SPIE 11th Annual International Symposium

Smart Structures and Materials

SPIE 9th International Symposium

NDE for Health Monitoring and Diagnostics

Including

Smart Structures/ NDE Joint Conference

14–18 March 2004
Town and Country Resort & Convention Center
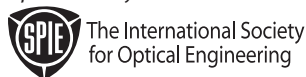San Diego, California USA

Conferences • Poster Session • Exhibition • Courses

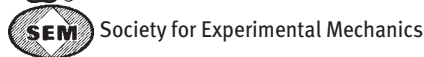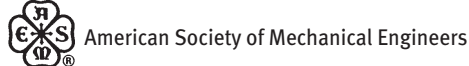**SPIE** The International Society for Optical Engineering

Welcome!

The Organizing Committee of SPIE's 11th Annual International Symposium on Smart Structures and Materials and SPIE's 9th Annual International Symposium on NDE for Health Monitoring and Diagnostics welcomes you to what promises to be an exciting conference event. These unique symposia offer many opportunities to network with colleagues from a variety of disciplines in academia, industry and government from all over the world. Over the last decade, this event has grown from small beginnings in the then emerging field of Smart Structures and Materials to a premier conference that includes the allied fields of NDE and Health Monitoring. The overlapping offering of these two symposia has led to new avenues for collaboration and the offering of joint conference programs. Over 660 oral and poster papers will be presented at the symposium.
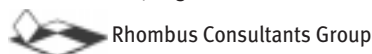
The Symposium on Smart Structures and Materials considers all aspects of this evolving field - materials, enabling technologies, sensor/actuator design and fabrication, MEMS, NEMS and other micro-, nano- and bio- electronic devices, biomimetics, signal processing and control, systems concepts, wireless sensors and sensor networks, modeling and simulation, and applications of these technologies to cover the whole spectrum of life in the 21st century including commercial, medical, aerospace, military uses and many others. The symposium is organized in many different parallel conferences. Some of the conferences are jointly organized with NDE.

The NDE for Health Monitoring and Diagnostics Symposium includes several parallel conferences on a range of topics related to nondestructive evaluation. The symposium will bring together emerging technologies and advanced research in instrumentation, sensing, and measurement science with progressive management and diagnostic approaches and smart systems. The recent addition of a conference on NDE for Homeland Security will showcase the challenges and opportunities in this field of national importance. Focus areas of the symposium include application of micro- and nano-material systems, health monitoring of structural and biological systems, NDE for aerospace materials and applications, and NDE technologies for homeland security. Engineers and researchers from government, military, academia and the commercial sector will discuss current status and future directions of nondestructive evaluation technologies for health monitoring and diagnostics. Case studies, emerging research agendas and innovative new technologies will be presented.

The four plenary speakers have been selected to inform and inspire the attendees. The technology and applications overviews planned for Sunday is open to all symposium attendees and has been planned to give the 'big picture' of the NDE and Smart Structures field identifying issues and opportunities for both the enabling technologies as well as the showcased applications - Homeland Security, Medicine, Transportation Systems and the Environment.

The conference chairs take this opportunity to thank Ms. Pat Wight and Mr. Scott Walker of the SPIE staff and all the conference chairs whose hard work and dedication has made this event possible. Welcome to San Diego where with their usual efficiency SPIE will arrange for sunshine and warm weather everyday!

Smart Structures and Materials Symposium Chairs

Vasundara V. Varadan,
National Science Foundation

Yoseph Bar-Cohen,
Jet Propulsion Lab.

NDE of Health Monitoring and Diagnostics Symposium Chairs

Glenn Washer,
Federal Highway Administration

Norbert Meyendorf,
Univ. of Dayton Research Institute Ctr. for Materials Diagnostics

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SPIE Professional Development Courses

SC634 Electroactive Polymer Actuators and Devices, (Bar-Cohen, Madden, Su), 8:30 am to 5:30 pm

SC607 Introduction of RF MEMS and Applications, (Chiao), 8:30 am to 5:30 pm

Register for Courses onsite!

Special Events

Sunday 14 March

Smart Structures and Materials, and NDE for Health Monitoring and Diagnostics Technology and Applications Overviews

Golden West Ballroom

These technology and applications overviews are intended to give the 'big picture' of issues and opportunities of enabling technologies such as materials, devices for sensors and actuators, control systems, power supplies, signal processing and systems integration that drive applications. The applications areas reflect the current trend of opportunities. This session should be of interest to all symposium attendees.

1:00 pm

Introduction
Vasundara V. Varadan,
National Science Foundation

1:10 to 3:00 pm

Enabling Technologies
- Active Materials - TBD
- Sensors - TBD
- Actuators - **Victor Giurgiutiu,** Univ. of South Carolina
- Control, Signal Processing, and Power Systems - **Donald J. Leo,** Virginia Polytechnic Institute and State Univ.
- Systems Integration - **Vittal S. Rao,** Univ. of Missouri/ Rolla

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3:00 to 3:20 pm

Coffee Break

3:20 to 5:00 pm

Applications
- Homeland Security - **H. Felix Wu,** National Institute of Standards and Technology
- Medicine - **Vijay K. Varadan,** The Pennsylvania Univ.
- Transportation Systems - **Glenn Washer,** Federal Highway Administration
- Environment - TBD

5:05 to 5:15 pm

Concluding Remarks
Vasundara V. Varadan

Monday 15 March

8:00 to 10:00 am

Award Presentations

Town and Country Ballroom
- Smart Structures and Materials Achievement Award
- NDE Achievement Award
- Nondestructive Evaluation Best Paper Award

Plenary Presentation

Future of Biomimetic Microelectronics

Town and Country Ballroom
Mark Humayun, M.D., Ph.D.
Univ. of Southern California

Abstract: The recently announced NSF Biomimetic Microelectronics Systems (BMES) Engineering Research Center (ERC) involving multidisciplinary research groups at the Univ. of Southern California, the Univ. of California at Santa Cruz, and the California Institute of Technology will yield devices for treatment of blindness, paralysis, and memory loss. The vision will be realized by first synthesizing engineered system specifications from medical, scientific, and engineering disciplines and then attacking the development process through an aggressive deployment of the latest microelectronic and microsystems technology. The collective experience of many decades of the faculty of the BMES ERC has enabled us to put forth a focused development path for the engineered systems. The BMES will concentrate on three thrust areas of enabling technology that will be biologically inspired that are at the heart of immediate and long-term interest to the rapidly growing medical device and diagnostic industry. The 3 thrust areas are 1) mixed signal systems on a chip, 2) power and data management, and 3) interface technology in 3 well-defined test beds; retinal, neuromuscular, and cortical prostheses. The potential benefit to society will come not only from alleviating human suffering and improving quality of life, but also by reducing the health care costs people with disabilities.

Mark S. Humayun, M.D., Ph.D., received his B.S. from Georgetown Univ. in 1984, his M.D. from Duke Univ. in 1989, and his Ph.D. from the Univ. of North Carolina, Chapel Hill in 1994. He is currently Professor of Ophthalmology and Biomedical Engineering at the Univ. of Southern California and the Associate Director of Research at the Doheny Retina Institute. Dr. Humayun's research interests include retinal prosthesis, implantable microelectronics, and ophthalmic surgical instrumentation. He is a member of the IEEE-EMBS, the Biomedical Engineering Society, the Association for Research in Vision and Ophthalmology, the Vitreous Society, and the Retina Society. He is the Director of the NSF Biomimetic Microelectronics Systems Engineering Research Center.

5:00 to 6:00 pm

EAP-in-Action Session

Room: Town and Country
Moderator: **Yoseph Bar-Cohen,** Jet Propulsion Laboratory, Chair, EAPAD Conference

This Session, held annually as part of the Electroactive Polymer Actuators and Devices (EAPAD) Conference, is intended to turn the spotlight on Electroactive Polymers (EAP) materials, and their current and potential application. New materials and applications for EAP are continuing to emerge, and this session will provide attendees an opportunity to see a demonstration of the latest EAP materials in action. Moreover, researchers and potential users of EAP materials will have the opportunity to exchange ideas and experience this emerging technology through a series of "hands-on" demonstrations. The first-and much publicized-human/EAP robot arm wrestling competition will be held during a future EAPAD Conference, and this year's conference will feature a demonstration of an EAP-actuated robot arm performing a wrestling motion.

6:00 to 7:30 pm

All Conference Welcome Reception
Poolside by Terrace Pavilion

7:30 to 9:30 pm

Technical Group Meeting

Royal Palm 5
Chair: **Alison B. Flatau,** Univ. of Maryland/College Park

The Smart Structures and Materials Technical Group will meet to hear presentations from the six finalists in the Best Student Paper Contest. Following the presentations, technical group members will vote to determine the 1st, 2nd, and 3rd place winning papers. The winners will be announced Tuesday morning at 8:00 am before the plenary presentations. This contest is sponsored by Boeing Co. JIMSS/Sage Publications, Rhombus Consultants, and CSA Engineering.

All conference attendees are cordially invited to attend the Technical Group Meeting.

Tuesday 16 March

8:00 to 8:55 am

Award Presentations

Town and Country Ballroom
- ASME Adaptive Structures and Materials Systems Best paper Awards
- Smart Structures and Materials/ASME Best Student Paper Award

Plenary Presentation

Future Development of Commercial Aircraft Structure Technology

Town and Country Ballroom
Bruno Beral, Airbus France

Abstract: Future aircraft will be manufactured out of new and innovative materials (e.g. CFRP, GLARE, etc.) and will be assembled using fast and economic assembling technologies (e.g. Laser Beam Welding, Friction Steer Welding, etc.). Nevertheless, conventional or advanced aluminum will play a major role in future design philosophies as well. The inspection of conventional and new materials and the use of all benefits of new assembling technologies only make sense if new inspection and monitoring technologies are used.

This presentation will highlight the potential use of new materials and technologies for structure as well as SHM impact on the various business areas of an aircraft manufacturer, and will discuss possible benefits and necessary changes in maintenance and design philosophies. It will also identify what SHM system requirements need to be met before such a system can be used in an in-service aircraft.

Biography: Bruno Beral graduated from Toulouse University (Design Concepts & Mechanics) in 1982. After graduation he was employed at Aerospatiale Aircraft Division in Toulouse, France, and was concept and design manager responsible for nose landing gear door issues, wing movables and surfaces, and landing gear door issues. In 1990 Aerospatiale became Aerospatiale Matra Airbus, and Mr. Beral became Design Office Manager for Composite Structures Research, then the European Project Manager for Composite Fuselage, and responsible for program development for large aircraft composite center wing box. Currently, Aerospatiale Matra Airbus is known as Airbus France, and Mr. Beral is head of the Structures Technology Development Department, and coordinates the Airbus Structures Research planning.

6:00 to 7:30 pm

Poster/Exhibition Reception

Lower Level, Exhibition Hall
The exhibition hall will be open Tuesday evening in conjunction with the poster session, to allow attendees specific exhibition and poster viewing time during the symposium. Take the opportunity to see the exhibits and talk with company representatives as well as review posters. Refreshments will be served.

Poster authors will be able to set up their poster papers between 10:00 am and 4:00 pm Tuesday. Poster papers can be previewed after 4:00 pm before the formal poster session begins at 6:00 pm.

Special Events

8:00 to 8:55 am

Plenary Presentation

Building Robust Systems out of Non-Robust Components

Town and Country Ballroom

Pradeep K. Khosla, Carnegie Mellon University

Abstract: Whenever a system fails (and they often do), one typically assigns the blame to the failure of some hardware or software component. In this talk we will describe research that allows systems to exhibit robust behavior in the presence of faults within hardware and software subsystems. The ability to operate through faults is derived from the fact that systems are able to measure their contribution towards the achievement of the specified goal and adapt their behavior accordingly. We will several examples of robotic systems that have been built using this philosophy.

