7-2011

Preface: Review of Progress in Quantitative Nondestructive Evaluation

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Abstract
The 38 th annual Review of Progress in Quantitative NDE was held at the University of Vermont in Burlington, VT, on July 17-22, 2011. This conference, widely regarded as the most prestigious of NDE research conferences, emphasizes the interface between current research results in the development of new measurement techniques (theory with experimental confirmation) and early engineering applications used to enhance the safety in high technology systems. With an attendance of 350 persons - approximately one half coming from overseas and the other half from U.S. academia, industry, and government - over 320 technical papers were presented in both verbal and poster sessions. As is customary for this meeting, papers in essentially all NDE technologies were presented, ranging from fundamental theoretical analyses to practical applications. 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. Student papers from the 9th Annual Student Poster Competition were incorporated as a part of the Review and are 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 Ames Laboratory (DOE) at Iowa State University, the American Society of Nondestructive Testing (ASNT), 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.

Keywords
QNDE, Aerospace Engineering

Disciplines
Aerospace Engineering | Materials Science and Engineering | Structures and Materials

This article appeared in *AIP Conference Proceedings* 1430 (2012): 3–5 and may be found at http://dx.doi.org/10.1063/1.4716208.

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Citation: AIP Conf. Proc. **1430**, 3 (2012); doi: 10.1063/1.4716208
View online: http://dx.doi.org/10.1063/1.4716208
View Table of Contents: http://proceedings.aip.org/dbt/dbt.jsp?KEY=APCPCS&Volume=1430&Issue=1
Published by the American Institute of Physics.

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The 38th annual Review of Progress in Quantitative NDE was held at the University of Vermont in Burlington, VT, on July 17-22, 2011. This conference, widely regarded as the most prestigious of NDE research conferences, emphasizes the interface between current research results in the development of new measurement techniques (theory with experimental confirmation) and early engineering applications used to enhance the safety in high technology systems. With an attendance of 350 persons - approximately one half coming from overseas and the other half from U.S. academia, industry, and government - over 320 technical papers were presented in both verbal and poster sessions. As is customary for this meeting, papers in essentially all NDE technologies were presented, ranging from fundamental theoretical analyses to practical applications. 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. Student papers from the 9th Annual Student Poster Competition were incorporated as a part of the Review and are 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 Ames Laboratory (DOE) at Iowa State University, the American Society of Nondestructive Testing (ASNT), 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.

Attendees at the Review were greatly saddened this year with the passing of Dr. R. Bruce Thompson on March 7, 2011. Bruce was the Director of the Center for NDE at Iowa State University, a co-organizer of this conference since its initiation, and a pillar of the QNDE teaching and research community. This Review and these volumes are dedicated to him and his rich legacy. Toward this end, the usual keynote and plenary lectures which characteristically open the conference were replaced with a session entitled "A Tribute to Bruce" that is reprinted here in its entirety. It is a unique session prepared by researchers who worked with Bruce in many of the various fields that his research touched. Introductory comments were given by Center for NDE Associate Director L. Brasche and Center for NDE Interim Director G. A. Kraus in which they acknowledged many of the ways that Bruce impacted safety, the NDE community, and Bruce's superior skills and attitudes in working with many different people with a variety of backgrounds. Bruce's introductory research in NDE was then reviewed by D. O. Thompson and included studies of harmonic generation in amorphous silica and crystalline aluminum, a study of new ways to measure adhesive bond strength in honeycomb materials, and a theoretical and experimental determination of dispersion curves in honeycomb structures. This talk was followed by F. Passarelli with input from G. A. Alers in which they reviewed Bruce's and their extensive work in the development of theoretical and experimental models for the electromagnetic transduction of ultrasonic waves. T. A. Gray then presented a summary of Bruce's and his work in developing the concept and practicality of the ultrasonic "measurement model", a very important tool that integrates transducer properties, wave propagation characteristics, and defect scattering cross section so that defect signals can be calculated at the design stage of a component. This model is, arguably, the most important tool in the ultrasonic "tool kit". Bruce's extensive and thorough work in developing material microstructural

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AIP Conf. Proc. 1430, 3-5 (2012); doi: 10.1063/1.4716208

information from ultrasonic signals was well reviewed by F. J. Margetan who also identified and credited many of Bruce's students for their contributions. This is an exceptionally deep and thorough set of research papers. Bruce's most recent contributions to his research legacy, model assisted probability of detection, was reviewed by his colleague W. A. Meeker. This difficult work has benefited greatly from Bruce's skills in both physical modeling of the measurement process and his knowledge of statistics. The session concluded with tributes to Bruce for his many international contributions by P. Cawley, and for his unmatched skill in technology transfer of complex thoughts into workable industrial practice by K. Smith. Although not included in the session, the Editors have incorporated into this section a summary of comments and thoughts gathered from Bruce's many students and compiled by J. Mittleman, which show the extremely high regard in which they held Bruce.

Bruce left a remarkable legacy for the QNDE community. His research was broad in scope, deep in understanding, and set the path for much of QNDE. Not only did he set research standards, he mentored many students who have become strong contributors to QNDE and he was so diligent about working with NDE users to transfer research results into practice. Bruce was a remarkable person who will be sorely missed by all his colleagues, students, friends, and family.

Over 320 presentations were given at the Review following the plenary sessions in both verbal and poster sessions. Most of these presentations 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, NDE of Structures including a new topic in NDE in reactor environments, process control, structural health monitoring, new techniques and systems, POD and benchmark comparisons. The sessions were both organized and contributed. The organized sessions included: Benchmark Validation NDE, Digital Signal Processing of Guided Waves, Laser Ultrasonics, NDE for Austenitic Weld Materials & Welds, NDE for Microstructure, NDE of Armor and Armor Systems, NDE Techniques of Civil Engineering Materials and Structures, New Eddy Current Probes & Techniques, New Reactor Designs, Probability of Detection, Terahertz and Microwave 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 9th Annual Student Poster Competition and to congratulate each of them. They are: Ramya Chandrasekar, Iowa State University, 1st Place; Yu Liu, Georgia Institute of Technology, 2nd Place; Simon Walker, 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 invited technical sessions: R. C.

Addison, Jr. (Consultant), L. Brasche (Iowa State University), R. Brennan (US Army Research Laboratory), T. Capobianco (Bechtel Marine Propulsion Corporation), U. Ewert (BAM-Berlin), X. Han (Wayne State University), L. Jacobs (Georgia Institute of Technology), A. Lasseigne (G2MT - Texas), E. Lindgren (Air Force Research Laboratory), E. Medina (Air Force Research Laboratory), J. Michaels (Georgia Institute of Technology), J.-P. Monchalin (National Research Council of Canada), D. Olson (Colorado School of Mines), P. Ramuhalli (Pacific Northwest National Laboratory), H. Ringermacher (General Electric Global Research Center), L. Schmerr (Iowa State University), L. Udpa (Michigan State University), S. Udpa (Michigan State University), and U. Zscherpel (Bam-Berlin).

The conference organizers also wish to acknowledge the special contributions of Ms. Heidi Long of the Center for NDE staff and Ms. Karen Cheney of Mainstay for their planning of budgetary and all logistical matters and 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 care in publishing the proceedings and to the staff at the University of Vermont for their excellent support of the Conference. The conference 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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