ASME® 2020 QNDE

47th Annual Review of Progress in Quantitative Nondestructive Evaluation

CONFERENCE
August 25-26, 2020

Virtual, Online

Program

https://event.asme.org/QNDE

The American Society of Mechanical Engineers®
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SETTING THE STANDARD

WELCOME

As the QNDE 2020 conference Chair and Co-Chairs, it is our privilege and honor to welcome you to the 47th Annual Review of Progress in Quantitative Non-Destructive Evaluation conference. In its 47 years of history, this conference has never been cancelled and we are glad to say that COVID-19 could not break this record. Because of the determination and hard work of the organizing committee, ASME supporting staff, authors, moderators, panelists and plenary speakers, we could offer QNDE 2020 virtually, without endangering anyone's health.

Yes, there were some consideration to cancel the 2020 event when we could not meet in person, fearing very few would have interest in attending a virtual conference. However, we were very inspired when all three plenary speakers committed to present their speeches live from different parts of the world – USA, Europe and Asia – while adjusting their vacations and bed times! In addition, the majority of our authors and organizers expressed their willingness to speak, attend and work for a virtual conference. With all the expressed support, our decision was made to go ahead with the event.

We believe you will enjoy the conference. We also understand that no matter how well we prepare for it, in some areas things might not run as planned or can be improved further. We will invite your feedback afterwards, to help us to prepare for the 2021 event.

We are extremely grateful to the ASME support staff for their tireless efforts to work with us to make it all happen. We have a terrific slate of speakers, panelists and moderators ready to engage us in a successful two-day conference experience. We encourage you to be all-in as much as possible the next couple of days, so you can get the most out of your time with us.

Thank you for your support. We are all looking forward to "seeing you" at the conference!

Sincerely,

Tribikram Kundu (Bikram), University of Arizona, Conference Chair

Henrique Reis, University of Illinois at Urbana-Champaign, Conference Co-Chair

Gary Georgeson, The Boeing Company, Conference Co-Chair

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47th Annual Review of Progress in Quantitative Nondestructive Evaluation

VIRTUAL CONFERENCE
August 25-26, 2020

Conference Schedule | 08.19.20 | Subject to Change. | All Times are Eastern Time

DAY 1 – August 25th, 2020

9:30 AM – 9:50 AM Live Welcome from **Thomas COSTABILE P.E., Executive Director/CEO, ASME** and **Tribikram (Bikram) KUNDU, QNDE 2020 Conference Chair, University of Arizona**

9:50 AM – 10:20 AM **Plenary Speaker 1 - Peter CAWLEY, Imperial College, London**
"Structural Health Monitoring – Opportunities for NDE Research and Industry"

10:20 AM – 10:45 AM Q&A with Peter CAWLEY

10:35 AM – 10:45 AM Break

10:45 AM – 12:15 PM **Concurrent Technical Presentations with Live Q&A**

Sessions 1, 2 & 3 will happen concurrently. You can switch between sessions.

SESSION 1 - NDE in Oil and Gas & Nuclear Power
Moderators: Yang LIU, University of Wyoming and **Pradeep RAMUHALLI**, Oak Ridge National Laboratory

Agron GJINOLLI, Durr Universal Inc.
Troubleshooting Exhaust Silencer Catalyst Vibration Failures Using Calibrated Fea From Ndt Data
Karthik GOPALAKRISHNAN, Michigan State University
Characterization and Classification of Corrosion Pits using Cross Sampling Entropy Analysis and Dense Neural Network
Min LIN, University of Wyoming
A Novel Corrosion Detection Method Using Higher Order Lamb Wave
Xiao HE, Institute of Acoustics, Chinese Academy of Sciences
Unipole Sonic Logging While Drilling With Eccentric Tools and Anisotropy Evaluations
Ahmed Shah ARMAN, University of South Carolina
Full-Wave and Circuit Based Simulations of Cable Insulation Damage Using Time-Frequency Domain Reflectometry
S.W. GLASS, III, PNNL
Feasibility of Molten Salt Reactor Heat Exchanger On-Line Monitoring
Fangxin ZOU, The Hong Kong Polytechnic University
A Novel Ultrasonic Technique for in situ Quantitative Evaluation of Corrosion Rates