Pradeep K. Khosla is the Dowd Professor in the College of Engineering and School of Computer Science. He is also the head of Electrical and Computer Engineering and the Founding Co-Director of the CyLab—a multidisciplinary initiative for Cybersecurity research at Carnegie Mellon. Dr. Khosla's research interests are in distributed robotic systems, distributed information systems, and embedded software. He is the recipient of several awards including the McDowell Award from Computer Society in 2001. Dr. Khosla is a Fellow of IEEE and AAAI. Professor Khosla's vision of an intelligent system involves several specialized components (hardware or software) that can be composed rapidly to create a system, and that collaborate with each other to achieve the desired behavior. To accomplish these goals and demonstrate this vision, technologies are being developed for distributed design and manufacturing, and utilization of the next generation of distributed robot systems (macroscopic and microelectromechanical systems (MEMS)-based) that will include hardware, software and man-machine interfaces.

6:00 to 7:30 pm

National Science Foundation

Sensors and Sensor Networks Program and other related opportunities

Organized by:

Vittal Rao, Program Director, Electrical & Communications Systems

Shi-Chi Liu, Program Director, Civil & Mechanical Systems

Vasundara Varadan, Division Director, Electrical & Communications Systems

7:30 pm

SS/NDE Women's Dinner

All women attendees are invited to attend dinner at a local restaurant (TBD). Please sign up at the registration desk. Each person is responsible for covering the cost of her meal. Please join us!

8:00 to 8:55 am

Plenary Presentation

The CIRCE Project: Of Bats And Robots

Town and Country Ballroom

Herbert Peremans, University of Antwerp (Belgium)

Abstract: The CIRCE project is sponsored by the European Union as part of the FET-Lifelike Perception Systems initiative (framework 5). It is a multi-university project bringing together wide ranging domains of expertise from: Universiteit Antwerpen (biologically-based ultrasonic perception systems); University of Edinburgh (biologically-based mobile robotics); Universitat Erlangen (electromechanical transducers); Katholieke Universiteit Leuven (miniature mechanical systems); Bath University (neuromorphic digital VLSI systems); Universitat bingen - Syddansk Universitet (biology/neuroscience of bat sonar).

The goal of this project is to reproduce, at a functional level, the sonarsystem of bats by constructing a bionic bat head. This bionic bat head consists of an emission/reception system capable of both generating bat vocalisations and processing the echoes in real-time which is mounted on a multi degree of freedom miniature mechanical system that allows realistic pinna movement. The talk will focus on the development of various components required for the construction of such a bionic bat head. This includes the realization of wideband (20-200kHz) ultrasonic transducers, based on flexible electromechanical films with piezolike properties. To study directional hearing we have determined the pinna shapes of various bat species and based on X-ray tomography, we have produced artificial pinnae, using rapid prototyping technology. The pinnae + transducers are mounted on a miniature actuating system, to allow investigation of active search strategies as employed by bats. The received signals are processed in real-time with a neuromorphic cochlea model implemented on FPGA's which consists of a filterbank of 700 bandpass filters, an envelope extraction stage and a spike generation stage. Finally, we will present biologically plausible pattern recognition procedures that start from the spike codes generated by this neuromorphic cochlea and successfuly extract geometric and target type information from the complex echoes generated by natural targets like plants and trees.

Herbert Peremans obtained his PhD from the University of Ghent in electrical engineering and computer science in '94 on a study of tri-aural sonar systems for mobile robots. He spent two years (96-98) at the Artificial Intelligence department, University of Edinburgh, as a Marie Curie fellow to investigate biologically inspired ultrasonic sensors. After a short spell in industry (98-99) working on industrial sensors he joined the University of Antwerp where he is now a senior lecturer. He has published over 40 papers on sonar systems and received an 'outstanding paper award' from the 'IEEE Robotics and Automation Society' in 1993. His current research efforts are directed at gaining an increased understanding of biological sonar systems, e.g. bats, and incorporating this knowledge in the design of new, more advanced robotic sonar systems. He is the coordinator for the multi-university CIRCE project.

Bring your products to light!

Exhibition
Lower Level Exhibition Hall

Exhibition Hours

Tuesday 16 March
10:00 am to 4:00 pm;
6:00 to 7:30 pm

Wednesday 17 March
10:00 am to 4:00 pm

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SPIE's 11th Annual International Symposium on
Smart Structures and Materials
and
SPIE's 9th Annual International Symposium on
NDE for Health Monitoring and Diagnostics
San Diego Town and Country Resort & Convention Center, San Diego, California

Registration Hours
San Diego Town and Country Resort & Convention Center, Atlas Foyer

Sunday 14 March . . . . 7:30 am to 4:00 pm
Monday 15 March . . . . 7:00 am to 4:00 pm
Tuesday 16 March . . . . 7:15 am to 4:00 pm
Wednesday 17 March . . . . 7:30 am to 4:00 pm
Thursday 18 March . . . . 7:30 am to 11:00 pm

Exhibition Hours
Lower Level Exhibition Hall

Tuesday 16 March . . . . 10:00 am to 4:00 pm
. . . . 6:00 to 7:30 pm
Wednesday 17 March . . . . . . 10:00 am to 4:00 pm
See facing page.

Poster/Exhibition Reception
Lower Level Exhibition Hall

Tuesday 16 March . . . . 6:00 to 7:30 pm
The exhibition hall will be open Tuesday evening in conjunction with the poster session, to allow attendees specific exhibition and poster viewing time during the symposium. Take the opportunity to see the exhibits and talk with company representatives as well as review posters. Refreshments will be served.

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All Conference Welcome Reception
Poolside by Terrace Pavilion

Monday 15 March . . . . 6:00 to 7:30 pm
Sponsored by: **San Diego Town and Country Resort & Convention Center** and **SPIE**
All attendees are invited to relax, socialize and enjoy refreshments at the Town & Country resort poolside. Please remember to wear your conference registration badges. Dress is casual.

Speakers Audiovisual Desk Hours
Terrace Salon III

Sunday . . . . 11:00 am to 5:00 pm
Monday through Thursday . . 7:30 am to 5:00 pm
Speakers who did not request audiovisual equipment or are using a laptop are asked to stop at the Audiovisual Desk. Speakers who have requested to use a slide projector, VHS video player, or data projector may preview their materials at the Audiovisual Desk prior to their presentation. Speakers will be responsible for delivering visual materials to the conference room and may obtain materials from the room monitor in the conference room immediately following the session.

Coffee Breaks
Morning coffee and bakery items will be served at the following locations:
Royal Palm Court

Monday and Thursday . . . . 10:00 to 10:30 am

Exhibition Hall (Lower Level Exhibition Hall)

Tuesday-Wednesday . . . . 10:00 to 10:30 am

Afternoon coffee will be served at the following locations:
Royal Palm Court
Sunday, Monday and Thursday
3:10 to 3:40 pm

Exhibition Hall (Lower Level Exhibition Hall)

Tuesday-Wednesday . . . . 3:10 to 3:40 pm

Desserts
Dessert snacks will be served in the Exhibition Hall (Lower Level) Tuesday and Wednesday from 3:10 to 3:40 pm. Complimentary tickets for dessert snacks will be included in attendee registration packets.

Proceedings of SPIE
A full-manuscript, editor-reviewed Proceedings of SPIE volume will be published for each conference and will be available within eight to twelve weeks after the symposium. You may order Proceedings now at reduced prepublication prices. See page XX for details and order information.

Messages for Attendees
San Diego Town & Country Resort phone number: (619) 291-7131
The SPIE Message Board will be located near the Registration Desk. Messages will be taken during registration hours Saturday through Friday. To leave a message, call the hotel and ask the hotel operator for the SPIE Registration Desk.

Video/Digital Recording Policy
For copyright reasons, video or digital recording of any conference session is strictly prohibited without written prior consent from each specific presenter to be recorded. Individuals not complying with this policy will be asked to leave a given session and to surrender their film or disc. It is the responsibility of the presenter to notify SPIE if consent is given.

SPIE Bookstore
Terrace Salon II

Open during registration hours

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Terrace Salon III Room

Monday through Wednesday 7:00 am to 6:00 pm
Thursday . . . . 7:00 am to 1:30 pm
The Terrace Salon III Room will be equipped with stations so attendees may access their internet e-mail during the conference. There will be a 10-minute time limit per internet session.

Wireless Internet Access (Wi-Fi)
The Town and Country Business Center offers wireless internet service within the conference center. The internet service is available in the following areas: Atlas Foyer, Grand Foyer and the Patio area. If you are interested in this service, you may contact the Business Center directly for details. The Business Center phone number is 619 291 8770. The rates will be $9 per day or $36 for the entire week of the SPIE symposium.

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Marion's Child Care, 1-888-891-5029, or within San Diego call 619-582-5029,
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PACIFIC SALON ONE
PACIFIC SALON TWO
PACIFIC SALON THREE
GOLDEN BALLROOM
PACIFIC BALLROOM

GRAND FOYER

TRI-LEVEL PARKING

REGENCY ROAD

REGENCY TOWER
LE PAVILLON
LE SOIREE
2100-3021

ROYAL PALM COURT

TERRACE SALON ONE
TERRACE SALON TWO
TERRACE SALON THREE

GAZEBO   GAZEBO

WHIRLPOOL

POOL

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ATLAS BALLROOM

TOWN & COUNTRY

SAN DIEGO

GOLDEN WEST

CALIFORNIA

ATLAS FOYER

ROYAL PALM BALLROOM

ROSE GARDEN

GAZEBO

TERRACE CAFE

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POOL

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VAN

3500-3506

3634

POOL

3700-3799
REGENCY BALLROOM

3400-3482

REGENCY PROMENADE

REGENCY LANE

ACCESSIBLE LIFT

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THE PATIO

TRELLISES COURTYARD

POOL

3130-3150

3200-3119

REGENCY ROAD

3020-3064

CHARLIE'S

3800-3025

3524-3536

REGENCY LANE

LOBBY

ROSE MIX GALLERY

BEAUTY SALON

BARBER SHOP

LOBBY TERRACE COURT

ROYAL PATH

VAN

PRIMO'S SALON & DAY SPA

TROLLEY GAZEBO

TAXI PARKING

KELLY'S STEAKHOUSE

Smart Structures and Materials

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Kon-Well Wang, The Pennsylvania State Univ.

Conference 5383

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and **Arnold Lumsdaine,** Univ. of Tennessee/Knoxville

Conference 5384

Chairs: **Eric Udd,** Blue Road Research;

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Conference 5385

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Conference 5386

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Conference 5389

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Conference 5390

Chair: **Alison B. Flatau,** University of Maryland/College Park

Smart Structures and Materials

Conference 5383
Room: Royal Palm III

Mon.-Thurs. 15-18 March 2004
Proceedings of SPIE **Vol. 5383**

Modeling, Signal Processing, and Control

Conference Chair: **Ralph C. Smith**, North Carolina State Univ.

Cochair: **Robert L. Clark**, Duke Univ.

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Conference 5384
Room: Golden West

Mon.-Wed. 15-17 March 2004
Proceedings of SPIE **Vol. 5384**

Smart Sensor Technology and Measurement Systems

Conference Chairs: **Eric Udd**, Blue Road Research; **Daniele Inaudi**, SMARTEC SA (Switzerland)

Cochairs: **Kim D. Bennett**, Lafayette College; **Brian Culshaw**, Univ. of Strathclyde (United Kingdom); **Dryver R. Huston**, Univ. of Vermont; **Luc Thevenaz**, Swiss Federal Institute of Technology (Switzerland)

Program Committee: **Xiaoyi Bao**, Univ. of Ottawa (Canada); **Richard O. Claus**, Virginia Polytechnic Institute and State Univ.; **John P. Dakin**, Univ. of Southampton (United Kingdom); **Wolfgang Ecke**, Institut für Physikalische Hochtechnologie eV (Germany); **Riccardo Falciai**, Istituto di Fisica Applicata (Italy); **E. J. Friebele**, Naval Research Lab.; **Peter L. Fuhr**, San Jose State Univ.; **Stephan Grosswig**, GESO (Germany); **Wolfgang R. Habel**, Bundesanstalt für Materialforschung und -prüfung (Germany); **Stephen T. Kreger**, Blue Road Research; **Mark S. Miller**, Goodrich Corp.; **Marc Niklès**, Omnisens SA (Switzerland); **Kara J. Peters**, North Carolina State Univ.; **Pieter L. Swart**, Rand Afrikaans Univ. (South Africa); **Maurice P. Whelan**, Ctr. Comune di Ricerca (Italy)

Conference 5385
Room: Town & Country

Mon.-Thurs. 15-18 March 2004
Proceedings of SPIE **Vol. 5385**

Electroactive Polymer Actuators and Devices (EAPAD)

Conference Chair: **Yoseph Bar-Cohen**, Jet Propulsion Lab.

