

7-2010

Preface

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Preface

Abstract

The Marriott Hotel in San Diego's Mission Valley was the site of the 37 th annual Review of Progress in Quantitative Nondestructive Evaluation (QNDE) on July 18-23, 2010. This conference, widely regarded as the most prestigious of NDE conferences, emphasizes the interface between current research results in the development of new measurement techniques (theory with experimental confirmation) used to enhance the safety and early engineering applications. About 300 technical papers were presented in both verbal and poster sessions with an attendance of 306 persons.

Keywords

nondestructive testing, sensors, data acquisition, nondestructive evaluation, QNDE, Aerospace Engineering

Disciplines

Aerospace Engineering | Materials Science and Engineering | Structures and Materials

Comments

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This article appeared in *AIP Conference Proceedings* 1335 (2011): 581–588 and may be found at <http://dx.doi.org/10.1063/1.3591903>.

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Citation: *AIP Conf. Proc.* **1335**, 1 (2011); doi: 10.1063/1.3595982

View online: <http://dx.doi.org/10.1063/1.3595982>

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Preface

The Marriott Hotel in San Diego's Mission Valley was the site of the 37th annual Review of Progress in Quantitative Nondestructive Evaluation (QNDE) on July 18-23, 2010. This conference, widely regarded as the most prestigious of NDE conferences, emphasizes the interface between current research results in the development of new measurement techniques (theory with experimental confirmation) used to enhance the safety and early engineering applications. About 300 technical papers were presented in both verbal and poster sessions with an attendance of 306 persons. Approximately one half of the attendees came from overseas while the remainder came from U.S. academia, industry, and government. Attendees included members of the World Federation of NDE Centers, an organization dedicated to broad cooperation in and harmonization of research and education for NDE. As is customary for this meeting, papers in many NDE technologies were presented, ranging from fundamental theoretical analyses to practical applications. Student papers from the 8th Annual Student Poster Competition, incorporated as a part of the Review, are also included in these volumes. The Review was organized by the Center for Nondestructive Evaluation at Iowa State University and sponsored by QNDE Programs with welcome assistance from the Air Force Research Laboratory, the American Society of Nondestructive Testing (ASNT), the Ames Laboratory of the U.S. Department of Energy, the Army Research Laboratory, the Federal Aviation Administration (FAA), the National Aeronautics and Space Administration (NASA), and the National Science Foundation (NSF) Industry/University Cooperative Centers.

Professor Catherine French of the Institute of Technology, Department of Civil Engineering at the University of Minnesota, gave the Review's keynote address. Her talk was entitled "I-35W Bridge Collapse, Rebuild, and Structural Health Monitoring: Including Challenges Associated with Structural Health Monitoring of Bridge Systems". Professor French described in detail the tragic collapse of the I-35 bridge in 2007 with the loss of thirteen lives. She noted that the steel truss bridge was undergoing deck reconstruction at the time of the catastrophe and was carrying some 140,000 vehicles daily. As a consequence, great interest in the employment of structural health monitoring systems was generated and applied to the replacement bridge- a post-tensioned concrete box bridge. Over 500 sensors and instruments have been placed in the new structure and various models developed to monitor its structural behavior and to predict the long term behavior of the bridge. She went on to describe in some detail the instrumentation that is involved, preliminary results that have been obtained, the overall plan for developing long-term monitoring capabilities, and the challenges that are associated with structural health monitoring systems. She also detailed future research directions to follow that should produce results useful to structural health monitoring development.

