

The International Information Center for Multiphase Flow

NEWSLETTER

No. 36, September 2011

The Japanese Society for Multiphase Flow

Report on "The 3rd International Conference on Jets, Wakes and Separated Flows" ICJWSF-2010, September 27-30, 2010, Ohio, USA

1. About ICJWSF

"The 3rd International Conference on Jets, Wakes and Separated Flows, The 3rd ICJWSF-2010, Cincinnati" was held at Marriott Kingsgate Conference Center, Cincinnati, Ohio, USA during September 27th to 30th, 2010 (Figs. 1, 2). The Chairperson was Prof. E. Gutmark, Univ. of Cincinnati. One of the Cosponsor was JSMF (Japan Society for Multiphase Flow). The main topics of the conference were about jets, wakes and separated flows including multiphase flow, flow control, experimental and numerical, and others.

The 1st Conference was held at Toba Hotel International, Mie, Japan during October 5th to 8th, 2005. The Chairperson was Prof. T. Shakouchi, Mie Univ.

This conference was prompted newly by the earlier successes of the meetings about "Jets, Wakes and Separated Flows" at the JSMF and JSME, many Organized Sessions and the OS at The 3rd and 4th ASME/JSME (Japan Soc. of Mechanical Engineers)

by Shakouchi Toshihiko

Joint Fluids Engineering Conferences. The number of presentation paper was 124 and participants were about 200 researchers and engineers from 17 countries, and the selected papers were published as the "Special issue on Jets, Wakes and Separated Flows" at the JSME International Journal, Ser.B, Vol.149, No.3, 2006.



Fig. 1 Program book and abstracts of ICJWSF-2010, Cincinnati

To Join ICeM:

Everybody, who is interested in Multiphase flow, is welcome to join ICeM. Please contact one of the following board members to register in ICeM member.

Chairperson (Editor): Prof. Hiroshige Kikura Research Lab. for Nuclear Reactors Tokyo Institute of Technology Ookayama, Meguro, Tokyo 152-8550 Tel: +81-3-5734-3058 Fax:+81-3-5734-2959 E-mail: kikura@nr.titech.ac.jp Members: Prof. Yoshimichi Hagiwara Kyoto Institute of Technology E-mail: yoshi@kit.ac.jp Prof . Tomio Okawa Osaka University E-mail: t-okawa@mech.eng.osaka-u.ac.jp

Prof. Shigeo Hosokawa Kobe University E-mail:hosokawa@mech.kobe-u.ac.jp

Dr. Kosuke Hayashi Kobe University E-mail: hayashi@mech.kobe-u.ac.jp



Fig. 2 State conference, Marriott Kingsgate conference center

The 2nd Conference was held by the success of the 1st one at Technishe Universiaet Berlin, TU-Berlin, Germany, and the Chairperson was Prof. O.Paschereit, TU-Berlin. The number of paper was 116, and the selected papers were also published at the Journal of Fluid Science and Technology, JFST, JSME, Vol.4, No.2, 2009.

2. The 3rd ICJWSF-2010, Cincinnati

The 3rd Conference was held at September, 2010 in Cincinnati, USA, as mentioned above. Figures 1 and 2 are the cover of the program book and abstract of ICJWSF-2010 and the state of the conference, respectively.

The Conference has 110 papers from 13 countries, and they presented at the 13 sessions of *Free and Confined Jets, *Passive and Active Flow Control, *Aerodynamic Bodies, *Measurement Techniques, *Applications, *Jets and Plumes, *Liquid Flows, *Aeroacoustics and Noise, *Flow over Solid Bodies, *Pulsating Flows, *Impinging Jets, *Numerical Methods and Applications, and *Coherent Structures.

The typical papers related to multiphase flow are "Formation of air bubble by issuing air jet into boundary layer", "Cavitating jet and its application", "Flow characteristics of bubbly flow around a body", "Flow analysis of around bubble plume by 3D-PTV", "Jet flow in a nuclear power plant and high speed gas-liquid flow in jet pump and ejector", "Numerical analysis of bubbly flow" and others.

The excursion was held as Ohio river cruise, Major league, Cincinnati Reads, tour and visit the National Museum of the US Air Force, Wright-Patterson, Ohio, and many colleagues joined and enjoyed.