Cochair: **Peter Sommer-Larsen**, Risø National Lab. (Denmark)

Program Committee: **Michael S. Banik**, Boston Scientific Corp.; **Ray H. Baughman**, Univ. of Texas/Dallas; **Paul D. Calvert**, Univ. of Massachusetts; **Richard O. Claus**, Virginia Polytechnic Institute and State Univ.; **Pierre-Gilles de Gennes**, ESPCI (France); **Danilo De Rossi**, Univ. degli Studi di Pisa (Italy); **Rainer W. Gülch**, Eberhard-Karls-Univ. Tübingen (Germany); **Olle Inganäs**, Linköping Univ. (Sweden); **Keiichi Kaneto**, Kyushu Institute of Technology (Japan); **Jaehwan Kim**, Inha Univ. (South Korea); **Roy D. Kornbluh**, SRI International; **Gabor Kovacs**, EMPA (Switzerland); **Wen-Liang Liu**, Industrial Technology Research Institute (Taiwan); **John D. Madden**, Univ. of British Columbia (Canada); **Chris Melhuish**, Univ. of the West of England (United Kingdom); **Siavouche Nemat-Nasser**, Univ. of California/San Diego; **Yoshihito Osada**, Hokkaido Univ. (Japan); **Toribio F. Otero**, Univ. Politecnica de Cartagena (Spain); **Mohsen Shahinpoor**, Univ. of New Mexico; **Valery P. Shibaev**, Moscow State Univ. (Russia); **Elisabeth Smela**, Univ. of Maryland/College Park; **Ji Su**, NASA Langley Research Ctr.; **Minoru Taya**, Univ. of Washington; **Gordon G. Wallace**, Univ. of Wollongong (Australia); **Qi Ming Zhang**, The Pennsylvania State Univ.; **Miklos Zrinyi**, Budapest Univ. of Technology and Economics (Hungary)

Conference 5386
Room: Royal Palm I

Mon.-Thurs. 15-18 March 2004
Proceedings of SPIE **Vol. 5386**

Damping and Isolation

Conference Chair: **Kon-Well Wang**, The Pennsylvania State Univ.

Cochair: **William W. Clark**, Univ. of Pittsburgh

Program Committee: **Gregory S. Agnes**, Jet Propulsion Lab.; **Mehdi Ahmadian**, Virginia Polytechnic Institute and State Univ.; **Eric M. Austin**, Clemson Univ.; **H. Thomas Banks**, North Carolina State Univ.; **Amr M. Baz**, Univ. of Maryland/College Park; **Richard G. Cobb**, Air Force Institute of Technology; **L. Porter Davis**, Honeywell Space Systems; **Faramarz Gordaninejad**, Univ. of Nevada/Reno; **Roy Ikegami**, Boeing Phantom Works; **Daniel J. Inman**, Virginia Polytechnic Institute and State Univ.; **Conor D. Johnson**, CSA Engineering, Inc.; **Nikhil A. Koratkar**, Rensselaer Polytechnic Institute; **Donald J. Leo**, Virginia Polytechnic Institute and State Univ.; **George A. Lesieutre**, The Pennsylvania State Univ.; **Wei-Hsin Liao**, Chinese Univ. of Hong Kong (Hong Kong); **Joseph R. Maly**, CSA Engineering, Inc.; **Samir A. Nayfeh**, Massachusetts Institute of Technology; **Roger Ohayon**, Conservatoire National des Arts et Métiers (France); **Zahidul H. Rahman**, Jet Propulsion Lab.; **Massimo Ruzzene**, Georgia Institute of Technology; **Steve I. Y. Shen**, Univ. of Washington; **Roger Stanway**, Univ. of Sheffield (United Kingdom); **Jian Q. Sun**, Univ. of Delaware; **Jiong Tang**, Univ. of Connecticut; **Geoffrey R. Tomlinson**, Univ. of Sheffield (United Kingdom); **Norman M. Wereley**, Univ. of Maryland/College Park

Conference 5387
Room: California

Mon.-Thurs. 15-18 March 2004
Proceedings of SPIE **Vol. 5387**

Active Materials: Behavior and Mechanics

Conference Chair: **Dimitris C. Lagoudas**, Texas A&M Univ.

Cochair: **William D. Armstrong**, Univ. of Wyoming

Program Committee: **Gary L. Anderson**, Army Research Office; **Roshdy G. S. Barsoum**, Office of Naval Research; **Abhijit Bhattacharyya**, Univ. of Arkansas/Little Rock; **James G. Boyd IV**, Texas A&M Univ.; **L. Catherine Brinson**, Northwestern Univ.; **Gregory P. Carman**, Univ. of California/Los Angeles; **Martin L. Dunn**, Univ. of Colorado/Boulder; **Qing Jiang**, Univ. of California/Riverside; **Marc Kamlah**, Forschungszentrum Karlsruhe (Germany); **Ibrahim Karaman**, Texas A&M Univ.; **Donald J. Leo**, Virginia Polytechnic Institute and State Univ.; **Doru C. Lupascu**, Technische Univ. Darmstadt (Germany); **Christopher S. Lynch**, Georgia Institute of Technology; **Robert M. McMeeking**, Univ. of California/Santa Barbara; **Robert C. O'Handley**, Massachusetts Institute of Technology; **Zoubeida Ounaies**, Virginia Commonwealth Univ.; **Etienne Patoor**, Ecole Nationale Superieure d'Arts et Metiers (France); **Muhammad A. Qidwai**, Geo-Centers, Inc.; **John A. Shaw**, Univ. of Michigan; **Thomas W. Shield**, Univ. of Minnesota; **Thomas R. Shrout**, The Pennsylvania State Univ.; **Ralph C. Smith**, North Carolina State Univ.; **Nancy R. Sottos**, Univ. of Illinois/Urbana-Champaign

Conference 5388
Room: San Diego

Tues.-Thurs. 16-18 March 2004
Proceedings of SPIE **Vol. 5388**

Industrial and Commercial Applications of Smart Structures Technologies

Conference Chair: **Eric H. Anderson**, CSA Engineering, Inc.

Cochair: **Edward V. White**, The Boeing Co.

Program Committee: **Grigory Adamovsky**, NASA Glenn Research Ctr.; **Emanuele Bianchini**, Vibration-X, Inc; **Christian Boller**, Univ. of Sheffield (United Kingdom); **Peter C. Chen**, Techno-Sciences Inc.; **Arthur V. Cooke**, Active Signal Technologies; **Johannes K. Dürr**, DaimlerChrysler AG (Germany); **B. Kyle Henderson**, Air Force Research Lab.; **Ursula Herold-Schmidt**, DaimlerChrysler Aerospace (Germany); **Jack H. Jacobs**, Honeywell Space Systems; **Mark R. Jolly**, Lord Corp.; **Chad H. Joshi**, Energen, Inc.; **Jayanth N. Kudva**, NextGen Aeronautics; **Mark Lin**, Acellent Technologies, Inc.; **Douglas K. Lindner**, Virginia Polytechnic Institute and State Univ.; **John A. Main**, DARPA; **Anna-Maria R. McGowan**, NASA Langley Research Ctr.; **David E. Parekh**, Georgia Tech Research Institute; **Wade J. Pulliam**, Fortis Technologies, Inc.; **Mark E. Regelbrugge**, Rhombus Consultants Group; **W. Lance Richards**, NASA Dryden Flight Research Ctr.; **Brian P. Sanders**, Air Force Research Lab.; **Janet M. Sater**, Institute for Defense Analyses; **Jerry Schmidt**, Materials Systems, Inc.

Conference 5389
Room: Meeting House/Sunset

Mon.-Thurs. 15-18 March 2004
Proceedings of SPIE **Vol. 5389**

Smart Electronics, MEMS, BioMEMS, and Nanotechnology

Conference Chair: **Vijay K. Varadan**, The Pennsylvania State Univ.

Cochairs: **Zeynep Celik-Butler**, Univ. of Texas/Arlington; **Laszlo B. Kish**, Texas A&M Univ.

Program Committee: **Vasu K. Aatre**, Defence Research & Development Organisation (India); **Pratul K. Ajmera**, Louisiana State Univ.; **Steven W. Arms**, MicroStrain, Inc.; **John H. Belk**, Boeing Co.; **Jung-Chih Chiao**, Univ. of Texas/Arlington; **Sang H. Choi**, NASA Langley Research Ctr.; **Andras Der**, Biophysical Research Institute (Hungary); **Claes-Göran Granqvist**, Uppsala Univ. (Sweden); **Peter Heszler**, Uppsala Univ. (Sweden); **Michael H. Hoffmann**, Univ. Ulm (Germany); **Ajay P. Malshe**, Univ. of Arkansas; **Kathryn M. McGrath**, Univ. of Otago (New Zealand); **Y. Eugene Pak**, Samsung Advanced Institute of Technology & CRI (South Korea); **Gabe Schmera**, Space and Naval Warfare Ctr., San Diego; **Andrei M. Shkel**, Univ. of California/Irvine; **Ashok Srivastava**, Louisiana State Univ.; **Maria Strømme**, Uppsala Univ. (Sweden); **Robert Vajtai**, Rensselaer Polytechnic Institute; **Lode K. J. Vandamme**, Technische Univ. Eindhoven (Netherlands)

Conference 5390
Room: Meeting House/Towne

Mon.-Thurs. 15-18 March 2004
Proceedings of SPIE **Vol. 5390**

Smart Structures and Integrated Systems

Conference Chair: **Alison B. Flatau**, Univ. of Maryland/College Park

Cochair: **Yuji Matsuzaki**, Nagoya Univ. (Japan)

Program Committee: **Gregory S. Agnes**, Jet Propulsion Lab.; **Eric H. Anderson**, CSA Engineering, Inc.; **Gary L. Anderson**, Army Research Office; **Hiroshi Asanuma**, Chiba Univ. (Japan); **Balakumar Balachandran**, Univ. of Maryland/College Park; **Roshdy G. S. Barsoum**, Office of Naval Research; **Diann E. Brei**, Univ. of Michigan; **Allen J. Bronowicki**, TRW Space & Electronics Group; **Gregory P. Carman**, Univ. of California/Los Angeles; **Fu-Kuo Chang**, Stanford Univ.; **Aditi Chattopadhyay**, Arizona State Univ.; **Peter C. Chen**, NASA Goddard Space Flight Ctr.; **Seung-Bok Choi**, Inha Univ. (South Korea); **Ephrahim Garcia**, Cornell Univ.; **John M. Ginder**, Ford Motor Co.; **Victor Giurgiutiu**, Univ. of South Carolina; **Nesbitt W. Hagood**, Continuum Photonics; **T. Tupper Hyde**, Honeywell Space Systems; **Daniel J. Inman**, Virginia Polytechnic Institute and State Univ.; **George A. Lesieutre**, The Pennsylvania State Univ.; **John A. Main**, DARPA; **David R. Martinez**, Sandia National Labs.; **Michihiro C. Natori**, Institute of Space and Astronautical Science (Japan); **Christopher Niezrecki**, Univ. of Florida; **Darryll J. Pines**, Univ. of Maryland/College Park; **Dale Ruebsamen**, Honeywell Inc.; **Roger Stanway**, Univ. of Sheffield (United Kingdom); **Friedrich K. Straub**, Boeing Co.; **Kon-Well Wang**, The Pennsylvania State Univ.; **Shoko Yoshikawa**, Phoenix Science & Technology; **Yung H. Yu**, NASA Ames Research Ctr.