SESSION 2 - UT Phased Arrays
Moderator: Henrique REIS, QNDE 2020 Conference Co-Chair, University of Illinois at Urbana-Champaign

Marco Tulio LOPES GUERREIRO, Universidade Tecnológica Federal do Paraná (UTFPR)
Comparison of Nearest-Neighbor and Linear Interpolation for Time-Domain Ultrasonic Imaging
David LINES, University of Strathclyde
Modelling of Echo Amplitude Fidelity for Transducer Bandwidth and Tfm Pixel Resolution

Jorge Franklin MANSUR RODRIGUES FILHO, École de technologie supérieure
Influence of Surface Curvature and Probe Position in Phased Array Ultrasonic Testing
Randika Kosala WATHAVANA VITHANAGE, University of Strathclyde
Automated In-Process Phased Array Ultrasonic Inspection of Multipass Welds
Sumana, Homi Bhabha National Institute, India
Total Focusing Method Based Ultrasonic Phased Array Imaging in Thick Structures
Xiangyu LEI, Chalmers University of Technology
Experimental Validation and Application of a Phased Array Ultrasonic Testing Model on Sound Field Optimization

SESSION 3 - Nonlinear Ultrasonics & Resonant NDE
Moderators: Christopher KUBE, The Pennsylvania State University and **Sunil Kishore CHAKRAPANI**, Michigan State University

Aakash KHANDELWAL, Michigan State University
Dislocation Damping Effects in Nonlinear Resonant Vibrations of Structures
Hyunjo JEONG, Wonkwang University
Transducer Optimization for Pulse-Echo Measurement of Material Nonlinearity
Tribikram KUNDU, University of Arizona
Linear and Non-Linear Ultrasonic Techniques for the Evaluation of Stress-Induced Damage in Concrete
Chi-Luen HUANG, University of Illinois
Progress in Monitoring In-Place Rail Stress Conditions Using Impulse Vibration Measurements
Julieanne HEFFERMAN, Vibrant Corporation
Detecting and Characterizing Overtemperature Exposure in Titanium via Process Compensated Resonance Testing (Pcrt)

12:15 PM – 12:30 PM Break Time – Stretch your legs and check out our Exhibitor Hall

12:30 PM – 1:35 PM **INDUSTRY NEEDS IN NDE - LUNCH & LEARN PANEL SESSION**
Moderator: Dr. Gary GEORGESON, QNDE 2020 Conference Co-Chair, The Boeing Company

Panelists:
Peter CAWLEY, Imperial College, London
Greg GARCIA, EVRAZ North America
Rich KLAASSEN, GE Aviation
Clint THOMSON, Northrop Grumman Corporation

1:35 PM – 1:50 PM Q&A with Industry Panelists

1:55 PM – 2:25 PM **Exhibitor Demo Corner - Live!**
Come check out the latest products and services demoed by Verasonics & LuxSonics. Your chance to ask questions.

2:25 PM – 2:35 PM Break

2:35 PM – 3:10 PM **Plenary Speaker 2 - Dr. Eric LINDGREN, U.S. Air Force Research Laboratory**
"Challenges and Future Directions for NDE R&D: an USAF Perspective"
Introduction by Henrique REIS, QNDE 2020 Conference Co-Chair, University of Illinois at Urbana-Champaign

3:10 PM – 3:25 PM Q&A with Dr. Eric LINDGREN

3:25 PM – 3:35 PM Break

3:35 PM – 5:00 PM **Concurrent Technical Presentations with Live Q&A**

Sessions 4 & 5 will happen concurrently. You can switch between sessions.