The selected papers are also going to be published as the "Special Issue on Jets, Wakes and Separated Flows" at the JFST, JSME in May, 2011.

The next, "The 4th ICJWSF-2012" is going to have at Nagoya, Japan, Chairperson will be Prof. Y. Sakai, Nagoya Univ., in September, 2013.

We are waiting your joining with us.

Prof. Shakouchi Toshihiko Mie University, Japan

49th European Two-Phase Flow Group Meeting May 29 – June 2, 2011, Tel-Aviv, Israel

by Yehuda Taitel

The 49th European Two-Phase Flow Group Meeting was held in Tel-Aviv, May 29 – June 2, 2011. It was organized by Tel-Aviv University, School of Mechanical Engineering. The conference chairman was Prof. Yehuda Taitel, Co-chairman Prof. Lev Shemer. Scientific committee: Professors: Dvora Barnea, Neima Brauner and Amos Ullmann.

The ETPFGM is unique and it has a very special character unlike most other professional meetings. It

is a prestigious meeting for invitees only that are expert in their field. Most of the participants are from Europe but it may include some distinguished scientists usually from the U.S. and Japan. The purpose is to establish informal get-together of first rate scientists dealing in multiphase flow with application to energy and environment and to present up-to-date research activity. Emphasis is placed on discussion and exchange of ideas. It is acceptable, and in fact encouraged, to present incomplete work in order to enhance fruitful discussions.

The meeting is a yearly event that has a long tradition. The first meeting was established on October 4th, 1963, at the Royal Institute of Technology in Stockholm. Since then it took place in alternating European cities. Last one was held in Brunel University, London. During 1975 it was held in the Technion, Israel Institute of Technology, directed by Prof. Gad Hetsroni.

The 49th ETPFGM was held in Carlton Hotel, located along the Tel-Aviv Mediterranean shoreline. Business Time scanorama Ltd Company helped with the organization. About 50 scientists attended the meeting, 30 from Europe, USA, Japan and Venezuela and 20 from Israel. Since the conference was in Israel it was an opportunity for young Israeli scientists, usually not invited to these meetings, to be exposed to the colleagues from abroad.

Financial support was provided mainly by Tel-Aviv University and by Ben-Gurion University of the Negev, Technion Israel Institute of Technology, Afeka Tel-Aviv academic college of engineering, Holon Institute of Technology and Ormat Systems LTD company.

Out of 36 presentations 5 were Keynotes. Prof Golan Michael from NTU, Norway reviewed the problems and challenges in the oil industry, Prof. Akio Tomiyama from Kobe University, Japan talked on the effect of contamination on bubbles and drops motion, Prof. Avinoam Nir from the Technion, Israel, lectured on drops dynamics, Prof. Joseph Katz from Johns Hopkins University, USA discussed breakage of droplets in a turbulent field and Yair Shokef from the Weizmann Institute, Israel spoke on models of disordered matters.

Success of a meeting is associated not only with good presentations but also with social events. The location of the conference in a hotel that from every window the beautiful sea shoreline is visible had a considerable contribution to the pleasant special atmosphere. The meals were excellent and the coffee breaks took place without a break. We had a starting Cocktail, tour of old Jaffa the old restored part of Tel-Aviv (Neve Tzedek) which ended in a nice oriental restaurant at Tel-Aviv Port. Finally the Gala dinner took place on the hotel roof from which the spectacular landscape of Tel Aviv surrounding is visible.

We feel that the conference was very successful. We may quote an E-mail from Prof. Iztok Zun:

Thank you very much indeed for the perfect organization of the ETPFGM'11. I am sure that Tel Aviv is going to remain in our memory as highly professional meeting nicely embedded into beautiful atmosphere of the location that you have chosen.

Prof. Yehuda Taitel Tel-Aviv University, Israel



Report on 12th International Symposium on Gas-Liquid Two-Phase Flows in AJK2011-FED July 24-29, 2011, Hamamatsu, Japan

by Michio Sadatomi

ASME-JSME-KSME Joint Fluids Engineering Conference 2011 was held in Hamamatsu. Japan. as the first conference coorganised by the respective Fluid Engineering Divisions of American Society of Mechanical Engineers, Japan Society of Mechanical Engineers, and Korean Society of Mechanical Engineers. The conference took place at ACT CITY Congress Center from July 24 to 29, 2011, sponsored by Hamanatsu City. In the conference, there were twenty six Symosia, six Forums and four Technical Flashs, and more than 600 reserachers and students attended from all over the world. The 12th International Symposium on Gas-Liquid Two-Phase Flows was one of the above Symosia.

In the Symposium on Gas-Liquid Two-Phase Flows, Prof. Michio Sadatomi (Kumamoto University, Japan), Prof. Dimitris E. Nikitopoulos (Louisiana State University, USA), and Moo Hwan Kim (Pohang University of Science and Technology, Korea) were disignated as the lead organisers. These proffesors together with Prof. Yoichiro Matsumoto (The University of Tokyo, Japan), Prof. Michel Lance (Ecole Central de Lyon, France), Dr. Timothy J. O'Hern (Sandia National Laboratory, USA), Dr. Upendra Rohatgi (Brookhaven National Laboratory, USA), and Prof. Gihun Son (Sogang University, Korea) conducted several cooperative works as the organizers, such as review prosess and session programming, and so on.

The Symposium included five oral sessions of (S10-1) Atomization and jet with droplets, (S10-2) Micro bubble, cavitation, nozzle flow, (S10-3) Bubble formation and behavior, (S10-4) Nano-, mico- and medium-sized channels, (S10-5) Modelling with and without heat transfer, and one poster session. These sessions were opened from Monday afternoon to Tuesday evening. The total number of accepted paper was 30, and the authors who present the paper were seventeen from Japan, three from Korea, three from China (inc. two from Taiwan), two from Norway, each one from USA, India, Canada, Brasil, and

Turkey. Unfortunately, however, the author from Brasil and Turkey could not attend. In addition, the scarcity of the paper from USA was surprisingly. In the next 2015 ASME-JSME-KSME Joint Fluids Engineering Conference, held in Korea, I hope more than five papers will be submitted from the researchers in USA, and more than ten papers from the researchers in other countries than Japan, Korea and USA.

I am looking forward to seeing much more researchers in the next conference.



Cooperation by Mr. Y. Nomura as a presenter and by Prof. Abe as a session chair (Courtesy of University of Tsukuba)

Prof. Michio Sadatomi One of Lead organizers Kumamoto University, Kumamoto, Japan E-mail sadatomi@mech.kumamoto-u.ac.jp

Future Meetings

Following list includes Conference Name, Place, Date and Contact.

Thermodynamics 2011

Athens, Greece, September 1 - 3, 2011 http://www.thermodynamics2011.org/

24th European Conference on Liquid Atomization and Spray Systems (ILASS Europe 2011) Estoril Coast, Portugal, September 5 - 7, 2011 Conference Assistant Prof. Luís Almeida Moreira Instituto Superior Técnico Tel/Fax: +351 21 841 77 32/+351 21 849 61 56

E-mail: Ilass2011@dem.ist.utl.pt http://www.ilass2011.org/

15th International Symposium on Applied Electromagnetics and Mechanics (ISEM 2011) Naples, Italy, September 7 - 9, 2011

Secretariat M. Vetrano CREATE Consortium, E-mail: isem2011@unina.it http://www.jsm.or.jp/ejam/information/4_ISEM2011. html

The 7th International Symposium on Measurement Techniques for Multiphase Flows Tianjin, China, September 17 - 19, 2011 Secretary of ISMTMF 2011 Prof. Feng Dong School of Automation Tianjin University Tel: +86-22-27892055 E-mail: ismtmf2011@tju.edu.cn http://www.ismtmf.com/ or http://www.ismtmf.org.cn/

12th International Conference: Multiphase Flow in Industrial Plants Ischia (Napoli), Italy, September 21 - 23, 2011 Scientific Committee Secretariat

Executive Division of The Japanese Society for Multiphase Flow (2011)

President	M. Sadatomi (Kumamoto University)
Vice Presidents	H. Akimoto (JAEA)
	A. Tomiyama (Kobe University)
	Y. Koizumi (Shinshu University)
Chair of Informatics Division	
	H. Kikura (Tokyo Institute of Technology)
Chair of Planning Division	
	Y. Saito (Kyoto University)
Chair of International Intercourse Division	
	T. Okawa (Osaka University)
Chair of General Affairs Division	
	A. Kawahara (Kumamoto University)
Executive Office of JSMF:	
Gakujyutu Shuppan Insatu Co.	
2-14-9 Kasugadenaka, Konohana-ku, Osaka, 554-0022, JAPAN	
Tel: +81-6-6466-1588 Fax: +81-6-6463-2522	
E-mail : office@jsmf.gr.jp	
WWW homepage : http://www.jsmf.gr.jp/	