SS/NDE Joint Conference
Conference 5391
Room: Meeting House/Sunrise

Mon.-Thurs. 15-18 March 2004
Proceedings of SPIE **Vol. 5391**

Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems

Conference Chair: **Shih-Chi Liu**, National Science Foundation

Cochairs: **Chung Bang Yun**, Korea Advanced Institute of Science and Technology (South Korea); **A. Emin Aktan**, Drexel Univ.; **Alison B. Flatau**, Univ. of Maryland/College Park; **Jan Ming Ko**, Hong Kong Polytechnic Univ. (Hong Kong); **Akira Mita**, Keio Univ. (Japan)

Program Committee: **Makola M. Abdullah**, Florida A&M Univ./Florida State Univ.; **Masato Abe**, Univ. of Tokyo (Japan); **Satoru Aizawa**, Takenaka Corp. (Japan); **Thomas Baca**, Applied Technology Associates; **Amr M. Baz**, Univ. of Maryland/College Park; **Fabio Casciati**, Univ. degli Studi di Pavia (Italy); **Fu-Kuo Chang**, Stanford Univ.; **Genda Chen**, Univ. of Missouri/Rolla; **Reginald DesRoches**, Georgia Institute of Technology; **Shirley J. Dyke**, Washington Univ.; **Charles R. Farrar**, Los Alamos National Lab.; **Toshiaki Fujimori**, Shimizu Corp. (Japan); **Yozo Fujino**, Univ. of Tokyo (Japan); **Robert X. Gao**, Univ. of Massachusetts/Amherst; **Henri P. Gavin**, Duke Univ.; **Steven Glaser**, Univ. of California/Berkeley; **Faramarz Gordaninejad**, Univ. of Nevada/Reno; **Dryver R. Huston**, Univ. of Vermont; **Sami F. Masri**, Univ. of Southern California; **Masoud Motavalli**, EMPA (Switzerland); **Isao Nishimura**, Musashi Institute of Technology (Japan); **Shunsuke Otani**, Univ. of Tokyo (Japan); **Darryl J. Pines**, Univ. of Maryland/College Park; **Rahmat A. Shoureshi**, Colorado School of Mines; **Andrew W. Smyth**, Columbia Univ.; **Billie F. Spencer, Jr.**, Univ. of Illinois/Urbana-Champaign; **Masayoshi Tomizuka**, National Science Foundation; **Kevin K. Tseng**, Vanderbilt Univ.; **Ming L. Wang**, Univ. of Illinois/Chicago; **Glenn A. Washer**, Federal Highway Administration; **Norman M. Wereley**, Univ. of Maryland/College Park; **Sharon L. Wood**, Univ. of Texas/Austin; **You-Lin Xu**, Hong Kong Polytechnic Univ. (Hong Kong); **Bojidar S. Yanev**, New York City DOT; **Kazuo Yoshida**, Keio Univ. (Japan); **Lily L. Zhou**, Nanjing Univ. of Aeronautics & Astronautics (China)

Smart Structures

Smart Structures and Materials

MONDAY 15 MARCH

8:00 to 10:00 am • Town and Country Ballroom

Smart Structures and Materials Achievement Award Presentation

Plenary Presentation
The Future of Biomimetic Microelectronics
Mark Humayun, M.D., Ph.D., Univ. of Southern California

SESSION 1
Room: Royal Palm III
Mon. 10:30 am to 12:10 pm

Piezoceramic Materials I
Chair: **Ralph C. Smith**, North Carolina State Univ.

10:30 am: **Rate dependent hysteresis model for a piezoelectric stack actuator,** W. S. Galinaitis, Ferrum College . . . . [5383-01]

10:50 am: **Temperature-dependent model for relaxor ferroelectric,** J. K. Raye, Virginia Commonwealth Univ.; R. Smith, North Carolina State Univ. . . . . [5383-02]

11:10 am: **Finite element formulation of orthotropic piezoceramic patch actuator laminated plates,** Z. K. Kusculuoglu, T. J. Royston, Univ. of Illinois/Chicago . . . [5383-03]

11:30 am: **Stress-dependent hysteresis model for piezoceramic actuators with application to THUNDER,** B. L. Ball, R. C. Smith, North Carolina State Univ.; Z. Ounaies, Virginia Commonwealth Univ. . [5383-04]

11:50 am: **Modeling and applications of new piezoelectric actuator technologies,** T. D. Usher, A. Sim, G. Ashford, A. Cabanyog, K. Ulibarri, Jr., G. Camargo, E. Naco, California State Univ. . . . . [5383-05]

Lunch Break . . 12:10 to 1:30 pm

SESSION 1
Room: Golden West
Mon. 10:30 am to 12:10 pm

Fiber Optic Sensors I
Chairs: **Eric Udd**, Blue Road Research; **Daniele Inaudi**, SMARTEC SA (Switzerland)

10:30 am: **Distributed fiber-optical HC leakage and pH sensing techniques for implementation into smart structures,** J. M. Buerck, Forschungszentrum Karlsruhe (Germany); B. Vogel, GESO GmbH (Germany); S. Roth, S. Ebrahimi, K. Kraemer, Forschungszentrum Karlsruhe (Germany) [5384-01]

10:50 am: **Simultaneous distributed Brillouin strain and temperature sensor with photonic crystal fiber,** L. Zou, X. Bao, L. Chen, Univ. of Ottawa (Canada) . . . . [5384-02]

11:10 am: **Leakage monitoring by temperature monitoring,** B. H. Vogel, GESO GmbH (Germany); M. Niklès, Omnisens SA (Switzerland); S. Grosswig, GESO GmbH (Germany); F. Briffod, Omnisens SA (Switzerland); S. Luebbecke, GESO GmbH (Germany); F. Sauser, Omnisens SA (Switzerland); T. Pfeiffer, GESO GmbH (Germany); A. Bals, Omnisens SA (Switzerland) . . . . [5384-03]

11:30 am: **Health monitoring of a pipeline based on distributed strain and temperature measurements,** B. Glisic, SMARTEC SA (Switzerland); S. Brunengo, Snam Rete Gas (Italy); M. Cerulli, A. Figini, D. Inaudi, SMARTEC SA (Switzerland); G. Milani, Snam Rete Gas (Italy) . . . . [5384-04]

11:50 am: **Interferometric sensor and calibration system for high-precision applications,** M. Welter, G. Jäger, E. Manske, Technische Univ. Ilmenau

SESSION 1
Room: Town & Country
Mon. 10:30 am to 12:10 pm

EAP as Emerging Actuators
Chairs: **Yoseph Bar-Cohen**, Jet Propulsion Lab.; **Peter Sommer-Larsen**, Risø National Lab. (Denmark)

Keynote

10:30 am: **New horizons for orthotic and prosthetic technology: merging body and machine** *(Invited Paper),* **H. M. Herr,** MIT-Harvard Division of Health Sciences and Technology and Spaulding Hospital, Harvard Medical School . . . . [5385-01]

11:10 am: **EAP as artificial muscles: progress and challenges,** Y. Bar-Cohen, Jet Propulsion Lab. . . . . . [5385-02]

11:30 am: **Electrostrictive polymer for mechanical energy harvesting,** Y. Liu, K. Ren, H. Hofmann, Q. Zhang, The Pennsylvania State Univ. . . . . [5385-64]

11:50 am: **Converging the capabilities of EAP artificial muscles and the requirements of bio-inspired robotics,** D. F. Hanson, Univ. of Texas/Dallas . . . . [5385-04]

Lunch Break . . 12:10 to 1:30 pm

SESSION 1
Room: Royal Palm I
Mon. 10:30 am to 12:10 pm

Vibration Isolation
Chairs: **Kon-Well Wang**, The Pennsylvania State Univ.; **Nikhil A. Koratkar**, Rensselaer Polytechnic Institute

10:30 am: **Robust control of vibration isolation systems: theory and experiment,** S. A. Nayfeh, L. Zuo, Massachusetts Institute of Technology [5386-01]

10:50 am: **Vibration isolator design via energy confinement through eigenvector assignment and piezoelectric networking,** T. Wu, K. Wang, The Pennsylvania State Univ. . . . . [5386-02]

11:10 am: **Vibration isolation for launch of a Space Station Orbital Replacement Unit,** J. R. Maly, S. Pendleton, M. Mimovich, CSA Engineering, Inc.; J. W. Sills, Jr., United Space Alliance; G. H. James III, NASA-JSC . . [5386-03]

11:30 am: **Development of a variable stiffness spring for adaptive vibration isolators,** J. M. Cronje, P. S. Heyns, N. J. Theron, Univ. of Pretoria (South Africa); P. W. Loveday, CSIR (South Africa) . . . . [5386-04]

11:50 am: **Base isolation system using shape-memory alloy wires,** Y. Yamashita, A. Masuda, A. Sone, Kyoto Institute of Technology (Japan) . . . [5386-05]

Lunch Break . . 12:10 to 1:30 pm

Conference 5387 Room: California	Conference 5388 Room: San Diego	Conference 5389 Meeting House/Sunset	Conference 5390 Meeting House/Towne	Conference 5391 Meeting House/Sunrise

MONDAY 15 MARCH

8:00 to 10:00 am • Town and Country Ballroom
Smart Structures and Materials Achievement Award Presentation

Plenary Presentation
The Future of Biomimetic Microelectronics
Mark Humayun, M.D., Ph.D., Univ. of Southern California

SESSION 1
Room: California
Mon. 10:30 am to 12:10 pm

Multifunctional Composites I

Chairs: **Donald J. Leo**, Virginia Polytechnic Institute and State Univ.; **Zoubeida Ounaies**, Virginia Commonwealth Univ.

Keynote
10:30 am: **Ionic polymer-metal composites as soft actuators and sensors: experimental evaluation and nanoscale modeling** *(Invited Paper)*, S. Nemat-Nasser, Univ. of California/San Diego . [5387-01]

11:10 am: **Effects of counter-ion, solvent type, and loading condition on the material response of ionic polymer transducers,** K. M. Farinholt, D. J. Leo, Virginia Polytechnic Institute and State Univ. . . . . . . [5387-02]

11:30 am: **Generalized multiphysics Von-Karman equations for large deflection of artificial muscle plates,** J. Michopoulos, Naval Research Lab. . . . . [5387-03]

11:50 am: **Performance analysis of microcapsule actuation under large strain,** H. Tan, D. J. Leo, T. Long, Virgina Polytechnic Institute and State Univ.[5387-04]

Lunch Break . . 12:10 to 1:30 pm

SESSION 1
Room: Meeting House/Sunset
Mon. 10:30 am to 12:10 pm

Smart Electronics I

Chairs: **Ashok Srivastava**, Louisiana State Univ.; **K. A. Jose**, The Pennsylvania State Univ.