Two plenary lectures that examined specific aspects of structural health monitoring technology followed the keynote presentation. In the first of these, Professor Jerome Lynch, Department of Civil and Environmental Engineering at the University of Michigan, provided an overview, "Application of an Automated Wireless Structural Monitoring System for Long-Span Suspension Bridges", of an emerging set of sensor technologies under development at the University of Michigan within the National Institute of Standards (NIST) Technology Innovation Program. The overall system architecture spans multiple length scales with data collected from sensors deployed at the local and global scales of a structure. Data from multiple bridges on a regional scale are

collected by a cyber infrastructure system. These data can then be ingested into a system database and utilized in a “toolbox” from which life-cycle analyses can be conducted. Professor M. A. Zikry of the Mechanical and Aerospace Engineering Department at North Carolina State University presented the second plenary lecture. In his talk, entitled “Microstructural Material Mechanisms and Global Behavior”, Prof. Zikry discussed how microstructural behavior at scales ranging from the nano to the macro can have dominant effects on global structural and material failure. He showed that modeling predictions related to dynamic failure in crystalline materials and nano-indentation can be used to control failures at different physical scales. Dr. Zikry’s paper was not available at the time of publication but his abstract and a list of recent references are included in the Proceedings.

Most of the presentations given at the Review in both verbal and poster sessions, including the 8th Annual Student Poster Competition, are collected in these volumes. These volumes are organized as follows: Volume A treats fundamental developments in essentially all NDE technologies while Volume B is focused on NDE for materials and applications (engineered materials, a broad range of materials characterization issues, process control, structural health monitoring, new techniques and systems, and benchmark comparisons). The verbal program consisted of both contributed sessions and those organized by invitation that dealt with specific subjects. Organized sessions included sessions on Benchmark Validation NDE, Electromagnetic Inverse Problems, Guided Waves, Laser Ultrasonics, NDE for Microstructure, NDE of Armor and Armor Systems, NDT in Civil Engineering, Material Properties Measurements, Probability of Detection, Structural Health Monitoring, Terahertz NDE, Thermography and Thermosonics, Ultrasonic Phased Arrays, and X-ray NDE. The Benchmark Problems session is a unique offering to these Proceedings by the World Federation of NDE Centers. It is dedicated to experimental comparisons of theoretical NDE models by members of the Federation in various laboratories of the world and is worthy of study, not only by World Federation members, but to all who are interested.

The Review organizers and sponsors are pleased to list the winners of the 8th Annual Student Poster Competition and to congratulate each of them. They are: Navneet Gandhi, Georgia Institute of Technology, 1st Place; Kathryn H. Matlack, Georgia Institute of Technology, 2nd Place; Krzysztof J. Lesnicki, Georgia Institute of Technology, 3rd Place. Papers from the poster winners are so marked.

The organizers are indebted to many persons for a successful Review. They wish to thank the chairpersons for managing the sessions on time yet making room for key points of technical discussion. They also wish to thank those who organized technical sessions: R. C. Addison, Jr. (Consultant), J. Bowler (Iowa State University), N. Bowler (Iowa State University), R. Brennan (US Army Research Laboratory), P. Cawley (Imperial College), T. Gordon (Boeing), X. Han (Wayne State University), J. Knopp (Air Force Research Laboratory), S. Krishnaswamy (Northwestern University), A. Lasseigne (NIST – Boulder), D. Levesque (National Research Council of Canada), E. Lindgren (Air Force Research Laboratory), J.-P. Monchalain (National Research Council of Canada), D. Olson (NIST – Boulder), H. Ringermacher (General Electric Global Research Center), L. Schmerr (Iowa State University), and H. Wiggenhauser (Federal Institute for Materials Research and Testing - Germany).

Special thanks are due Ms. Heidi Long, Ms. Sarah Kallsen, Ms. Connie Nessa, and Ms. Libby Bilyeu for their valuable assistance both at the meeting and prior to it and to Ms. Karen Cheney of MainStay Events for her management of Review logistics. The organizers wish to acknowledge the special contributions of Ms. Connie Nessa and Ms. Sarah Kallsen for their devoted dedication and highly professional assistance in the preparation and management of abstracts, manuscripts, and these Proceedings. Thanks also go to the staff at AIP for their rapid response time in publishing the proceedings and to the staff at the Marriott Hotel in San Diego for providing a very pleasant Review venue. Finally, and not least, the organizers wish to thank the attendees for their participation and preparation of the written manuscripts that are the core of the Proceedings.

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