SESSION 4 - Ultrasonic Scattering & Materials Characterization

Moderators: Andrea ARGUELLES, The Pennsylvania State University & **Henrique REIS**, QNDE 2020 Conference Co-Chair, University of Illinois at Urbana-Champaign

Guangdong ZHANG, Central South University
Measuring the Frequency-Dependent Attenuation Coefficients of Solids Using a Pulse-Echo Ultrasonic Method
Jiming SONG, Iowa State University
Modeling Ultrasonic Scattering Using Cfie Formulation and Diagonal-Form Fmm
Yongfeng SONG, Central South University
The Effects of Ultrasonic Grain Noise on the Sub-Wavelength Flaw Sizing
Fan SHI, Hong Kong University of Science and Technology
Predicting the Variance of Elastic Wave Scattering From Randomly Rough Cracks Using an Analytical Approach
Changgong KIM, University of Illinois At Urbana-Champaign
Ultrasonic Characterization of Microstructure Variation in Laser Powder Bed Fusion (Lpbf) 316l Stainless Steel
Charles MACLEOD, University of Strathclyde
Initiation and Phased Array Verification of Intentional Representative Weld Defects
Shan LIN, Central Research Institute of Electric Power Industry
Quantitative Evaluation of Abnormal Structures in High Chromium Steel Welds Using Ultrasonic Testing Technique

SESSION 5 - Guided Waves

Moderator: Tribikram (Bikram) KUNDU, QNDE 2020 Conference Chair, University of Arizona

Andrew DOWNS, Iowa State University
Array Based Guided Wave Transduction With Pulse-Echo Source Location Using Dispersion Compensation
Aubin CHABOTY, École de technologie supérieure
Propagation of Low Frequency Guided Waves Through Lap Joints
Dineo RAMATLO, University of Pretoria
Guided Wave Ultrasound Modelling Framework for Simulation of Features and Defects in Welded Rail Tracks
Momchil VASILEV, University of Strathclyde
Verification & Sensitivity Study of Automated In-Process Ultrasonic Inspection of Thin Steel Plate Welds Using Non-Contact Lamb Waves
Nived SURESH, Indian Institute of Technology Madras
Evaluation of Remnant Thickness Using the Cut-Off Property of the Shear Horizontal Guided Wave Mode
Paul FROMME, UCL
High Frequency Guided Wave Propagation and Scattering in Silicon Wafers
Guru Prakash SAHU, Indian Institute of Technology Madras
Surface Temperature Mapping of a Metal Plate Using Ultrasound Guided Wave Technique

DAY 2 – August 26th, 2020

9:30 AM – 10:10 AM **Welcome & Plenary Speaker 3 - Li CHENG, Hong Kong Polytechnic University**
"Detection of Incipient Structural Damage and Material Degradation Using Nonlinear Ultrasonic Guided Waves"
Introduction by Dr. Gary GEORGESON, QNDE 2020 Conference Co-Chair, The Boeing Company

10:10 AM – 10:25 AM Q&A with Li CHENG

10:25 AM – 10:35 AM Break – Don't miss the opportunity to go the Networking Section and connect with colleagues!

10:35 AM – 12:00 PM **Concurrent Technical Presentations with Live Q&A**

Sessions 6, 7 & 8 will happen concurrently. You can switch between sessions.

SESSION 6 - Structural Health Monitoring and Prognosis & Metamaterials

Moderators: Olivier MESNIL, CEA Tech, France and **Simon LAFLAMME**, Iowa State University

Han LIU, Iowa State University
Numerical Investigation of Auxetic Textured Sensing Skin for Structural Health Monitoring
Takahiro HAYASHI, Osaka University
Remote Defect Imaging Using a Wireless Microphone Unit With an Optical Power Feeding Device
Joel B. HARLEY, University of Florida
Spread Spectrum Time Domain Reflectometry for Health Monitoring of Solar Arrays
Olivier MESNIL, CEA Tech, France
Validation of Spectral Finite Element Simulations for Large Numerical Campaigns in Mapod Shm
Tribikram KUNDU, The University of Arizona
Acoustic Wave Propagation and Source Localization in a 3d Heterogeneous Structure - a Numerical Study
Harshkumar MAHESHWARI, Indian Institute of Technology Madras
Technique for Implementing Holey Metalenses Using Conventional Ultrasonic Transducers

SESSION 7 - Modeling for Composites, Thermography & Thermosonics

Moderators: Portia BANERJEE, [KBR], NASA Ames Research Center and **Xiaoyan HAN**, Wayne State University

Harold SABBAGH, Victor Technologies, LLC
Electromagnetic Modeling and Inverse Methods for Eddy-Current Characterization of Carbon Fiber Composites
Matthias BRAUNS, XARION Laser Acoustics
Contact-Free Ultrasound Nondestructive Testing of Aerospace Composites With an Optical Microphone
William WINFREE, NASA Langley Research Center
Parallelized Quadrupole Simulations of Thermographic Responses of Composites
Joseph ZALAMEDA, NASA Langley Research Center
Delamination Depth Imaging for Quasi-Static and Fatigue Load Testing Using Passive Thermography
Omar OBEIDAT, Wayne State University
The Effect of Ultrasonic Excitation Duration on the Quantitative Estimation of Defect Depth Using Sonic Infrared Imaging
Qiuye YU, Wayne State University
Studying Relationships of Dependency Energy Consumption on Transducer Tip Size and Crack Length in Sonic Infrared Imaging

SESSION 8 - Additive Manufacturing

Moderator: Gary GEORGESON, QNDE 2020 Conference Co-Chair, The Boeing Company

Ahmed ALLAM, Georgia Institute of Technology
Ultrasonic Inspection of Additive Manufactured Components
Randika W.K. VITHANAGE, University of Strathclyde
A High-Temperature Phased Array Ultrasonic Roller-Probe Designed for Dry-Coupled In-Process Inspection of Wire + Arc Additive Manufactured Components
Felix H. KIM, National Institute of Standards and Technology
Incorporation of X-Ray Computed Tomography (Xct) Simulation for Estimation of Pod Curves
Guillermo HUANES-ALVAN, Michigan State University
Ultrasonic Characterization of Multi-Material Structures Fabricated Using Laser Ded
Rastislav ZIMERMANN, University of Strathclyde
Implementation of an Ultrasonic Total Focusing Method for Inspection of Unmachined Wire+arc Additive Manufacturing Components Through Multiple Interfaces
Rosa MORALES, University of Colorado, Boulder
Laser Ultrasonic Monitoring of Thermal Processes

12:00 PM – 12:25 PM **SPECIAL LIVE Q&A SESSION with POSTER SUBMISSION AUTHORS**

MODERATOR: Tribikram (Bikram) KUNDU, QNDE 2020 Conference Chair, University of Arizona

Jethro NAGAWKAR, Iowa State University
Model-Based Sensitivity Analysis of Ultrasonic Testing Simulations Using Deep Gaussian Processes and Sobol' Indices
Vishal RAUL, Iowa State University
Dimensionality Reduction of Model-Based Probability of Detection Calculations Using Principal Component Analysis
Yen-Chen LIU, Iowa State University
Model-Based Global Sensitivity Analysis of Ndt System Scalar and Vector Quantities of Interest With Metamodeling and Sobol' Indices
Kwang-Hee IM, Woosuk University
Terahertz Wave Radiation on Detecting Foreign Materials of Composite Panels of Honeycomb Sandwiches

12:25 PM – 12:35 PM Break

12:35 PM – 1:55 PM **NEXT FRONTIERS IN RESEARCH & FUNDING LANDSCAPE - LUNCH & LEARN SESSION**

Moderator: Yuris DZENIS, Chair of ASME's Nondestructive Evaluation, Diagnosis, and Prognosis Division, University of Nebraska-Lincoln

Panelists:
Hoda AZARI, U.S. Department of Transportation, Federal Highway Administration
Chuck FARRAR, Los Alamos National Laboratory and the University of California San Diego's Jacobs School of Engineering
Ward JOHNSON, U.S. Department of Commerce, National Institute of Standards Technology
Robert LANDERS, National Science Foundation, Cyber-Physical Systems
Dr. Ignacio PEREZ, Office of Naval Research, Non-Destructive Evaluation (NDE) and Prognostics: Advanced Sensors and Technologies
Dr. William H. PROSSER, NASA Engineering and Safety Center

1:55 PM – 2:10 PM Q&A with Research & Funding Panelists

2:10 PM – 2:20 PM Break

2:20 PM – 3:25 PM **Concurrent Technical Presentations with Live Q&A**

SESSION 9 - Machine Learning & Statistical Methods in NDE

Moderator: Joel B. HARLEY, University of Florida

Kaiyang HAN, University of Florida
Distinguishing Steel Fiber Content in Ultra-High Performance Concrete (Uhpc) Using Machine Learning Algorithms
Kang YANG, University of Utah
A Comparison of Representation Learning Methods for Damage Detection With Guided Wave Structural Health Monitoring
Roberto MIORELLI, CEA-List
Defect Characterization in Composites With Deep Learning in Guided Wave Shm
Subodh KALIA, Syracuse University
Machine Learning and Anomaly Detection Applied to Damage Characterization From Compliance Data in 3-Point Bending Fatigue

Sessions 9 &10 will happen concurrently. You can switch between sessions.

SESSION 10 - Eddy Current & Electromagnetic Methods

Moderators: John C. ALDRIN, Computational Tools and **Saptarshi MUKERJEE**, Lawrence Livermore National Laboratory

Harold SABBAGH, Victor Technologies, LLC
Model Development for Broadband Spiral-Coil Eddy-Current Probes
Bharath Basti SHENOY, Michigan State University
Early Stage Fatigue Prediction for Martensitic Stainless-Steel Samples Using Non-Linear Eddy Current Techniques
Manohar TAMARANA, Indian Institute Of Technology Tirupati
Development of a Simple Quasi-3d Finite Element Model for Modeling Sh Wave Generation and Reception in Emat Configuration
Zi LI, Michigan State University
Magnetic Barkhausen Noise Technique for Early Stage Fatigue Prediction in Martensitic Stainless-Steel Samples
Saptarshi MUKERJEE, Lawrence Livermore National Laboratory
A Time Reversal Based Selective Focusing Method for Microwave Nde of Gfrp Composites

3:25 PM – 3:30 PM Break

3:30 PM – 4:00 PM **QNDE Awards Presentation & Conference Conclusion**
Join us in congratulating the winners of the prestigious Founders Award and the 2019 Best Paper Awards and 2019 Outstanding Paper Awards

About QNDE

QNDE, as a field of endeavor, which is a highly interdisciplinary that involves the use of various techniques to characterize materials and to detect both manufacturing and service related anomalies in materials and structures which are important to safety in essentially all industries. For more than four decades, the QNDE Conference has been identified as the world's leading research/engineering conference in this specialized engineering field.

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Review of Progress in Quantitative Nondestructive Evaluation

PLENARY SPEAKER

Peter Cawley
Department of Mechanical Engineering
Imperial College, London

Peter Cawley received his BSc and PhD degrees in Mechanical Engineering from University of Bristol in 1975 and 1979 respectively.