10:30 am: **Nanometer-size p-channel SON MOSFET and its electrical characteristics,** P. K. Ghosh, A. Venkatachalam, Syracuse Univ. . . . . . . [5389-01]

10:50 am: **Digital CMOS interface circuit for current, voltage, and capacitance (IVC) sensing,** A. Srivastava, Louisiana State Univ. . . . . [5389-02]

11:10 am: **0.8-V ultralow-power CMOS analog multiplexer for remote biological and chemical signal processing,** C. Zhang, A. Srivastava, P. Ajmera, Louisiana State Univ. . . . . [5389-03]

11:30 am: **High-aspect-ratio neural probes for monolithic integration with ultralow-power CMOS operational amplifier circuit,** T. Xin, P. Ajmera, C. Zhang, A. Srivastava, Louisiana State Univ. . . . . [5389-04]

11:50 am: **Organic thin-film transistor and electronics,** J. Xie, V. K. Varadan, The Pennsylvania State Univ. . . . . [5389-05]

Lunch Break . . 12:10 to 1:30 pm

SESSION 1
Room: Meeting House/Towne
Mon. 10:30 am to 12:10 pm

Control of Smart Structures

Chairs: **Mehdi Ahmadian**, Virginia Polytechnic Institute and State Univ.; **Mehrdad N. Ghasemi-Nejhad**, Univ. of Hawaii/Manoa

10:30 am: **Fault-tolerant control of flexible smart structures using robust decentralized periodic output feedback technique,** T. C. Manjunath, B. Bandyopadhyay, Indian Institute of Technology (India) . . . . [5390-01]

10:50 am: **Thermally induced vibration control of space flexible booms,** K. Oh, Aerospace Engineering College (South Korea); C. Kong, Chosun Univ. (South Korea); Y. Sugiyama, Univ. of Osaka Prefecture (Japan) . . . . [5390-02]

11:10 am: **Genetic algorithms for designing hexapod struts capable of pointing, vibration isolation, and vibration absorption,** Z. Guo, J. E. McInroy, Univ. of Wyoming . . . . [5390-03]

11:30 am: **Response of a hybrid semiactive control technique to steady state and transient dynamics of vehicle suspensions,** M. Ahmadian, Virginia Polytechnic Institute and State Univ.; N. Vahdati, Nanyang Technological Univ. (Singapore) . . . . [5390-04]

11:50 am: **Two-DOF precision platform for spacecraft thrust vector control: control strategies and simulations,** K. Ma, G. N. Mehrdad, Univ. of Hawaii/Manoa . . . . [5390-05]

Lunch Break . . 12:10 to 1:30 pm

SESSION 1
Room: Meeting House/Sunrise
Mon. 10:30 am to 12:30 pm

Modeling and Analysis of Smart Systems I

Chairs: **Jerome P. Lynch**, Univ. of Michigan; **Ming L. Wang**, Univ. of Illinois/Chicago

10:30 am: **Structural system identification based on multibranch BPNN,** H. Li, Dalian Univ. of Technology (China); H. Yang, Shenyang Architectural and Civil Engineering Institute (China) . . . . [5391-01]

10:50 am: **Linear and nonlinear pattern classification methods for damage detection in a structural health monitoring benchmark structure,** J. P. Lynch, Univ. of Michigan . . . . [5391-02]

11:10 am: **Active damage detection method using support vector machine and frequency modulation,** A. Mita, R. Taniguchi, Keio Univ. (Japan) . . . . [5391-03]

11:30 am: **Modeling of structural steel and magnetite for NDE corrosion sensing,** V. Singh, G. Lloyd, M. L. Wang, Univ. of Illinois/Chicago . . . . . [5391-04]

11:50 am: **Continuous damage monitoring of civil structures using vibratory gyroscopes,** A. Masuda, A. Sone, S. Morita, Kyoto Institute of Technology (Japan) . . . . [5391-05]

12:10 pm: **Hybrid control of microvibration of high-tech facility under horizontal and vertical ground motion,** Y. Xu, Hong Kong Polytechnic Univ. (Hong Kong); A. X. Guo, H. Li, Harbin Institute of Technology (China) . . . . [5391-88]

Lunch Break . 12:30 to 1:30 pm

Smart Structures and Materials

MONDAY 15 MARCH

Conference 5383 — Room: Royal Palm III

SESSION 2
Room: Royal Palm III
Mon. 1:30 to 3:10 pm

Piezoceramic Materials II

Chair: **Marcelo J. Dapino**, The Ohio State Univ.

1:30 pm: **Piezoelectric actuation of a compliant semi-infinite beam,** E. M. Austin, B. Ananthasayanam, Clemson Univ. . . . . [5383-06]

1:50 pm: **Prediction of hysteretic effects in PZT stack actuators using a hybrid modeling strategy,** G. N. Washington, J. N. Park, The Ohio State Univ. . . . . [5383-07]

2:10 pm: **Linear modeling and control of a cantilever beam with bonded piezoelectrics using finite element software,** A. P. Weightman, R. G. Scott, M. C. Levesley, Univ. of Leeds (United Kingdom) . . . . [5383-08]

2:30 pm: **Effects of material nonlinearities in piezoceramics on resonant driven piezoceramic actuators, transducers, and transformers,** T. R. Sattel, Univ. Paderborn (Germany) . [5383-09]

2:50 pm: **Investigation of nonlinear shear-induced flexural vibrations of piezoceramic actuators,** S. K. Parashar, Technische Univ. Darmstadt (Germany); A. Das Gupta, Indian Institute of Technology (India); P. Hagedorn, Technische Univ. Darmstadt (Germany) . [5383-10]

Coffee Break . . 3:10 to 3:40 pm

Conference 5384 — Room: Golden West

(Germany) . . . . [5384-05]
Lunch Break . . 12:10 to 1:30 pm

SESSION 2
Room: Golden West
Mon. 1:30 to 3:10 pm

Fiber Optic Sensors II

Chairs: **Eric Udd**, Blue Road Research; **Daniele Inaudi**, SMARTEC SA (Switzerland)

1:30 pm: **Dynamic demodulation of long-gauge interferometric strain sensors,** D. Inaudi, D. Posenato, SMARTEC SA (Switzerland) . . . . [5384-06]

1:50 pm: **Health monitoring of full-composite CNG tanks using long-gage fiber optic sensors,** B. Glisic, D. Inaudi, SMARTEC SA (Switzerland) . . . . [5384-07]

2:10 pm: **Implementing fiber sensors to monitor humidity and moisture,** W. Kunzler, S. Calvert, M. Laylor, Blue Road Research . . . . [5384-08]

2:30 pm: **Long-term evaluation of a fiber optic-based irreversible moisture sensor,** K. R. Cooper, B. P. FitzPatrick, Luna Innovations, Inc. . . . . [5384-09]

Coffee Break . . 3:10 to 3:40 pm

Conference 5385 — Room: Town & Country

SESSION 2
Room: Town & Country
Mon. 1:30 to 5:00 pm

Electronic EAP

Chairs: **Elisabeth Smela**, Univ. of Maryland/College Park; **Ji Su**, NASA Langley Research Ctr.

1:30 pm: **Recent progress on electro-elastomers and their application for biomimetic walking robots** *(Invited Paper),* Q. Pei, SRI International . [5385-05]

2:10 pm: **Conductive filler: elastomer composites for Maxwell stress actuator applications,** C. G. Cameron, R. S. Underhill, J. P. Szabo, Defence Research and Development Canada (Canada) . . . . [5385-06]

2:30 pm: **Dielectric elastomer laminates for active membrane pump applications,** K. Pope, A. Tews, M. I. Frecker, E. Mockensturm, N. Goulbourne, A. J. Snyder, The Pennsylvania State Univ. . . . . [5385-07]

2:50 pm: **Materials for dielectric elastomer actuators,** P. Sommer-Larsen, Risø National Lab. (Denmark); A. L. Larsen, Danmarks Tekniske Univ. (Denmark) . . . . [5385-08]

Coffee Break . . 3:10 to 3:40 pm

Conference 5386 — Room: Royal Palm I

SESSION 2
Room: Royal Palm I
Mon. 1:30 to 3:10 pm

MR/ER Fluid Damping I

Chairs: **Joseph R. Maly**, CSA Engineering, Inc.; **Massimo Ruzzene**, Georgia Institute of Technology

1:30 pm: **Shock isolation systems using magnetorheological dampers,** Y. Choi, N. M. Wereley, Univ. of Maryland/College Park [5386-06]

1:50 pm: **Investigation of the response time of magnetorheological fluid dampers,** F. D. Goncalves, J. Koo, M. Ahmadian, Virginia Polytechnic Institute and State Univ. . . . . [5386-07]

2:10 pm: **Skyhook damping with linearized MR dampers: an experimental study,** D. Batterbee, N. D. Sims, Univ. of Sheffield (United Kingdom) . . . . [5386-08]

2:30 pm: **Nonlinear dynamics of a magnetorheological-fluid-based active suspension system for a neonatal transport,** A. Shukla, M. Bailey Van-Kuren, Miami Univ. of Ohio . . [5386-09]

2:50 pm: **Magnetic field analysis of a disk type,** C. Zhu, Zhejiang Univ. (China) . . . . [5386-10]

Coffee Break . . 3:10 to 3:40 pm

Conference 5387 Room: California	**Conference 5388** Room: San Diego	**Conference 5389** Meeting House/Sunset	**Conference 5390** Meeting House/Towne	**Conference 5391** Meeting House/Sunrise

MONDAY 15 MARCH

<div style="float:right">**Smart Structures**</div>

SESSION 2
Room: California
Mon. 1:30 to 4:40 pm

Multifunctional Composites II

Chairs: **Daniel J. Inman**, Virginia Polytechnic Institute and State Univ.; **Ramesh Kolar**, Naval Postgraduate School

1:30 pm: **Modeling and testing of temperature behavior and resistive heating in a multifunctional composite,** C. Santos, S. Nemat-Nasser, T. Plaisted, D. Arbelaez, Univ. of California/San Diego . [5387-05]

1:50 pm: **Development of electroactive carbon nanotube-polymer composites,** Z. Ounaies, Virginia Commonwealth Univ.; C. Park, National Institute of Aerospace; J. Harrison, NASA Langley Research Ctr. . [5387-06]

2:10 pm: **Aligned carbon nanotube-polymer composites: investigating their electrical and physical characteristics,** S. Banda, Z. Ounaies, Virginia Commonwealth Univ.; C. Park, National Institute of Aerospace; J. Harrison, NASA Langley Research Ctr. . . [5387-07]

2:30 pm: **Analytical model of the mechanical properties of the single-crystal macrofiber composite actuator,** J. M. Lloyd, Virginia Polytechnic Institute and State Univ.; R. B. Williams, Cooper Union for the Advancement of Science and Art; D. J. Inman, Virginia Polytechnic Institute and State Univ.; W. K. Wilkie, NASA Langley Research Ctr. . . . . [5387-08]

2:50 pm: **Dynamic characteristics of piezoelectric shear deformable composite plates,** R. Kolar, Naval Postgraduate School [5387-09]

Coffee Break . . 3:10 to 3:40 pm

SESSION 2
Room: Meeting House/Sunset
Mon. 1:30 to 3:10 pm

Smart Electronics II

Chairs: **Sang H. Choi**, NASA Langley Research Ctr.; **Hargsoon Yoon**, The Pennsylvania State Univ.

1:30 pm: **Rectenna performance under a 200-w amplifier microwave,** K. D. Song, Norfolk State Univ.; S. H. Choi, NASA Langley Research Ctr.; W. T. Golembiewski, Norfolk State Univ.; G. C. King, NASA Langley Research Ctr. . . . . [5389-06]

1:50 pm: **Development of compact ferroelectric phase shifters on silicon for monolithic integration of voltage controllers,** H. Yoon, T. Ji, K. A. Jose, V. K. Varadan, The Pennsylvania State Univ. . . . . [5389-07]

2:10 pm: **Enhancement of miniature and small-bandwidth micromachined antennas using GaAs technology,** S. H. Jung, Electronics and Telecommunications Research Institute (South Korea) [5389-08]

2:30 pm: **Four-element phased array antenna systems monolithically integrated on silicon,** T. Ji, H. Yoon, K. A. Jose, V. K. Varadan, The Pennsylvania State Univ. . . . . [5389-09]

2:50 pm: **Hierarchical sensor network architecture for stationary smart node supervision,** M. Jin, Y. Huang, W. Wu, C. Chen, Y. Chen, C. Wen, C. Kao, National Taiwan Univ. (Taiwan); C. Hsu, H. Rao, Far EasTone Telecommunications Co., Ltd. (Taiwan); C. Lee, National Taiwan Univ. (Taiwan) . . . . [5389-10]

Coffee Break . . 3:10 to 3:40 pm

SESSION 2
Room: Meeting House/Towne
Mon. 1:30 to 3:10 pm

Smart Composites

Chairs: **Seung J. Kim**, Seoul National Univ. (South Korea); **Alberto Belloli**, ETH Zürich (Switzerland)

1:30 pm: **Large-scale computational simulation for optimal design of curved piezoelectric actuator using composite material,** S. W. Chung, S. J. Kim, Seoul National Univ. (South Korea) . . . . [5390-06]

