Preface

On November 5-7, 2007, 60 Japanese and American engineers from industry, academia, government labs, and other research institutions gathered for the Sixth Japan-America Frontiers of Engineering Symposium (JAFOE) at Palo Alto, California, USA. Convened by the U.S. National Academy of Engineering (NAE), Japan Science and Technology Agency (JST), and the Engineering Academy of Japan (EAJ), this exciting and unique meeting included presentations and discussions of leading-edge research and technical work in five sessions: Human-Computer Interaction, Battery Technologies, Rocketry/Aerospace, Next Generation Data Centers, and Materials for Medicine. The primary purpose of this book is to convey the content of the meeting through abstracts of the presentations and other meeting materials reprinted herein, as well as to inform the reader about the underpinning philosophy of the Frontiers of Engineering program.

Origins and Goals of the Activity

Since 1995, the U.S. National Academy of Engineering has held an annual U.S. Frontiers of Engineering symposium that brings together 100 outstanding engineers (ages 30-45) from U.S. companies, universities, and government to discuss leading-edge research and technical work across a range of engineering fields. The goal of the 2-1/2-day symposium is to introduce these engineers to each other, challenge them to think about developments and problems at the frontiers of areas different from their own, and thereby facilitate collaborative work, the transfer of new techniques and approaches across fields, and establishment of contacts among the next generation of leaders in engineering. The program has expanded internationally, and there are now three bilateral programs — with Germany, Japan, and India.

The JAFOE activity aims to bring together outstanding, early-career Japanese and American engineers from industry, universities, and other research institutions to introduce their areas of engineering research and technical work, thereby facilitating an interdisciplinary transfer of knowledge and methodology that could eventually lead to the development of cooperative networks of young engineers from both countries. Conferences are held annually, alternately in Japan and the United States, with about 30 engineers from each country participating. An organizing committee comprised of Japanese and U.S. engineers develops the program for the event and assists in the selection of participants.

Content of the 2007 JAFOE Symposium

Dr. Glenn Fredrickson, professor of materials and chemical engineering and director of the Mitsubishi Chemical Center for Advanced Materials at the University of California, Santa Barbara, and Dr. Kohei Itoh, professor of department of Applied Physics and Physico-Informatics, Keio University, co-chaired the organizing committee and the symposium. Two Japanese and two Americans gave presentations in each of the four sessions mentioned above. Presentations covered such specific topics as Voice-based Continuous Control of Electro-

mechanical Devices, Challenges in Developing Next-Generation Battery Technology, Recent Achievements on Solid Propellant Science for Space Propulsion, and DNA as Material for Treatment of Cardiovascular Disease. Speakers had been asked to tailor their talks to a technically sophisticated but nonspecialist audience and to address various questions.

In addition to excellent presentations in the five topic areas, another highlight of the symposium was the dinner speech by Dr. Stan Williams, HP Senior Fellow and founding director of the HP Quantum Science Research Group, who talked about a new architecture for computing called memristance.

The meeting was designed to give an ample opportunity for discussion and networking among the participants through the Q&A sessions after each presentation in the plenary sessions as well as poster sessions that allowed each participant to showcase and talk about his/her technical work or research. In addition, the group took a tour of HP Labs. The labs were: a data center and three other labs dealing with nanoprint lithography; digital commercial printing; and Pluribus, a technology that combines multiple, inexpensive projectors to create a scalable "superprojector."

The eighth Japan-America Frontiers of Engineering symposium is scheduled for November 17-19, 2008, in Japan.

In Appreciation

We would like to express our appreciation to our sponsors – HP Labs, the U.S. National Science Foundation, the National Academy of Engineering Fund, the Armstrong Endowment for Young Engineers, and the Japan Science and Technology Agency – for their support of this symposium. Our appreciation also goes to the members of the Symposium Organizing Committee for their work in planning this event.