He worked in industry from 1979-1981 and then joined the Mechanical Engineering Department at Imperial College, London initially as a lecturer and then successively senior lecturer, reader and professor. He served as head of the Imperial College Mechanical Engineering department for 7 years to October 2019 and is now Engineering Associate Dean for Enterprise, encouraging technology transfer activity across the faculty. He founded the Imperial NDE research group and was also the principal investigator of the UK Research Centre for NDE (RCNDE) from its formation in 2003 to March 2020. He has published over 200 refereed journal papers in this field.

Peter Cawley is a fellow of the Royal Academy of Engineering and of the Royal Society. He is a director of Guided Ultrasonics Ltd that was set up to exploit the guided wave inspection and monitoring technology that was developed in his lab. From 2009-2016 he was chairman of Permasense Ltd that was set up to exploit his group's work on wall thickness monitoring at high temperatures; the company was acquired by Emerson Inc. in 2016.

Lecture Title: "*Structural Health Monitoring – Opportunities for NDE Research and Industry*"

PLENARY SPEAKER

Dr. Eric Lindgren
U.S. Air Force Research Laboratory

Dr. Lindgren is currently the Nondestructive Evaluation Technology Lead in the Materials State Awareness Branch of the Materials and Manufacturing Directorate of the Air Force Research Laboratory. Before joining AFRL in 2006, Eric worked as the Director of Nondestructive Evaluation (NDE) Sciences at SAIC Ultra Image. He has over 35 years of experience in NDE research, development, transition, and deployment, including efforts to develop and deploy advanced inspection methods for aerospace applications, transitioning basic research to inspections used on USAF aircraft structures, and developing materials characterization and process monitoring/control methods using NDE technology. He earned a B.S., M.S., and Ph.D. in Materials Science and Engineering from Johns Hopkins University.

Lecture Title: "*Challenges and Future Directions for NDE R&D: an USAF Perspective*"

PLENARY SPEAKER

Li Cheng
Chair Professor of Mechanical Engineering
Department of Mechanical Engineering, Hong Kong Polytechnic University

Dr. Li Cheng is currently a Chair Professor and the Director of Consortium for Sound and Vibration Research (CSVR) at the Hong Kong Polytechnic University. He received his BSc degree from Xi'an Jiaotong University, China and Ph.D. degree from the Institut National des Sciences Appliquées de Lyon (INSA-Lyon), France. He became a faculty member at Laval University, Canada in 1992, rising from an assistant professor to Associate/Full Professor, before joining Hong Kong PolyU in 2000. He was the Head of Department of Mechanical Engineering from 2011 to 2014. Dr. Cheng published extensively in the field of sound and vibration, structural health monitoring, smart structure and fluid-structure interaction. He currently serves as Deputy Editor-in-Chief of Journal of Sound and Vibration, Associate Editor of the Journal of the Acoustical Society of America, Associate Editor of Structural Health Monitoring: An International Journal and an editorial board member of a few other journals.

Dr. Cheng has been a Plenary/Keynote speaker in various conferences for 30+ times, including some of the most prestigious conferences in his field such as 47th Inter-noise, 23rd ICSV, 13th RASD, 15th APVC and 12th ICOVP. He also served as the general Chair of the 46th Inter-noise and the14th and 17th Asia Pacific Vibration Conference. He is an elected fellow of the Acoustical Society of America, Acoustical Society of China, International Institute of Acoustics and Vibration, IMechE, Hong Kong Institution of Engineers and Hong Kong Institute of Acoustics. Dr. Cheng was the President of the Hong Kong Society of Theoretical and Applied Mechanics. He is now serving as a board director of both IIAV (International Institutes of Acoustics and Vibration) and I-INCE (International Institutes of Noise Control Engineering).

Lecture Title: *"Detection of Incipient Structural Damage and Material Degradation Using Nonlinear Ultrasonic Guided Waves"*

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CONFERENCE CO-CHAIRS
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Xiaoyan Han, Wayne State University
Yang Liu, University of Wyoming

Thank you for joining us.

We look forward to seeing you in 2021.

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