations and make efforts to make this program more active.

At the end of the session, Prof. Maruyama, who was the Program Leader of the COE, summarized as follows;

- 1) In order to make the International Internship Program successful it requires long term cooperation between professors who send out and accept students.
- 2) It is necessary for COE administrative office to provide support for sending and receiving students.
- 3) It is important to put pressure on the students so that they may achieve their full purpose and thus the effect of the program is not limited to that of a mere research excursion.
- 4) Internship Program was introduced in the “ Inoue Plan ” , and it is expected that the activities will keep expanding.

In the presentations by the five graduates there were no negative opinions against this program, which is further proof that this program was successful.



Tetsuya Uchimoto, Associate Professor, Institute of Fluid Science

At the 4<sup>th</sup> International Conference on Flow Dynamics the Home-coming Session was held for the first time. The purpose of this session was to think back on the Internship Programs conducted over the last five years. Since this session was held at the same time as the session in which general students took a central role, the speakers had made a short presentation at a beer party, "Students/Young Birds Friendship Night" held the previous night. The session started with an Introduction by Professor Toshiyuki Takagi, in which he stated that 75 students had studied abroad under this program, and five of them were speakers in this session and working for the university at the present.

Dr. Gregory, who graduated from Perdue University, arrived at his post in Tohoku University through the Japan Aerospace Exploration Agency (JAXA) in 2004 and stayed under Professor Asai, who had just opened his laboratory. Dr. Gregory talked about his own research and career up to the present as well as his memories during his stay, such as the JAXA visit, Nikko, Matsushima, festivals, and barbecues. With this session, both the speakers and faculty advisers saw each other after a long time, and had an opportunity to review for the future development as well as reflect on the past. It was indeed a chance to feel exactly like a homecoming while graduates were exchanging the latest news about themselves.

At the conclusion of the session, Professor Shigenao Maruyama made a speech and commented that it was necessary to keep up a long term connection between the faculties because mutual thorough understanding on the research is a must so that the dispatched students under this program, in which the length of stay is up to three months, can start research smoothly after arriving at the receiving university. And he concluded his speech with his wish for progress in the careers of the graduates who experienced this program, and expressed that it is desirable that graduates who experienced this program advance their research in new fields without sticking to the research of their school days.

Ryuta Ibuki, Assistant Professor,  
Environmental System Division,  
Department of Food Industry,  
Miyagi University

2004 International Internship Student (INSA de Lyon, France)



*Dr. Ibuki during the Internship*



*Short presentation at a beer party*



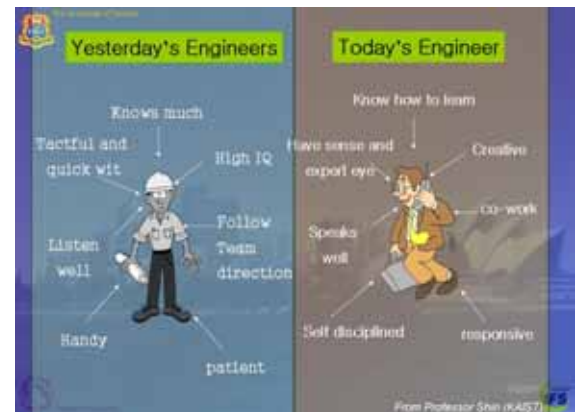
*A scene at the lecture*



# Liaison Office Session

## Overview of the Liaison Office Session and Future Policy

At the Liaison Office Session, two sessions, a Plenary Lecture Session and an activity report of each liaison office were held to sum up the activities of the liaison office during the five-year 21st Century COE Program “Flow Dynamics”. At the Plenary Lecture Session, Professor Masud Behnia from the University of Sydney (Australia) summarized “An Overview of Activities of Liaison Office through 21st Century COE Program “Flow Dynamics - International Research & Research Training” as a report of international joint research and/or education seen from the outside, and gave a lecture on how education should be in the future.



*Future image of young researchers and engineers*

In his lecture a slide shown by Professor Shin from KAIST (Korea) in 2006 was placed again (upper right), and the future image of young researchers and engineers was expressed. I believe this future image coincides with the one which our COE has aimed at, and will keep as our goal as well.

In addition, at the Plenary Lecture Session, Professor Shigenao Maruyama made a presentation on the Micro-Nano Scale Heat Flow dynamics established up to now, entitled “Establishing Academic Principle and Future Prospects of Flow Dynamics.”

Prior to the report on each liaison office’s activities, Toshiaki Ikohagi, the director of institute commented on the activities and future concept of the Institute of Fluid Science, expressing that it is important for the future development of the fluid science to integrate with other fields.

Makoto Ohta, Associate Professor, Institute of Fluid Science



This year, the final year of our COE, we invited Professor Behnia from the University of Sydney to give a plenary lecture on the activities of the Liaison Offices, which the COE established and developed. Since Professor Behnia has served on the third party assessment committee, he reported the outcome for the last five years using detailed data, and to point out what is expected of the exchange through the Liaison Offices in terms of joint research and/or education, and the future necessity of the joint education of the doctoral program

The 4<sup>th</sup> convention of the Liaison Offices was held as a session of this international conference in the afternoon of September 27 and at the Institute of Fluid Science in the afternoon of September 28. The speakers from each liaison office were as follows:

Professor Masud Behnia	The University of Sydney
Professor A. N. Vasiliev	Moscow State University
Professor Hyun Dong Shin	Korea Advanced Institute of Science and Technology
Professor Hiroshi Higuchi	Syracuse University
Professor Joel Courbon	INSA de Lyon
Dr. Veronica Eliasson	Royal Institute of Technology

The following describes a summary of the lecture and discussion in these two meetings:

1. Exchange through the Liaison Offices enabled many graduate students in the doctoral course to interact with each other as international internship students. This brought a significant outcome, and we can expect this will lead to the double degree of the doctoral course in future.
2. Joint research was carried out through the Liaison Offices. Some research projects formed a multi-network through the Liaison Offices. These will continue to advance the joint research and education even after the COE finishes.
3. What lies beyond the exchange through the Liaison Office is a joint laboratory that provides us with a place and chance to practically conduct joint research and education. Keeping this in mind, we are determined to realize this future prospect hand in hand. Financial support from each country funding organization is necessary for this.
4. The COE Program has brought us great outcomes in terms of the exchange of graduate students in the doctoral course. It is necessary to establish some support system for excellent graduate students in the master's course who are likely to advance to the doctoral course.

Toshiyuki Takagi, Professor, Institute of Fluid Science



---

---

## **CONTACT**

21st Century COE Program “International COE of Flow Dynamics” Office,

Institute of Fluid Science, Tohoku University

2-1-1, Katahira, Aoba-ku, Sendai 980-8577, Japan

TEL/FAX: +81-22-217-5301

E-mail: [21coe-office@ifs.tohoku.ac.jp](mailto:21coe-office@ifs.tohoku.ac.jp)

URL: <http://www.ifs.tohoku.ac.jp/21coe/>

---

October 2007