1:50 pm: **Piezoelectric actuator performance effectiveness for active composite panels with surface mounted and embedded sensors and actuators using direct constant voltage scheme,** R. Russ, M. N. Ghasemi Nejhad, Univ. of Hawaii/Manoa [5390-07]

2:10 pm: **Modeling and characterization of active fiber composites,** A. Belloli, B. Castelli, ETH Zürich (Switzerland); X. Kornmann, C. Huber, EMPA Duebendorf (Switzerland); P. Ermanni, ETH Zürich (Switzerland) . . . . [5390-08]

2:30 pm: **Numerical simulation of actuation behavior,** S. H. Paik, J. G. Moon, S. J. Shin, S. J. Kim, Seoul National Univ. (South Korea) . . . . [5390-09]

2:50 pm: **Design of the metal-core piezoelectric fiber,** H. Sato, T. Sekiya, Y. Shimojo, National Institute of Advanced Industrial Science and Technology (Japan); M. Nagamine, Nagamine Manufacturing Co., Ltd. (Japan) . . . . [5390-10]

Coffee Break . . 3:10 to 3:40 pm

SESSION 2
Room: Meeting House/Sunrise
Mon. 1:30 to 3:10 pm

Fiber Optics I: Applications

Chairs: **Steve Vandenplas**, Katholieke Univ. Leuven (Belgium); **Jan-Ming Ko**, Hong Kong Polytechnic Univ. (Hong Kong)

1:30 pm: **Controlled tests of a structural health monitoring and seismic damage-detection system for bridges using fiber Bragg grating strain sensors,** S. G. Calvert, W. Kunzler, J. Mooney, Blue Road Research . . [5391-06]

1:50 pm: **Acoustic emission monitoring using a multimode optical fiber sensor,** S. Vandenplas, J. Papy, M. Wevers, S. Van Huffel, Katholieke Univ. Leuven (Belgium) . . . . [5391-07]

2:10 pm: **Embedding fiber Fabry-Perot strain sensor in prestressd reinforced concrete bridges,** Y. Fu, W. Chen, Y. Zhu, S. Huang, Chongqing Univ. (China) . . . . [5391-08]

2:30 pm: **FBG sensors for on-line temperature measurements,** L. Ren, H. Li, L. Sun, D. Li, Dalian Univ. of Technology (China) . . . . [5391-09]

2:50 pm: **Experiments on offshore platform model by FBG sensors,** D. Li, H. Li, L. Ren, L. Sun, Dalian Univ. of Technology (China) . . . . [5391-10]

Coffee Break . . 3:10 to 3:40 pm

Smart Structures and Materials

Conference 5383
Room: Royal Palm III

Conference 5384
Room: Golden West

Conference 5385
Room: Town & Country

Conference 5386
Room: Royal Palm I

MONDAY 15 MARCH

SESSION 3
Room: Royal Palm III
Mon. 3:40 to 5:40 pm

Shape-Memory Alloys

Chair: **Stefan Seelecke**, North Carolina State Univ.

3:40 pm: **Analytical and experimental study of micro-scale SMA actuators,** O. Heintz, S. Seelecke, North Carolina State Univ. . . . . [5383-84]

4:00 pm: **Analysis of SMA hybrid composite structures using commercial codes,** T. L. Turner, NASA Langley Research Ctr.; H. D. Patel, MSC Software Corp. . . . . [5383-12]

4:20 pm: **Static and dynamic loading of NiTi flexural beams experiencing R-phase transformations,** K. A. Williams, Univ. of Alabama . . . . [5383-13]

4:40 pm: **Preliminary characterization and modeling of SMA-based textile composites,** A. Masuda, Q. Ni, A. Sone, R. Zhang, T. Yamamura, Kyoto Institute of Technology (Japan) . . . . [5383-14]

5:00 pm: **Finite element analysis of shape-memory alloy springs designed for base isolation devices,** A. Masuda, A. Sone, S. Kamata, Y. Yamashita, Kyoto Institute of Technology (Japan) . . . . [5383-15]

5:20 pm: **Macroscopic constitutive model of shape-memory alloys for partial transformation cycles,** T. Ikeda, F. A. Nae, Y. Matsuzaki, Nagoya Univ. (Japan) . . . . [5383-16]

SESSION 3
Room: Golden West
Mon. 3:40 to 5:00 pm

Electrical and Acoustic Sensors I

Chairs: **Wolfgang Ecke**, Institut für Physikalische Hochtechnologie eV (Germany); **Richard O. Claus**, Virginia Polytechnic Institute and State Univ.

3:40 pm: **Development of smart piezoceramic transducers for detection of solidification in composite materials,** A. Palevicius, R. Bansevicius, E. Dragasius, M. Ragulskis, Kaunas Univ. of Technology (Lithuania) . . . . [5384-11]

4:00 pm: **Piezoelectric imbedded sensors for damage detection in composite plates under ambient and cryogenic conditions,** R. C. Engberg, NASA Marshall Space Flight Ctr.; T. K. Ooi, Univ. of Alabama in Huntsville and U.S. Army Aviation and Missile Command . . . . [5384-12]

4:20 pm: **Damage evaluation for concrete structures using fiber-reinforced composites as self-diagnosis materials,** K. Yoshitake, Shimizu Corp. (Japan); Y. Okuhara, Japan Fine Ceramics Ctr. (Japan) . . . . [5384-13]

4:40 pm: **Optimal sparse pattern of a two-dimensional ultrasonic transducer array,** Y. R. Roh, S. Lee, Kyungpook National Univ. (South Korea); J. Han, Prosonic Co., Ltd. (South Korea) [5384-14]

SESSION 2 *cont.*

3:40 pm: **Affects of cross-linking, prestretch, and dielectric strength on the electric field actuation response of a dielectric silicon elastomer,** X. Zhang, G. Kovacs, R. Brönnimann, B. Jaehne, M. Wissler, EMPA Duebendorf (Switzerland) . . . . [5385-09]

4:00 pm: **Enhanced dielectric and electromechanical response in high-dielectric-constant all-polymer percolative composites,** C. Huang, Q. Zhang, The Pennsylvania State Univ. . . . . [5385-10]

4:20 pm: **Novel electro-active polymer system: PVDF-based polymer blends,** Z. Cheng, Z. Li, M. D. Arbatti, Auburn Univ. . . . . [5385-11]

4:40 pm: **How to tune rubber elasticity,** A. L. Larsen, Danmarks Tekniske Univ. (Denmark); P. Sommer-Larsen, Risø National Lab. (Denmark); O. Hassager, Danmarks Tekniske Univ. (Denmark) . . . . [5385-12]

> ### EAP-in-Action Demonstrations Session
> 5:00 to 6:00 pm
>
> *Chair:* **Yoseph Bar-Cohen**, Jet Propulsion Lab.
>
> *Moderator:* **Yoseph Bar-Cohen,** Jet Propulsion Lab.
>
> The "EAP in Action" Session offers an opportunity to "feel" the progress that was made in developing EAP actuators and devices. This Session is intended to turn the spotlight on Electroactive Polymers (EAP) materials and their applications as well as increase the recognition of their potential for smart structures and biomimetic device. New materials and applications are continuing to emerge and this session is provides the attendees an opportunity to see a demonstration of EAP materials in action. This Session offers a forum of interaction between the technology developers and potential users as well as a "hands-on" experience with this emerging technology. It provides a forum for seeing the capability of the state-of-the-art of EAP as potential actuators-of-choice.

SESSION 3
Room: Royal Palm I
Mon. 3:40 to 5:40 pm

Characterization, Model, and Analysis I

Chairs: **Mehdi Ahmadian**, Virginia Polytechnic Institute and State Univ.; **Neil D. Sims**, Univ. of Sheffield (United Kingdom)

3:40 pm: **Vibration and sound radiation from a sandwich cylindrical shell with prismatic core,** M. Ruzzene, S. M. Jeong, Georgia Institute of Technology . . . . [5386-11]

4:00 pm: **Directional and band-gap behavior of periodic grid-like structures,** S. M. Jeong, M. Ruzzene, Georgia Institute of Technology . . . . [5386-12]

4:20 pm: **Damping of longitudinal waves using low-wave-speed media with applications to belt drives and flexure assemblies,** S. A. Nayfeh, K. Varnasi, Massachusetts Institute of Technology [5386-13]

4:40 pm: **Verifying with tests the improved dynamic and passive damping behavior of components: structural optimization based on bionic principles,** J. Weiss, DaimlerChrysler AG (Germany); M. Maier, Technische Univ. Kaiserslautern (Germany); H. Herrmann, P. Steibler, DaimlerChrysler AG (Germany) . . . . [5386-14]

5:00 pm: **Analysis of a flexual vibration driveshaft with a cylindrical contrained layer damping,** H. A. Ghoneim, Rochester Institute of Technology; D. J. Lawrie, Lawrie Technology, Inc. . . . . . [5386-15]

5:20 pm: **Human damping source and its floor vibration control capability,** L. Pedersen, L. P. Hansen, Aalborg Univ. (Denmark) . . . . [5386-16]

Conference 5387 Room: California	Conference 5388 Room: San Diego	Conference 5389 Meeting House/Sunset	Conference 5390 Meeting House/Towne	Conference 5391 Meeting House/Sunrise

MONDAY 15 MARCH

Conference 5387 — Room: California

SESSION 2 *cont.*

3:40 pm: **Manufacture of magnetically active fiber reinforced composites for use in power generation,** J. Etches, I. Bond, Univ. of Bristol (United Kingdom) . . . . [5387-10]

4:00 pm: **Mechanical loading effects on the large-volume magnetic field-induced strain in Gd5Si2Ge2,** N. Nersessian, S. W. Or, G. P. Carman, Univ. of California/Los Angeles; W. Choe, H. B. Radousky, Lawrence Livermore National Lab.; V. K. Pecharsky, A. O. Pecharsky, Iowa State Univ. . . . . [5387-11]

4:20 pm: **Micromechanics-based magnetomechanical modeling of ferromagnetic particle reinforced active composites,** L. Sun, H. Yin, Univ. of Iowa . . . . [5387-12]

SESSION 3
Room: California
Mon. 4:40 to 6:20 pm

Active Materials for Smart Systems Design

Chairs: **James P. Thomas**, Naval Research Lab.; **Manfred Kohl**, Forschungszentrum Karlsruhe (Germany)

4:40 pm: **Multifunctional energy storage and harvesting concepts for unmanned vehicle systems,** M. A. Qidwai, Geo-Centers, Inc.; J. P. Thomas, Naval Research Lab.; J. Baucom, Geo-Centers, Inc.; J. C. Kellogg, Naval Research Lab. . . . . [5387-13]

5:00 pm: **Novel autophagous structure-power system,** J. N. Baucom, Geo-Centers, Inc.; J. P. Thomas, Naval Research Lab.; M. A. Qidwai, Geo-Centers, Inc. . . . . [5387-14]

5:20 pm: **Shape-memory micromechanisms for microvalve applications,** M. Kohl, M. Popp, B. Krevet, Forschungszentrum Karlsruhe (Germany) . [5387-15]

5:40 pm: **Experimental characterization of an airfoil-based actuator using high-temperature shape memory alloys,** W. L. Ables, A. Bhattacharyya, Univ. of Arkansas/Little Rock; M. A. Qidwai, Geo-Centers, Inc. . . . . [5387-16]

6:00 pm: **Mechanical response of multilayered thin released active films,** R. Zhang, D. Shilo, G. Ravichandran, K. Bhattacharya, California Institute of Technology . . . . [5387-17]

Conference 5389 — Meeting House/Sunset

SESSION 3
Room: Meeting House/Sunset
Mon. 3:40 to 5:40 pm

RF MEMS

Chair: **Vijay K. Varadan**, The Pennsylvania State Univ.

3:40 pm: **Design, simulation, fabrication, and packaging of microwave RF switch,** A. Ziaei, T. Dean, P. Bondavalli, Thales Research & Technology (France) . . . . [5389-11]

4:00 pm: **Holographic imaging technique for characterization of MEMS switch dynamics,** V. Ostasevicius, A. Palevicius, Kaunas Univ. of Technology (Lithuania); A. Daugela, Hysitron Inc.; M. Ragulskis, R. Palevicius, Kaunas Univ. of Technology (Lithuania) . . . . [5389-12]

4:20 pm: **Development of RF-MEMS phase shifters using polymer and ferroelectric thin films,** T. Ji, H. Yoon, V. K. Varadan, The Pennsylvania State Univ. . . . . [5389-13]

4:40 pm: **RF-MEMS capacitive switch with isolation valley at lower-frequency band,** C. W. Jung, B. Ghodsian, B. A. Cetiner, F. D. Flaviis, Univ. of California/Irvine . . . . [5389-14]

5:00 pm: **Nanowire sensor applications based on radio frequency phase delay in coplanar waveguide,** H. Yoon, T. Ji, V. K. Varadan, The Pennsylvania State Univ. . . . . [5389-15]

5:20 pm: **Piezoelectric ceramic thick films deposited on Si substrates by screen printing,** K. Yao, X. He, Y. Xu, M. Chen, Institute of Materials Research and Engineering (Singapore) . . . . [5389-16]

Conference 5390 — Meeting House/Towne

SESSION 3
Room: Meeting House/Towne
Mon. 3:40 to 6:00 pm

MR & ER Devices

Chairs: **Keith A. Williams**, Univ. of Alabama; **Jin-Hyeong Yoo**, Univ. of Maryland/College Park

3:40 pm: **High-power density actuation through Terfenol-D resonant motion and magnetorheological flow control,** B. R. Burton, M. J. Dapino, The Ohio State Univ. . . . . . [5390-11]

4:00 pm: **Bidirectional control of a magnetorheological piezo-hydraulic actuator,** J. Yoo, J. Sirohi, N. M. Wereley, Univ. of Maryland/College Park [5390-12]

4:20 pm: **Vibration control of flexible structures using MR and piezoceramic mounts,** S. Choi, S. Hong, Inha Univ. (South Korea) . . . . [5390-13]

4:40 pm: **Semi-active control of torsional vibrations using a MR fluid brake,** K. A. Williams, S. Ye, Univ. of Alabama . . . . [5390-14]

5:00 pm: **Wheel slip control of ABS using ER valve pressure modulator,** S. Choi, M. Cho, Y. Kim, Inha Univ. (South Korea) . . . . [5390-15]

5:20 pm: **Robot actuator control using twin ER clutches: a new mathematical model with experimental validation,** R. Stanway, A. R. Johnson, D. Sconce, Univ. of Sheffield (United Kingdom) . . . . [5390-16]

5:40 pm: **Dynamic performance of a disk-type magnetorheological fluid damper under AC excitation,** C. Zhu, Zhejiang Univ. (China) [5390-17]

Conference 5391 — Meeting House/Sunrise

SESSION 3
Room: Meeting House/Sunrise
Mon. 3:40 to 6:20 pm

Modeling and Analysis of Smart Systems II

Chairs: **Kara J. Peters**, North Carolina State Univ.; **R. Lowell Smith**, New Engineering Paradigms, Inc.

3:40 pm: **Demonstration of failure identification methodology incorporating sensor degradation,** M. Prabhugoud, J. Pearson, K. Peters, M. Zikry, North Carolina State Univ. . . . . [5391-11]

4:00 pm: **Health monitoring of plates using structural power-flow criterion,** A. M. Baz, W. Akl, Univ. of Maryland/College Park . . . . [5391-12]

4:20 pm: **Equivalent circuit models for interpreting impedance perturbation spectroscopy data,** R. L. Smith, New Engineering Paradigms, Inc. . . . . [5391-13]

4:40 pm: **Semi-discrete method for analysis of laminated piezoelectric cylinders,** C. Liu, Univ. of California/Los Angeles; C. K. Chun, Sun Moon Univ. (South Korea); S. B. Dong, E. Taciroglu, Univ. of California/Los Angeles . . . . [5391-14]

5:00 pm: **High-sensitivity damage detection based on enhanced nonlinear dynamics,** B. I. Epureanu, S. Yin, Univ. of Michigan/Ann Arbor; M. M. Derriso, Air Force Research Lab. . . . . [5391-15]

5:20 pm: **Embedded diagnostics in combat systems,** M. Christopher, E. N. Bankowski, U.S. Army Tank-Automotive and Armaments Command [5391-16]

5:40 pm: **Auto-adaptive statistical procedure for tracking structural health monitoring data,** R. L. Smith, New Engineering Paradigms, Inc.; R. J. Jannarone, Brainlike Surveillance Research, Inc. . . . . [5391-17]

6:00 pm: **Control of coupled building system with a semi-active friction damper,** Y. Xu, C. L. Ng, Hong Kong Polytechnic Univ. (Hong Kong); J. Chen, W. L. Qu, Wuhan Univ. of Technology (China) . . . . [5391-89]

Smart Structures and Materials

Conference 5383	Conference 5384	Conference 5385	Conference 5386
Room: Royal Palm III	Room: Golden West	Room: Town & Country	Room: Royal Palm I

TUESDAY 16 MARCH

8:00 to 8:55 am • Town and Country Ballroom

Plenary Presentation
Future Development of Commercial Aircraft Structure Technology
Bruno Beral, Airbus France

SESSION 4
Room: Royal Palm III
Tues. 9:00 to 10:00 am

Polymer Models

Chair: **H. Thomas Banks**, North Carolina State Univ.

9:00 am: **Applying a computational micromechanics model to the hypothesis of polarization response in ionic polymers,** L. M. Weiland, D. J. Leo, Virginia Polytechnic Institute and State Univ. . . . . . . [5383-17]

9:20 am: **Electrostatic operation and curvature modeling for a MEMS flexible film actuator,** R. C. Smith, North Carolina State Univ. . . . . [5383-18]

9:40 am: **Nonlinear identification of ionic polymer actuator systems,** C. S. Kothera, Virginia Polytechnic Institute and State Univ.; S. L. Lacy, R. S. Erwin, Air Force Research Lab.; D. J. Leo, Virginia Polytechnic Institute and State Univ. . . . . [5383-19]

Coffee Break   10:00 to 10:30 am

SESSION 4
Room: Golden West
Tues. 9:00 to 11:50 am

Electrical and Acoustic Sensors II

Chairs: **Wolfgang Ecke**, Institut für Physikalische Hochtechnologie eV (Germany); **Richard O. Claus**, Virginia Polytechnic Institute and State Univ.

9:00 am: **Mobile acoustic system for the detection of surface-breaking cracks in pavements,** F. Lanza di Scalea, P. Rizzo, Univ. of California/San Diego; A. Marzani, Univ. della Calabria (Italy); G. Benzoni, Univ. of California/San Diego . . . . [5384-15]

9:20 am: **OLC: a signal conditioning and calibration technique for magneto-elastic sensors,** R. Sorrentino, Ctr. Italiano Ricerche Aerospaziali (Italy) . . . . [5384-16]

9:40 am: **Measurement of elastic waves in a non-ferromagnetic plate by a patch-type magnetostrictive sensor,** S. H. Cho, K. H. Sun, Y. Y. Kim, Seoul National Univ. (South Korea) . . . . [5384-17]

Coffee Break   10:00 to 10:30 am

SESSION 3
Room: Town & Country
Tues. 9:00 to 10:00 am

Modeling Electronic EAP

Chairs: **Richard O. Claus**, Virginia Polytechnic Institute and State Univ.; **Toribio F. Otero**, Univ. Politécnica de Cartagena (Spain)

9:00 am: **Micromechanics of polymeric electrostrictive composites,** J. Li, N. Rao, Univ. of Nebraska/Lincoln . . . . [5385-13]

9:20 am: **Electro-elastic modeling of a dielectric membrane for a prosthetic blood pump,** N. C. Goulbourne, M. I. Frecker, E. Mockensturm, The Pennsylvania State Univ. . . . . [5385-14]

9:40 am: **Modified two-dimensional computational model,** C. Sun, Y. Wang, Kansas State Univ.; J. Su, NASA Langley Research Ctr. . . . . [5385-15]

Coffee Break   10:00 to 10:30 am

SESSION 4
Room: Royal Palm I
Tues. 9:00 to 10:00 am

Novel Damping Treatments

Chair: **Faramarz Gordaninejad**, Univ. of Nevada/Reno

9:00 am: **Characterization of damping properties of carbon nanotube thin films,** N. A. Koratkar, J. Suhr, Rensselaer Polytechnic Institute . . [5386-17]

9:20 am: **Investigation of carbon nanotube-based polymers for improved structural damping,** X. Zhou, K. Wang, C. Bakis, The Pennsylvania State Univ. . . . . [5386-18]

9:40 am: **Hard ceramic coatings: a novel damping treatment,** S. Patsias, N. Tassini, R. Stanway, Univ. of Sheffield (United Kingdom) . . . . [5386-19]

Coffee Break   10:00 to 10:30 am

Conference 5387 Room: California	Conference 5388 Room: San Diego	Conference 5389 Meeting House/Sunset	Conference 5390 Meeting House/Towne	Conference 5391 Meeting House/Sunrise

TUESDAY 16 MARCH

8:00 to 8:55 am • Town and Country Ballroom

Plenary Presentation
Future Development of Commercial Aircraft Structure Technology
Bruno Beral, Airbus France

SESSION 4
Room: California
Tues. 9:00 am to 12:10 pm

Magnetic Shape-Memory Alloys I

Chairs: **Robert C. O'Handley**, Massachusetts Institute of Technology; **Alexander A. Likhachev**, Helsinki Univ. of Technology (Finland)

Keynote
9:00 am: **A way to search for new smart materials with unprecedented physical properties** *(Invited Paper)*, R. D. James, Univ. of Minnesota . . . . [5387-18]

9:40 am: **Magnetic forces controlling magnetic shape memory in Ni-Mn-Ga and their practical measurement from the mechanical testing experiments in constant magnetic fields,** A. Likhachev, A. Sozinov, K. Ullakko, Helsinki Univ. of Technology (Finland) . . . . [5387-19]

Coffee Break   10:00 to 10:30 am

SESSION 1
Room: San Diego
Tues. 9:00 to 10:00 am

Semiconductor Applications

Chair: **Eric H. Anderson**, CSA Engineering, Inc.

9:00 am: **High-speed parallel robots with integrated vibration-suppression for handling and assembly,** R. Keimer, M. Rose, S. Algermissen, E. Breitbach, Deutsches Zentrum für Luft- und Raumfahrt eV (Germany) . . . . [5388-01]

9:20 am: **Active membrane masks for improved overlay performance in proximity lithography,** D. R. Huston, J. Plumpton, B. Esser, Univ. of Vermont . . . . [5388-02]

9:40 am: **Active damping elements for improving the accuracy of a microlithography machine,** J. Holterman, T. J. de Vries, Univ. Twente (Netherlands) . . . . [5388-03]

Coffee Break   10:00 to 10:30 am

SESSION 4
Room: Meeting House/Sunset
Tues. 9:00 to 10:00 am

Modeling and Simulation of MEMS

Chair: **Laszlo B. Kish**, Texas A&M Univ.

9:00 am: **CAD/CAM for MEMS and BioMEMS,** K. H. Church, nScyrpt; W. L. Warren, HAT, LLC . . . . [5389-17]

9:20 am: **Simulation of a piezoelectric actuated valveless micropump,** B. Fan, G. Song, F. Hussain, Univ. of Houston . . . . [5389-18]

Coffee Break   10:00 to 10:30 am

SESSION 4
Room: Meeting House/Towne
Tues. 9:00 to 10:00 am

Tensegrity Systems

Chairs: **Gregory S. Agnes**, Jet Propulsion Lab.; **Robert T. Skelton**, Univ. of California/San Diego

9:00 am: **Implementation of a class 2 symmetric tensegrity reconfiguration,** J. Pinaud, R. E. Skelton, Univ. of California/San Diego . . . . [5390-18]

9:20 am: **Optimization of class 2 tensegrity towers,** M. Masic, R. E. Skelton, Univ. of California/San Diego . . . . [5390-19]

9:40 am: **Design and demonstration of a high-authority shape-morphing structure,** S. L. dos Santos e Lucato, J. Wang, R. M. McMeeking, A. G. Evans, Univ. of California/Santa Barbara . . . . [5390-20]

Coffee Break   10:00 to 10:30 am

SESSION 4
Room: Meeting House/Sunrise
Tues. 9:00 to 10:00 am

Novel Sensors I

Chairs: **Cam Nguyen**, National Science Foundation; **Anthony F. Starr**, Univ. of California/San Diego

9:00 am: **Adaptive, robotic, and mobile sensor systems for structural assessment,** D. R. Huston, J. Miller, B. Esser, Univ. of Vermont . . . . [5391-18]

9:20 am: **Development of a microwave synthetic-pulse sensor for NDE of civil infrastructures,** J. Park, Texas A&M Univ.; C. Nguyen, National Science Foundation and Texas A&M Univ. . . . . [5391-19]

9:40 am: **Integrated sensing networks in composite materials,** A. F. Starr, S. Nemat-Nasser, D. R. Smith, D. Meyer, T. A. Plaisted, Univ. of California/San Diego . . . . [5391-20]

Coffee Break   10:00 to 10:30 am

Smart Structures and Materials

Conference 5383	Conference 5384	Conference 5385	Conference 5386
Room: Royal Palm III	Room: Golden West	Room: Town & Country	Room: Royal Palm I

TUESDAY 16 MARCH

SESSION 5
Room: Royal Palm III
Tues. 10:30 am to 12:10 pm

Magnetostrictive and Multiscale Models

Chair: **Brian L. Ball**, North Carolina State Univ.

10:30 am: **Nonlinear two-dimensional model for frequency dependence in magnetostrictive transducers,** M. J. Dapino, The Ohio State Univ. . . . . . [5383-20]

10:50 am: **Coupled magnetoelastic strain model for magnetostrictive transducers and application of the Raleigh law to the stress dependence of magnetization,** M. J. Dapino, The Ohio State Univ.; R. C. Smith, North Carolina State Univ. . . . . [5383-21]

11:10 am: **Parameter estimation techniques for nonlinear hysteresis models,** R. C. Smith, A. Hatch, North Carolina State Univ. . . . . [5383-22]

11:30 am: **Multiscale issues and inverse problems in complex materials,** H. T. Banks, North Carolina State Univ.; G. Pinter, Univ. of Wisconsin/Milwaukee . . . . [5383-23]

11:50 am: **Numerical approximation of ferromagnetic materials,** M. Bernadou, S. Depeyre, S. He, Pole Univ. Leonard de Vinci (France); P. Meilland, IRSID (France)[5383-24]

Lunch/Exhibition Break . . . . . . 12:10 to 1:30 pm

SESSION 4 *cont.*

10:30 am: **Intelligent sensory technology for health monitoring based maintenance of infrastructures,** S. Sumitro, T. Okamoto, Keisoku Research Consultant Co., Ltd. (Japan); D. Inaudi, SMARTEC SA (Switzerland) . . . . [5384-19]

10:50 am: **Self-assembled nanostructured sensors,** R. O. Claus, Virginia Polytechnic Institute and State Univ. . . . . [5384-20]

11:10 am: **Mimicking the biological neural system using active fiber continuous sensors and electronic logic circuits,** G. R. Kirikera, S. Datta, M. J. Schulz, Univ. of Cincinnati; A. Ghoshal, NASA Langley Research Ctr.; M. Sundaresan, North Carolina Agricultural & Technical State Univ. . . . . [5384-21]

11:30 am: **SOI smart gas sensors using fully CMOS-compatible microheaters,** F. Udrea, Univ. of Cambridge (United Kingdom); J. Gardner, J. Covington, Univ. of Warwick (United Kingdom); A. Zhao, Univ. of Cambridge (United Kingdom) . . . . [5384-22]

Lunch/Exhibition Break . . . . 11:50 am to 1:30 pm

SESSION 4
Room: Town & Country
Tues. 10:30 am to 12:10 pm

Modeling Ionic EAP I

Chairs: **Richard O. Claus**, Virginia Polytechnic Institute and State Univ.; **Toribio F. Otero**, Univ. Politécnica de Cartagena (Spain)

10:30 am: **Understanding ion transport in conjugated polymers** *(Invited Paper),* X. Wang, E. Smela, B. Shapiro, Univ. of Maryland/College Park [5385-16]

11:10 am: **Verification of micromechanical models of actuation of ionic polymer-metal composites (IPMCs),** S. Nemat-Nasser, Y. Wu, Univ. of California/San Diego . . . . [5385-17]

11:30 am: **Controlled actuation of ionic polymer-metal composites with various electric potential inputs,** S. Nemat-Nasser, S. Zamani, Univ. of California/San Diego . . . . [5385-18]

11:50 am: **Phase behaviors of solid polymer electrolyte/salt systems,** S. J. Pai, I. H. Kim, Y. C. Bae, Hanyang Univ. (South Korea) . . . . [5385-19]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

SESSION 5
Room: Royal Palm I
Tues. 10:30 am to 12:10 pm

MR/ER Fluid Damping II

Chairs: **Norman M. Wereley**, Univ. of Maryland/College Park; **Jiong Tang**, Univ. of Connecticut

10:30 am: **High-velocity behavior of magnetorheological fluids,** M. Ahmadian, J. A. Norris, Virginia Polytechnic Institute and State Univ. . . . . [5386-20]

10:50 am: **Magnetorheological fluid damper for HMMWV,** U. Dogruer, F. Gordaninejad, C. Evrensel, Univ. of Nevada/Reno . . . . [5386-21]

11:10 am: **Control of a quarter HMMWV suspension system using a magnetorheological fluid damper,** E. S. Karakas, F. Gordaninejad, C. Evrensel, Y. Liu, Univ. of Nevada/Reno; M. Yeo, Inha Technical Junior College . . . . [5386-22]

11:30 am: **Design and analysis of magnetorheological dampers for train suspension,** Y. Lau, W. Liao, Chinese Univ. of Hong Kong (Hong Kong) . . . . [5386-23]

11:50 am: **Experiment study of large-scale magnetorheological fluid damper,** X. Guan, J. Li, J. Ou, Harbin Institute of Technology (China) . . . . [5386-24]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

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Conference 5387
Room: California

Conference 5388
Room: San Diego

Conference 5389
Meeting House/Sunset

Conference 5390
Meeting House/Towne

Conference 5391
Meeting House/Sunrise

Smart Structures

TUESDAY 16 MARCH

SESSION 4 *cont.*

10:30 am: Anomalous behavior of the elastic constants in NiMnGa, L. Dai, J. Cullen, M. Wuttig, Univ. of Maryland/College Park . . . . [5387-20]

10:50 am: Affect of composition on crystal structure in NiMnGa alloys, N. Lanska, O. Soderberg, A. Sozinov, Y. Ge, K. Ullakko, V. K. Lindroos, Helsinki Univ. of Technology (Finland) . [5387-21]

11:10 am: Piezoelectrically induced actuation of NiMnGa ferromagnetic shape memory alloys, J. M. Chambers, S. R. Hall, R. C. O'Handley, D. C. Bono, Massachusetts Institute of Technology . . . . [5387-22]

11:30 am: Damping of polycrystalline NiMnGa bulk, PLD thin film, and sputtered thin film, D. A. Ruggles, G. P. Carman, Univ. of California/Los Angeles; E. Ngo, W. Nothwang, M. W. Cole, Army Research Lab. . . . . [5387-23]

11:50 am: Stress-induced twin-boundary motion in NiMnGa particles in polymer composites, J. Feuchtwanger, M. L. Richard, S. M. Allen, R. C. O'Handley, Massachusetts Institute of Technology . . . . [5387-24]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

SESSION 2
Room: San Diego
Tues. 10:30 to 11:50 am

Space Applications

Chair: **B. Kyle Henderson**, Air Force Research Lab.

10:30 am: Miniature vibration isolation system for space applications: phase II, J. H. Jacobs, Honeywell Inc. [5388-04]

10:50 am: Vibro-acoustic launch protection experiment overview and flight results summary, C. Gerhart, K. Henderson, Air Force Research Lab.; S. Griffin, Boeing-SVS, Inc.; A. Lazzaro, Boeing Co.; M. Evert, CSA Engineering, Inc.; W. McCrary, Delta Velocity Corp. . . . . [5388-05]

11:10 am: Subsurface ice and brine sampling using an ultrasonic/sonic gopher for life detection and characterization in the McMurdo dry valleys, Y. Bar-Cohen, S. Sherrit, Z. Chang, Jet Propulsion Lab.; L. Wessel, California Institute of Technology; X. Bao, Jet Propulsion Lab.; P. T. Doran, Univ. of Illinois/Chicago; C. Fritsen, Desert Research Institute; F. Kenig, Univ. of Illinois/Chicago; C. McKay, NASA Ames Research Ctr.; A. Murray, Desert Research Institute . . . . [5388-32]

11:30 am: Active vibration isolation system for launch load alleviation, M. E. Evert, P. C. Janzen, E. H. Anderson, CSA Engineering, Inc. . . . . [5388-07]

Lunch/Exhibit Break . . . . 11:50 am to 1:30 pm

SESSION 5
Room: Meeting House/Sunset
Tues. 10:30 am to 12:10 pm

Carbon Nanotubes and Applications

Chair: **Nikhil A. Koratkar**, Rensselaer Polytechnic Institute

10:30 am: Enhancing quality of carbon nanotubes through a real-time controlled CVD process with application to next-generation nanosystems, N. Jalili, K. Laxminarayana, Clemson Univ. . . . . [5389-20]

10:50 am: Large scale fabrication of aligned and coiled nanotubes by microwave CVD process, J. Xie, V. K. Varadan, The Pennsylvania State Univ. . . . . [5389-21]

11:10 am: Possibility of using carbon nanotubes as micro-actuators, N. A. Koratkar, Rensselaer Polytechnic Institute . . . . [5389-22]

11:30 am: Developing applications and exploiting the properties of carbon nanotubes, S. B. Jain, P. Kang, T. He, S. Pammi, A. Muskin, S. Narasimhadevara, D. Hurd, J. Chase, Y. Yeo-Heung, S. Subramanium, D. Shi, J. Boerio, V. Shanov, M. J. Schulz, Univ. of Cincinnati . . . . [5389-23]

11:50 am: Functionalized polymer carbon nanotubes for gas sensors, V. K. Varadan, The Pennsylvania State Univ. . . . . [5389-24]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

SESSION 5
Room: Meeting House/Towne
Tues. 10:30 to 11:50 am

EAP/Micro Air Vehicles

Chairs: **Martin R. Waszak**, NASA Langley Research Ctr.; **Hoon C. Park**, Konkuk Univ. (South Korea)

10:30 am: Mathematical model of a dielectric elastomer annulus undergoing large quasi-static deformation, E. Yang, M. I. Frecker, E. Mockensturm, The Pennsylvania State Univ. . . . . [5390-21]

10:50 am: Actuation of MAV control surface using shape-memory polymer actuator, N. S. Goo, K. J. Yoon, Y. C. Jung, J. W. Cho, Konkuk Univ. (South Korea) . . . . [5390-22]

11:10 am: Evaluation of bio-inspired morphing concepts with regard to aircraft dynamics and performance, A. M. Wickenheiser, E. Garcia, S. Cumming, Cornell Univ.; M. Waszak, A. McGowan, NASA Langley Research Ctr. . [5390-23]

11:30 am: Design and demonstration of flapping wing device powered by LIPCA, H. C. Park, S. Y. Lee, S. M. Lim, S. Lee, N. S. Goo, K. J. Yoon, Konkuk Univ. (South Korea) . . [5390-25]

Lunch/Exhibition Break . . . . 11:50 am to 1:30 pm

SESSION 5
Room: Meeting House/Sunrise
Tues. 10:30 am to 12:30 pm

Novel Sensors II

Chairs: **Yuri M. Shkel**, Univ. of Wisconsin/Madison; **Joseph C. