INNOVATIONS 2006

World Innovations in Engineering Education and Research

INNOVATIONS 2006

World Innovations in Engineering Education and Research

Edited by

Win Aung
International Network for Engineering Education and Research, Potomac, MD, USA
National Science Foundation, Arlington, VA, USA

Caroline Crosthwaite
The University of Queensland
Brisbane, Australia

Ramon Vasquez Espinosa
University of Puerto Rico
Mayaguez, Puerto Rico

Jerzy Moscinski
Silesian University of Technology
Gliwice, Poland

Shan-Hwei Ou
National Cheng-Kung University
Tainan, Taiwan, R.O.C.

Luis Manuel Sanchez Ruiz
Universidad Politécnica de Valencia
Valencia, Spain

BEGELL HOUSE PUBLISHING

Other books in the iNEER Innovations Series:

Engineering Education and Research – 2001, ISBN 1-5670018-6-6
Innovations 2003, ISBN 0-9741252-0-2
Innovations 2004, ISBN 0-9741252-1-0
Innovations 2005, ISBN 0-9741252-2-9
Innovations 2005 – Special Edition, ISBN 0-9741252-4-5

INNOVATIONS 2006: World Innovations in Engineering Education and Research

Copyright © 2006 by International Network for Engineering Education and Research.
All Rights Reserved.
No part of this book may be used or reproduced in any manner whatever without written permission except in the case of brief quotations embodied in critical articles and reviews. For information on this and related books, write the publishers at the following address.

iNEER
P.O. Box 5229
Preston King Station
Arlington, VA 22205, USA
ineer@ineer.org

Library of Congress Control Number 2004215784

ISSN 1553-9911

ISBN 0-9741252-5-3

Printed in the United States of America

CONTENTS

PREFACE

The sixth book in the iNEER Innovations Series, "Innovations 2006" includes fifty-three articles covering a broad range of topics written by experts from different parts of the world. Each article has passed through a rigorous peer review process and represents an important milestone of accomplishment recognized by the international community of scholars.

From the diverse topics covered in this volume there emerges a picture of the regional trends for education and research development. Different countries are focusing on different problems arising from their individual education policies, economic interests and workforce needs, but all share a common interest in furthering national economic development and prosperity by promoting and advancing innovations in engineering education and research.

This volume shows that student-centered engineering education is spreading to more regions of the world, and its advantages are being more widely understood and embraced.

The volume also concerns: new curricular materials that address the needs of the 21st Century; the adaptation of e-learning and Internet technologies in teaching and learning; collaborative and experiential learning; inculcating students with a global cultural and societal perspective; multidisciplinary design and integration; and assessment, accreditation and quality assurance.

ENHANCING STUDENT SUCCESS AND LEADERSHIP

As befitting the title of this volume, the lead chapter deals with the importance of innovations in the global marketplace, and is authored by G. Gilbert Cloyd of Procter & Gamble Company (P&G), a company noted for product innovations that have propelled it to become the dominant player in the worldwide consumer product market. As Chief Technology Officer of P&G, he writes (Chapter 1) from the perspective of an industry giant with an annual R&D budget of $2 billion, annual sales of over US$70 billion, and over 9,000 people worldwide in R&D. He calls for the U.S. to produce the innovation talent needed by refocusing on physical science and engineering education as a national priority, and for a new approach to academia-industry collaboration. He also outlines the realities and opportunities presented by what he calls developed market countries and low-income market countries. He writes that, for U.S.-based global companies to remain competitive and continue to grow, they must leverage the capabilities and cost-effectiveness in low-income countries as well as their emerging markets for growth.

To ensure that students will be successful as engineers in the global marketplace as discussed by Cloyd, it will be necessary for them to acquire, in addition to a strong fundamental technical background and other attributes, a global view with an

appreciation of the different cultures in our diverse world. While this concept is well understood and accepted in Norway, the attention of government funding agencies in that country, previously tuned to English-speaking countries such as U.K., is turning towards non-traditional destinations in Asia such as People's Republic of China and Taiwan (2). The need for integration into the world space in higher education is also recognized in Russia at the Volgograd State University of Architecture and Civil Engineering where the ideas and tools of the Bologna process is being implemented (3).

To enhance student success, the University of the Witwatersrand in South Africa has started to shift the responsibility for learning to first-year students in an Electric Circuits course, which is compulsory for all electrical, information and biomedical engineering first year students, so as to aid in development of imagination, self-confidence, intrinsic motivation, critical thinking and problem-solving (4). In the U.S., an engineering-based simulation game for instruction has been developed for use in communication and teamwork training (5). In Australia, a structured project-based approach to learning in a Digital Design course has been implemented (6). To ensure student success in computer science and engineering courses, a strategy has been developed in Ireland to lessen student anxiety related to computer programming (7) whereas, in the U.S., Pioro (8) recommends the use of graphs and comments in computer programming solutions for students at the early stages of learning computer programming.

NEW CURRICULAR APPROACHES

To promote innovations and the development of human resources needed for the global marketplace, many universities are developing new, responsive curricular materials and new courses of study. Thus, in this volume, many authors are concerned with helping students acquire the fundamental technical knowledge as well as the skills required to work in a diverse, multicultural environment. At The University of Queensland, Australia, Crosthwaite and Cameron (9) are implementing a project-centred curriculum in chemical engineering that integrates problem-based learning with traditional instruction. Other new developments include: a new curriculum for electronic packaging (10) in Taiwan; interest in biorefining research and education (11) and in a transferable curriculum for mechanical engineering technology programs (12) in the U.S.; programs in micro/nano technologies in Australia (13); and a curriculum for the precision mold and die design industry in southern Taiwan (14).

Also in Australia a transition is taking place from university-based to industry-based student projects (15). In Japan, a set of interactive learning tools for basic courses in automatic control developed in Japanese and English using MatLab (16) is now available. Other recent curricular innovations implemented in the U.S. include: a new modern optics laboratory for senior undergraduate students in science and engineering (17); a summer internship activity that seeks to improve students' oral and written communication skills (18); and the use of functional modules for Mechatronics education (19).

In the UK, concerns about the level of knowledge of mechanics among entrants to programs of study in engineering have led to a study at Loughborough University to review the situation with respect to students' knowledge of mechanics upon entry to university (20). From Japan, Seguchi and Ohkusa (21) suggest the incorporation of Universal Design into the teaching of Engineering Ethics, presenting the subject to students as ethical checks or standards in many different fields of engineering. A

German-Polish double graduation exchange program has been initiated in the field of materials science between two universities in Poland and a third in Germany (22).

Finally, in a thoughtful article, Lu (23) at the Naval Academy in Taiwan states the importance of ethics in both professional engineering and military practice.

E-LEARNING AND INTERNET TECHNOLOGIES

Several articles in this volume concern the application of e-learning approaches and the use of Internet technologies. From the Slovak Republic and the Czech Republic, Ozvoldova et al. report several successful developments, including: multimedia tools in the teaching of introductory engineering physics (24); a remote physics laboratory accessed through the Internet (25); and a new physics laboratory for non-major undergraduate students with computerized interactive capability (26). In the U.S., Chaturvedi et al. (27) have developed a web-based visualization module for the second undergraduate thermodynamics course in the mechanical engineering curriculum. A 'blended learning solution' that combines traditional learning practices and e-learning has been adopted for a graduate course in industrial electronics engineering in Portugal (28). A similar approach involving six universities in the eLearning Academic Network (ELAN) in Lower Saxony in Germany is discussed by Schafer (29).

A technology-enhanced laboratory manual, or labware, used to provide tools to enrich the learning environment and experience of students is described by Chevalier et al. (30). Also in the U.S., Merkel et al. have developed an online library of hypermedia case studies in usability engineering for use in teaching courses in human-computer interaction (31). At Kumamoto University in Japan Tsuchimura et al. (32) is helping to improve the efficiency of the design process and to shorten the time for product development at small- and medium-sized companies.

The article by Gillet (33) of École Polytechnique Fédérale de Lausanne in Switzerland deals with the challenges associated with the introduction of e-learning solutions and flexibility in higher education. Rafik et al. of the University of Wales Institute, Cardiff (34) in UK present ideas on how a multimedia-based approach in electronic computer aided design (ECAD) could support the learning process.

From Taiwan, Su et al. (35) report a low-cost simulation-based experimental approach developed for a control laboratory course in which a student with only a PC with Windows operating systems and the associated application software can learn how to model a physical plant as well as its power actuator circuit.

To close out this group of articles, Cukierman et al. (36) of Argentina discuss adapting mobile technologies in teaching and learning using Notebook PCs, Tablet PCs and Pocket PCs in an Applied Electronics course at the Universidad Tecnológica Nacional in Buenos Aires.

DIVERSITY, COLLABORATION, TEAMING, AND SOCIETAL CONNECTIONS

The ability to work in diverse teams and to communicate effectively with others, and an appreciation of the problems of society and industry: these are the attributes that contribute to a successful engineering career in the 21st Century. Recognizing this, many educators have incorporated the teaching of what used to be called "soft skills," such as teamwork and communication skills, directly or indirectly into the classroom. This volume reports recent innovations in these areas that include the work of: Talberg (37) of

the Faculty of Engineering, Oslo University College, Oslo, Norway, on the use of collaborative writing to enhance student participation and learning in group work; Chang (38) of National Central University in Taiwan on cultivating active learning abilities and teamwork skills in a team-based design course; Skokan et al. of the Colorado School of Mines (39) on a minor program in Humanitarian Engineering that has been initiated in which students must complete a humanitarian-designated interdisciplinary senior design project; and Jian (40) who has observed Taiwanese doctoral students' presentations at international conferences and finds that, while their writing, reading and listening skills are often satisfactory, their presentations in English are hard to comprehend for non-Taiwanese attendees, so that important ideas and thoughts may get lost during the presentation, which has led her, as a linguist, to propose a simple programme that can help improve Taiwanese engineering students' pronunciation skills.

Most perspectives on economic globalization deal with developments in Europe and Asia, but Uhomoibhi (41) of UK's University of Ulster in Northern Ireland provides a perspective on an important issue that we as educators must not ignore – that of the digital divide separating rich and poor nations – and must find ways to work with colleagues everywhere. Scott (42) shows how, as a Westerner and a woman, she is contributing to an innovative, multicultural international collaboration between two universities, one in the U.S. and another in the Middle East. The work by Brenner et al. (43) at Tufts University in the U.S. is focused on using buildable bridge models of different structural types for engineering outreach to grade school classrooms for the purpose of demonstrating basic engineering concepts to young students.

With an aim to teaching students to "learn to learn," Yao et al. (44) presents a case study in collaborative, project-oriented education to demonstrate the viability of academia-industry collaboration, and its benefits to engineering students and the cooperating company. A similar emphasis on teaching students to learn is employed by Bachiller et al. (45) at the Universidad Politécnica de Valencia in Spain, on teaching engineering concepts using collaborative work tools. At Indiana University-Purdue University Indianapolis, Fox et al. (46) have formed an international partnership with Berufsakademie Mannheim Berufsakademie Mannheim (BA-M), a cooperative education university in Mannheim, Germany, to teach sustainability, globalization, and German culture to undergraduate engineering and technology students.

ASSESSMENT, ACCREDITATION AND QUALITY ASSURANCE

The increasing attention on enhancement of student success and the trend toward globalization of engineering education has led to an increased focus on assessment, accreditation, and quality assurance in engineering education programs. At the University of Hertfordshire in the UK, Alinier et al. (47) have investigated the adoption of the Objective Structured Clinical Examination (OSCE) principle, long employed in the medical profession, in engineering education to assess students' skills. Chang et al. describe the formation of the Institute for Engineering Education Taiwan, an organization that is responsible for implementing international accreditation and standards criteria in Taiwan (48).

MULTIDISCIPLINARY DESIGN AND INTEGRATION

It is important for engineering graduates to be able to function in multidisciplinary teams, Organizational studies have shown that using self-directed cross functional work teams shortens the decision cycle, reduces costs, produces better results and yields greater profitability. Authors who address these issues include: King et al. (49) of Kettering University in the U.S. who have developed a process for integrating existing courses in order to provide multidisciplinary learning experience across departmental boundaries; Chang (50) at the School of Aerospace and Mechanical Engineering at the University of Oklahoma who introduces students to an All-Digital Design and Manufacturing (ADDM) education program; and Tsai et al. (51) who describe an innovative design competition in Taiwan in which participants must design an IC chip within one-half day.

At the University of Puerto Rico, Mayagüez, integration of biology and chemical engineering has been successfully carried out (52), while at the Universidad Simón Bolívar in Venezuela, Moreno et al. (53) is integrating different disciplines of engineering in the context of an international Formula SAE competition, and transferring the full responsibility to manage and complete the multidisciplinary engineering project to students.

ACKNOWLEDGEMENTS

We are pleased to present the above survey and summary as an introduction to the articles in this volume. The 53 articles are written by 130 authors are from 20 countries. Two hundred ninety-eight (298) experts from 41 countries formed the reviewer pool. The country that has contributed the largest number of reviewers by far is U.S.A, with 102, followed by Australia (23), UK (17) and Brazil and Spain, each with 14 reviewers. A significant number of reviewers are repeat reviewers, having also reviewed articles for previous volumes.

We are sincerely grateful to authors and reviewers alike. Their collective work has helped render this volume into a veritable chronicle of recent world innovations in research and education.

iNEER Board of Editors

Win Aung
iNEER, Arlington, VA, USA
Caroline Crosthwaite
The University of Queensland, Brisbane, Australia
Ramon Vasquez Espinosa
University of Puerto Rico, Mayaguez, Puerto Rico
Jerzy Moscinski
Silesian University of Technology, Gliwice, Poland
Shan-Hwei Ou
National Cheng-Kung University, Tainan, Taiwan
Luis Manuel Sanchez Ruiz
Polytechnic University of Valencia, Valencia, Spain

May 5, 2006

BOARD OF EDITORS

WIN AUNG

Following baccalaureate and post-graduate studies at the Rangoon Institute of Technology and the University of Minnesota, respectively, Win Aung joined Bell Laboratories in Whippany, NJ in 1969 as a Member of Technical Staff. In 1974 he became a Program Director at the U.S. National Science Foundation (NSF). From 1986 to 2000 he was named in succession as Director of the Division of Mechanics, Structures and Materials Engineering, Director of the Division of Civil and Mechanical Systems, and Senior Staff Associate – Engineering Education. He was appointed to the U.S. Senior Executive Service in 1985 and was recipient of the first NSF Federal Engineer of the Year Award in the same year. From 1976 - 1996, he held adjunct and visiting professorships at several universities in the U.S. and abroad, with an active schedule of teaching, research and student mentorship. In 1994, he initiated the ICEE (International Conference on Engineering Education) series and, in 2004, established the International Conference on Engineering Education and Research (iCEER) series. He co-founded the International Network for Engineering Education and Research (iNEER) in 2000, and is serving as its Secretary-General. A Fellow of American Society of Mechanical Engineers (ASME) since 1983, he has written extensively on research and education and is a frequent speaker on campuses around the world and at international conferences. He has published over 120 technical papers, and has edited or co-edited more than 10 books. In 1999, he was awarded an honorary doctorate (*Doctorem Honoris Causa)* by VSB – Technical University of Ostrava in Ostrava, Czech Republic, and in 2005, he was awarded the Medal of Merit by Silesian University of Technology in Gliwice, Poland. He was a member of the Standing Committee on Theory and Fundamental Research of the ASME Heat Transfer Division, the ASME Board on Engineering Education, and the ASME Council on Education. He is a member of the Scientific Board of VSB - Technical University of Ostrava and was an editor of Transactions of ASME, Journal of Heat Transfer.

CAROLINE CROSTHWAITE

Caroline Crosthwaite, BE (Hons), MEngStud, UQ, MSc, JCU, is an Associate Professor of Chemical Engineering at the University of Queensland, Brisbane, Australia, with extensive experience in curriculum design and innovation in engineering education. She is the coordinator of the curriculum team that won the 2005 Australian Award for University Teaching in the category of Enhancing the Quality of Teaching & Learning for the University of Queensland's Project Centred Curriculum in Chemical Engineering. She received the 2004 Australasian Association for Engineering Education Award for Excellence in Curriculum Innovation. She has taught across all levels of the

undergraduate curriculum, has written many papers on engineering curriculum and pedagogy, and consults nationally and internationally on engineering education development. As Director of Studies she is responsible for teaching and learning in all degree programs in the Faculty. She is also a Co-Director of the Catalyst Research Centre for Society & Technology.

RAMON VASQUEZ ESPINOSA

Ramon Vasquez Espinosa has been Dean of the College of Engineering at the University of Puerto Rico, Mayaguez (UPRM), since 2000. He first joined UPRM as a teaching assistant in 1974 and was appointed Assistant Professor and Associate Professor in 1984 and 1987, respectively. He became Professor of Electrical and Computer Engineering at UPRM in 1992. He received the BSEE and MSEE degrees from the University of Puerto Rico in Mayaguez in 1974 and 1979, resp., and the Ph.D. from Louisiana State University in 1984. From 1994 to 1999 he held a series of administrative and managerial positions including Associate Dean of Academic Affairs, Director of the laboratory of Remote Sensing and Image Processing (LARSIP), and Director of the Center for Computing Research and Development, Department of Electrical and Computer Engineering. A member of IEEE, ASEE, APIE and ACM, Sigma Xi, Eta Kappa Nu and Tau Beta Pi, he has received many honors and distinctions including the Centennial Certificate of ASEE. He has published and presented over 75 technical papers.

JERZY MOSCINSKI

Jerzy Moscinski received the M.Sc. and Ph.D. degrees in Automation and Robotics from Silesian University of Technology, Gliwice, Poland, in 1982 and 1990 respectively. He has taught several courses in the field of Control, Signal Processing, Identification and Estimation, Computer Controlled Systems and Computer Networks in the Department of Automatic Control, Electronics and Telecommunications and Computer Science, SUT, Gliwice. Since 1993 he has been involved in the organization of international co-operation at the Silesian University of Technology as Rector's Representative for International Collaboration. Dr. Moscinski has coordinated at the University level the international exchange of students and teachers, international vocational training programs as well as international collaboration in the field of research and development as head of the Regional Contact Point in Gliwice. He is an iNEER member and is involved in the organization of ICEE conferences. His main areas of interest include advanced control and signal processing, computer networks and their role in computer controlled systems and computer based education, Internet and multimedia technologies, international collaboration in education and research.

SHAN-HWEI OU

Shan-Hwei Ou is a Professor of Dept. of Hydraulic and Ocean Engineering at National Cheng Kung University, Tainan, Taiwan. He now serves as Vice President of the university. Dr. Ou received his education at National Cheng Kung University, earning the B.S., M.S. and Ph.D. degrees in civil engineering in 1968, 1971 and 1978, respectively. He spent much of his career as an educator and for more than 20 years has been on the faculty of the National Cheng Kung University. He has served in a succession of administrative posts in higher education, each for several years: Chairman and Director of Hydraulic and Ocean Engineering at National Cheng Kung University, Dean of the

College of Engineering at National Cheng Kung University. He has many publications, honors and awards and professional activities to his credit.

LUIS MANUEL SÁNCHEZ RUIZ

Since 1980 Luis Manuel Sánchez Ruiz has been affiliated with Universidad Politécnica de Valencia (UPV), Spain, where he became Full Professor of Mathematics in 2000. He graduated and received his Ph.D. from Universidad de Valencia in 1980 and 1988, respectively, and was a Visiting Professor at the University of Florida, Gainesville, FL, USA on several occasions during 1992-99. His current research interests include Functional Analysis from both theoretical and applied points of view. He has published over 100 papers in scientific journals and conference proceedings and more than 10 textbooks on Mathematics for Engineers, and is co-author of the research monograph *Metrizable Barrelled Spaces* published by Longman. The former Academic Coordinator of Mediterranean University of Science and Technology, he has been responsible for several research projects granted by the Spanish Ministry of Education. He is currently a reviewer for publishing companies, research projects and several international journals, as well as a member of the Editorial Board of Scientiae Mathematicae Japonicae. He has been a member of the International Steering Committee (ISC) of International Conference on Engineering Education (ICEE) of iNEER, and was General Chair of ICEE-2003: Valencia.

REVIEWERS

A. Chatterjee, *India*
A.M.C. Pretorius, *South Africa*
Abdulkadir Erden, *Turkey*
Abelardo Pardo, *Spain*
Ahmed Subaih, *UK*
Alcínia Zita Sampaio, *Portugal*
Alessandro La Neve, *Brazil*
Alexander Chernikov, *Ukraine*
Alfred Posch, *Austria*
Algirdas Sokas, *Lithuania*
Algirdas Vaclovas Valiulis, *Lithuania*
Ali Setoodehnia, *USA*
Alina Andreica, *Romania*
Anand D. Sharma, *Puerto Rico*
Anastasia S. Safigianni, *Greece*
Andreas Schlachetzki, *Germany*
Andrew Kline, *USA*
Andrew Martin, *Sweden*
Andrew Nafalski, *Australia*
Andy Koronios, *Australia*
Angelo J. Perna, *USA*
Anna Dias de Carvalho, *Brazil*
Anna Friesel, *Denmark*
Anna Igual Muñoz, *Spain*
Anna Wancław, *Poland*
Anne Nortcliffe, *UK*
Anthony J. McGoron, *USA*
António Betâmio de Almeida, *Portugal*
Antonio Dias de Figueiredo, *Portugal*
Antonio José Caulliraux Pithon, *Brazil*
Antonios Zavaliangos, *USA*
Arne Gjengedal, *Norway*
Asad Azemi, *USA*
Audun Weierholt, *Norway*
Babak D. Beheshti, *USA*
Bakari M. M. Mwinyiwiwa, *Ethiopia*
Barbara T Pioro, *USA*
Bernard Courtois, *France*
Bernardo Wagner, *Germany*
Bhaskar Choubey, *UK*
Birute Juodagalviene, *Lithuania*
Blaine W. Lilly, *USA*
Bobby G. Crawford, *USA*
Boguslawa Adamowicz, *Poland*
Brian Canavan, *UK*
Brian Daku, *Canada*
Brian Lithgow, *Australia*
Bruce R. Maxim, *USA*
Burford Furman, *USA*
C.T. Tsai, *USA*
Camilo Quintáns Graña, *Spain*
Carlos Sá Furtado, *Portugal*
Carol Crumbaugh, *USA*
Carol J. Miller, *USA*
Carol Robinson, *UK*
Caroline Crosthwaite, *Australia*
Catherine Skokan, *USA*
Ceeyavash (Jeff) Salehi, *USA*
Celina Pinto Leão, *Portugal*
Charles Lemckert, *Australia*
Charlie McDowell, *USA*
Che-Ho Wei, *Taiwan*
Chris Smaill, *New Zealand*
Chung-Ming Huang, *Taiwan*
Ciarán O'Leary, *Ireland*
Claire Davis, *UK*
Clara Amelia de Oliveira, *Brazil*
Claudiu Mereuta, *Romania*
Cornelia Connolly, *Ireland*
Cornelie Leopold, *Germany*
Costas Tzafestas, *Greece*
Cristina Alonso-Tristán, *Spain*
Cristina Pfeiffer, *Brazil*
D. Subbaram Naidu, *USA*

Dagmar Juchelková, *Czech Republic*
Damian Ginestar, *Spain*
Daa E. Knox, *USA*
David Ahlgren, *USA*
David Airey, *Australia*
David C. Chang, *USA*
David C. Ingram, *USA*
David Edwards, *Australia*
David F. Barbe, *USA*
David Holifield, *UK*
David I. Laurenson, *UK*
David Jonassen, *USA*
David K. Prestel, *USA*
Denis Gracanin, *USA*
Derek Gabbard, *USA*
Dirk Groeneveld, *USA*
Dominique Bourgeois, *France*
Donald R. Falkenburg, *USA*
Drago Hercog, *Slovenia*
Eduardo Montero, *Spain*
Eduardo Vendrell, *Spain*
Edward E. Anderson, *USA*
Edwin Koźniewski, *Poland*
Edwin S. Olson, *USA*
Egon Moesby, *Denmark*
Elena Mereuta, *Romania*
Elizabeth A. Coles, *USA*
Emil Micu, *Romania*
Emilia Rutkowski, *Brazil*
Erik Bohemia, *Australia*
Farhad Azadivar, *USA*
Filomena Soares, *Portugal*
Flemming K. Fink, *Denmark*
Florin Leon, *Romania*
Francesc J. Sànchez Robert, *Spain*
Francisco Ramos, *Spain*
Friedrich Ernst Wagner, *Germany*
Frode Eika Sandnes, *Norway*
G. Grodzicki, *Australia*
George J Gibbon, *South Africa*
Georgina Echániz Pellicer, *USA*
Gerald Farrell, *Ireland*
Gloria M. Rogers, *USA*
Guillaume Alinier, *UK*
Gulaim Seisenbaeva, *Sweden*
Gulsun Saglamer, *Turkey*
H. Oner Yurtseven, *USA*
Hana Sochorova, *Czech Republic*
Harald Loose, *Germany*
Hasan Sevim, *USA*
Heinz C. Luegenbiehl, *USA*
Hellmuth Stachel, *Austria*
Herman Mann, *Czech Republic*
Howard Kimmel, *USA*
Ian Benest, *UK*
Idalia Ramos, *Puerto Rico*
Igor Verner, *Israel*
Ingvar Gustavsson, *Sweden*
Irinia Radinschi, *Romania*
Ishiang Shih, *Canada*
Ismael Orquin Serrano, *Spain*
Ivan E. Esparragoza, *USA*
Ivana Linkeová, *Czech Republic*
J. Cecil, *USA*
J. D. Tedford, *New Zealand*
J. A. Rossiter, *UK*
J. D. Tedford, *New Zealand*
J. H. C. Pretorius, *South Africa*
Jack L. Waintraub, *USA*
Jack W. Judy, *USA*
Jacqueline Bridge, *Trinidad & Tobago*
James N. Shimabukuro, *USA*
James R. Rowland, *USA*
Jan Rusek, *Poland*
Janardan Choubey, *India*
Jarka Glassey, *UK*
Jaromir Polak, *Czech Republic*
Jaroslav Dvořáček, *Czech Republic*
Jason Merrill, *USA*
Jean Armstrong, *Australia*
Jeffrey Froyd, *USA*
Jenny Lo, *USA*
Jerzy Moscinski, *Poland*
Jesus A. del Alamo, *USA*
Jiun-Jih Miau, *Taiwan*
Joergen Hansen, *Denmark*
John Bourne, *USA*
John Carpinelli, *USA*
John Hoddinott, *Canada*
John Phillip Rayner, *Australia*
John Reis, *USA*
John Ringwood, *Ireland*
John Steffen, *USA*
John W. Prados, *USA*

John Watson, *USA*
Jonathan Grudin, *USA*
Josip Orovic, *Croatia*
Jugdutt (Jack) Singh, *Australia*
Julie E. Sharp, *USA*
Julie Mills, *Australia*
Julius Christauskas, *Lithuania*
K. L. DeVries (Larry), *USA*
K. J. Hill, *UK*
Karl A. Smith, *USA*
Karl M. Goeschka, *Austria*
Kent L. Lawrence, *USA*
Kevin Janni, *USA*
Kevin Taylor, *USA*
Koichi Sumikura, *Japan*
Krystyna Stec, *Poland*
Krzysztof J. Kurzydlowski, *Poland*
Kurt Gramoll, *USA*
L.M. Sanchez Ruiz, *Spain*
Linda C. Schmidt, *USA*
Loren Schwiebert, *USA*
Low Sew Ming, *Malaysia*
Luke H. Huang, *USA*
M. Ashraf Iqbal, *Pakistan*
M. Lucia P. Silva, *Brazil*
Manfred Andrié, *Germany*
Manuela Nechita, *Romania*
Marcelo Rodrigues da Nóbrega, *Brazil*
Marek L. Szary, *USA*
Marek Perkowski, *USA*
Maria C. Bachiller Martin, *Spain*
Maria Dinescu, *Romania*
Maria Helena Braz, *Portugal*
Maria Helenowska-Peschke, *Poland*
Maria Pereira da Silva, *Brazil*
Marina Y. Koledintseva, *USA*
Marios Kassinopoulos, *Cyprus*
Mark R. Henderson, *USA*
Martin Grimheden, *Sweden*
Martin J. Weller, *UK*
Marya Lieberman, *USA*
Mauricio Duque, *Colombia*
Mehter Mohammed Allam, *India*
Michael Bredol, *Germany*
Michael L. Raymer, *USA*
Michel Robert, *France*
Mihai Scarlete, *Canada*
Milton Vieira Junior, *Brazil*
Modris Dobelis, *Lithuania*
Mohd Fairuz Shiratuddin, *USA*
Morteza Biglari-Abhari, *New Zealand*
Nelson L. Lammoglia-Hoyos, *Colombia*
Nikolaos Bilalis, *Greece*
O. Hayden Griffin, Jr., *USA*
Okyay Kaynak, *Turkey*
Orlando J. Hernandez, *USA*
Ovid A. Plumb, *USA*
Palaiologou Nektaria, *Greece*
Pat Connolly, *Ireland*
Paula Postenicescu, *Romania*
Paulo Rupino da Cunha, *Portugal*
Pei-Lin Liu, *Taiwan*
Peter Moson, *Hungary*
Peter Stallinga, *Portugal*
Peter Willmot, *UK*
Poika Isokoski, *Finland*
R. de Toledo Assumpção, *Brazil*
Radim Farana, *Czech Republic*
Radovan Stulic, *Serbia*
Rainer Oechsle, *Germany*
Ramon E. Vasquez, *USA*
Ranjith Liyanapathirana, *Australia*
Renata Wagnerová, *Czech Republic*
Richard C. Kavanagh, *Ireland*
Richard Gale, *USA*
Richard M. Felder, *USA*
Richard Morris, *UK*
Rick Parent, *USA*
Robert M. Nerem, *USA*
Robertas Kersys, *Lithuana*
Roberto de Toledo Assumpção, *Brazil*
Robin Ford, *Australia*
Rogelio Palomera-Garcia, *USA*
Rolandas Domeika, *Lithuania*
Roman Miksiewicz, *Poland*
Rubens Nascimento Melo, *Brazil*
Rui Ferreira, *Portugal*
Ryte Ziuriene, *Lithuania*
S. M. Aziz, *Australia*
Salvador Cardona Navarrete, *Spain*
Santosh K. Kurinec, *USA*
Scott Clark, *USA*
Sebastian F. Colomar, *Spain*
Shia Chung Chen, *Taiwan*

Shu-San Hsiau, *Taiwan*
Shyue-Win Wei, *Taiwan*
Sigbjørn Kolberg, *Norway*
Stephen F Johnston, *Australia*
Steve E. Watkins, *USA*
Steve Hansen, *Australia*
Subha K. Kumpaty, *USA*
Surendra Shrestha, *Australia*
T. R. Kurfess, *USA*
Tahseen A. Rafik, *UK*
Tatsuya Kikuchi, *Japan*
Tetsuro Furukawa, *Japan*
Thomas J. Impelluso, *USA*
Thomas K. Jewell, *USA*
Tim Dallas, *USA*
Tim S Roberts, *Australia*
Timothy L. J. Ferris, *Australia*
Tom Thompson, *USA*
Tomas Ward, *Ireland*
Tony Montgomery, *Australia*
Tsung-Tsong Wu, *Taiwan*
Tsun-Wei Chang, *Taiwan*
Vadim Kochergin, *USA*
Vincent P. Manno, *USA*
Vinod K Lohani, *USA*
Vlasta Rabe, *Czech Republic*
Vojislav Ilic, *Australia*
Warren Mabee, *Canada*
Weining Feng, *USA*
Xin-Ran Duan, *USA*
Yong Lian, *Singapore*
Yuko Hoshino, *USA*
Yun-Che Wen, *Taiwan*
Zbigniew Hanzelka, *Poland*
Zeljko Ban, *Hungary*
Zuzana Krivá, *Slovak Republic*