Prof. Anna Pastore Dipartimento di Ingegneria Chimica Università degli Studi di Napoli Federico II Tel/Fax: +39 0817682258/+39 0815936936 E-mail: mfip2011@unina.it http://www.animp.it/mfip2011/index.aspx

Asian Symposium on Computational Heat Trans-

fer and Fluid Flow - 2011 (ASCHT2011) Kyoto, Japan, September 22 - 26, 2011 Secretary General : Prof. Yasuo Kawaguchi Tokyo University of Science (TUS) E-mail: sec@ascht2011.com http://www.ascht2011.com/

14th International Topical Meeting on Nuclear Reactor Thermal Hydraulics (NURETH-14)

Toronto, Ontario, Canada, September 25-29, 2011 Technical Program Chair: Jovica Riznic Canadian Nuclear Safety Commission Tel/Fax: (613) 943-0132/(613) 943-1292 Email: jovica.riznic@cnsc-ccsn.gc.ca http://cns-snc.ca/events/nureth-14/

4th Symposium on Hybrid RANS-LES Methods

Beijing, China, September 28 – 30, 2011 http://www.hrlm-4th.org/4th-symposium-on-hybrid-r ans-les-methods/

Short Course on Boiling Heat Transfer and Boiling Equipment

Darmstadt, Germany, October 17-21, 2011. http://termserv.casaccia.enea.it/boiling-course-2011/

1st international symposium on Multiscale Multiphase Process Engineering (MMPE)

Kanazawa, Japan, October 4-7, 2011. Secretariats Prof. Dr. Makoto Yoshimoto Yamaguchi University E-mail: yosimoto@yamaguchi-u.ac.jp Fax: +81-836-85-9201 Dr. Satoko Fujioka Keio University E-mail: fujioka@applc.keio.ac.jp Fax: +81-45-566-1575 http://www.mmpe.jp/

15th Annual Conference on Liquid Atomization and Spray System (ILASS-Asia 2011) Kenting, Taiwan, October 20-21, 2011.

Prof. Ta-Hui Lin Chairman of ILASS-Asia 2011 Department of Mechanical Engineering, National Cheng Kung University Tel/Fax: 886 6 2757575(ext. 62167)/+886 6 2352973 E-mail: thlin@mail.ncku.edu.tw http://conf.ncku.edu.tw/ilass/conference.htm

19th International Conference on Nuclear Engineering (ICONE19 Osaka)

Osaka, Japan, October 24-25, 2011. Secretariat of the PESD of JSME Saori Kawasaki E-mal: kawasaki@jsme.or.jp Tel/Fax: +81-3-5360-3502/+81-3-5360-3508 http://www.icone19.org/index.html

The 8th JFPS international Symposium on Fluid Power

Okinawa, Japan, October 25-28, 2011. Tel/Fax: 81-3-3346-8007/81-3-3346-8002 Email: jfps2011@jfps.or.jp http://www.jfps.jp/net/8thjfps/

2011ANS Winter Meeting and Nuclear Technology Expo

Washington, DC, USA, October 30 - November 3, 2011 http://www.new.ans.org/meetings/c 1

64th Annual Meeting of the APS Division of Fluid Dynamics

Baltimore, MD, November 20-22, 2011 http://www.aps.org/units/dfd/meetings/meeting.cfm?n ame=DFD11

11th International Conference on Fluid Control, Measurements, and Visualization (FLUCOME 2011)

Keelung, Taiwan, December 5 - 9, 2011 E-mail: flucome2011@gmail.com. http://flucome2011.ntou.edu.tw/

----- 2012 -----

The Eighth KSME-JSME Thermal and Fluids Engineering Conference (TFEC8) Incheon, Korea, March 18-21, 2012

Professor Yong Tae Kang, Secretary General Department of Mechanical Engineering, Kyung Hee University E-mail: ytkang@khu.ac.kr Tel/Fax: +82-31-201-2990/+82-31-202-3682; Associate Professor Yutaka Tabe, Secretary General Graduate School of Engineering, Hokkaido University E-mail: tabe@eng.hokudai.ac.jp Tel/Fax: +81-11-706-6381/+81-11-706-7889 http://www.tfec8.org/

11th World Filtration Congress (WFC11)

Graz, Austria, April 14-18, 2012 Prof. Wilhelm Höflinger Vienna University of Technology Prof. Gerd Mauschitz, Vienna University of Technology E-mail: info@wfc11.at http://www.wfc11.at

24th Annual Conference of the Institute for Liquid Atomization and Spray Systems: North and South America (ILASS-Americas 2012)

San Antonio, Texas, USA, May 20-23, 2012 http://www.ilass.org/2012/

8th ECI International Conference on Boiling and Condensation Heat Transfer

Lausanne, Switzerland, June 3 - 7, 2012 Conference Director Prof. John R. Thome Laboratory of Heat and Mass Transfer (LTCM), École Polytechnique Fédérale de Lausanne (EPFL). CH-1015 Lausanne. Switzerland Tel/Fax: (+41 21) 693 59 81/82/(+41 21) 693 59 60 E-mail: john.thome@epfl.ch Conference Secretary Dr. Navid Borhani Laboratory of Heat and Mass Transfer (LTCM), École Polytechnique Fédérale de Lausanne (EPFL), CH-1015 Lausanne. Switzerland Tel/Fax: (+41 21) 693 35 03/(+41 21) 693 59 60 E-mail: navid.borhani@epfl.ch http://boiling2012.epfl.ch/

US-Japan Seminar on Two-Phase Flow Dynamics

Tokyo, Japan, June 7 - 12, 2012 Prof. Tomoji Takamasa Faculty of Marine Technology Tokyo University of Marine Science and Technology Tel/Fax: +81-3-5245-7406/+81-3-5245-7410 E-mail: takamasa@kaiyodai.ac.jp

2012 ANS Annual Meeting

Chicago, USA, June 24 - 28, 2012 Program Chair: Ray Klann Argonne National Laboratory http://www.new.ans.org/meetings/c 1

16th International Symposium on Application of Laser Techniques to Fluid Dynamics Lisbon, Portugal, July 9-12, 2012 Symposium Assistant, scientific program and exhibition Vânia Silvério E-mail: llaser@dem.ist.utl.pt Tel/Fax: +351 21 841 97 24/+351 21 849 61 56 http://ltces.dem.ist.utl.pt/lxlaser/lxlaser2012/

The Eighth International Conference on Modeling and Diagnostics for Advanced Engine Systems (COMODIA 2012)

Fukuoka, Japan, July 23 - 26, 2012 http://www.jsme.or.jp/esd/comodia/comodia2012/

15th International Symposium on Flow Visualization (ISFV15)

Minsk, Belarus, July 25 - 28, 2012 http://www.isfv15.com/

12th International Conference on Liquid Atomization and Spray Systems (ICLASS 2012)

Heidelberg, Germany, September 2 - 6, 2012 E-mail: info@iclass2012.org http://iclass2012.org/

6th European-Japanese Two-Phase Flow Group Meeting

Kumamoto, Japan, September 23 - 28, 2012 Prof. Michio Sadatomi Dept. of Mechanical System Engineering Kumamoto University E-mail: sadatomi@mech.kumamoto-u.ac.jp

2012 ANS Winter Meeting and Nuclear Technology Expo

San Diego, CA, USA, November 11 - 15, 2012 http://www.new.ans.org/meetings/c_1

----- 2013 -----

International Conference on Multiphase Flow 2013 (ICMF2013) Jeju, Korea, May 26-31, 2013

2013 ANS Annual Meeting Atlanta, USA, June 16 - 20, 2013

http://www.new.ans.org/meetings/c_1

8th World Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics (ExHFT8)

Lisbon, Portugal, June 24-27, 2013

2013 ANS Winter Meeting and Nuclear Technology Expo

Washington DC, USA, November 10 - 14, 2013 http://www.new.ans.org/meetings/c_1

Corresponding Members

CANADA

Prof. M. Kawaji University of Toronto TEL: +1-416-978-3064, FAX: +1-416-978-8605 E-MAIL: kawaji@ecf.utoronto.ca

FRANCE

Prof. J. M. Delhaye CEA/GRENOBLE TEL: +33-2-76-88-42-75, FAX: +33-2-76-88-31-96, TLX: 320 323 E-MAIL: DELHAYE@DTP.CEA.FR Prof. J. Fabre INP, ENSEEIHT, Institut de Mécanique des Fluides de Toulouse TEL: +33-5-61-28-58-48, FAX: +33-5-61-28-59-91 E-MAIL: Jean.Fabre@imft.fr

F.R.G.

Prof. M. Sommerfeld Martin-Luther-Universitat TEL: +49-3461-462879 (or 2806), FAX: +49-3461-462878 E-MAIL: martin.sommerfeld@iw.uni-halle.de

ITALY

Dr. G. P. Celata ENEA Casaccia, Heat Transfer Unit Head TEL: +39-6-3048-3905, FAX: +39-6-3048-3026, TLX: 613296 ENEACAI E-MAIL: celata@casaccia.enea.it Prof. P. D. Marco

University of Pisa TEL: +39-050-2217-107, FAX: +39-050-2217-150

E-MAIL: p.dimarco@ing.unipi.it

ISRAEL

Prof. G. Hetsroni Israel Institute of Technology FAX: +972-8-432-4538 E-MAIL: MERHGO1@TECHNION.BITNET

JAPAN Prof. K. Hishida

Keio University TEL: +81-45-566-1739, FAX: +81-45-562-7625 E-MAIL: hishida@sd.keio.ac.jp **Prof. Y. Matsumoto** The University of Tokyo TEL: +81-3-5841-6286, FAX: +81-3-3818-0835 E-MAIL: ymats@mech.t.u-tokyo.ac.jp **Prof. A. Serizawa** Daikin Industries, Ltd. TEL: +81-72-257-8517, FAX: +81-72-250-1900 E-MAIL: akimi.serizawa@daikin.co.jp **Prof. A. Tomiyama** Kobe University TEL: +81-78-803-6132, FAX: +81-78-803-6131 E-MAIL: tomiyama@mech.kobe-u.ac.jp

Prof. T. Takamasa

Tokyo University of Marine Science and Technology TEL: +81-3-5245-7406, FAX: +81-3-5245-7410 E-MAIL: takamasa@kaiyodai.ac.jp **Prof. T. Tanaka** Osaka University TEL/FAX: +81-6-6879-7316 E-MAIL: tanaka@mech.eng.osaka-u.ac.jp

KOREA

Prof. K. H. Bang Korea Maritime University TEL: +82-51-410-4365, FAX: +82-51-405-4790 E-MAIL: khbang@hhu.ac.kr Prof. S. Y. Lee Korea Advanced Institute of Science and Technology TEL: +82-42-869-3026, FAX: +82-42-869-8207

E-MAIL: sangyonglee@kaist.ac.kr

P.R.CHINA

Prof. L. Guo Xi'an Jiaotong University TEL: +86-29-266-3895; FAX: +86-29-266-9033 E-MAIL: lj-guo@mail.xjtu.edu.cn **Prof. L. Zhou** Tsinghua University TEL: +86-10-6278-2231/4932, FAX: +86-10-6278-1824, TLX: 22617 QHTSC CN E-MAIL: zhoulx@mail.tsinghua.edu.cn

SLOVENIA

Prof. I. Zun University of Ljubljana TEL/FAX: +386-1-4771-403, FAX: +386-1-4254-217, TLX: 32240 FAKSTR 51 E-MAIL: iztok.zun@fs.uni-lj.si

U.K.

Prof. G. F. Hewitt Imperial College of Science, Technology and Medicine TEL: +44-171-594-5562 or 5563, FAX: +44-171-594-5564 or 5604 E-MAIL: g.hewitt@ic.ac.uk

U.S.A.

Prof. M. Ishii Purdue University TEL: +1-317-494-4587, FAX: +1-317-494-9570 Prof. R. T. Lahey, Jr. Rensselaer Polytechnic Institute TEL: +1-518-276-6614, FAX: +1-518-276-3055 E-MAIL: laheyr@rpi.edu Prof. E. Michaelides Tulane Universitty TEL: +1-504-865-5764, FAX: +1-504-862-8747 E-MAIL: emichael@mailhost.tcs.tulane.edu Prof. M. C. Roco National Science Foundation TEL: +1-703-306-1371, FAX: +1-703-306-0319 E-MAIL: mroco@nsf.gov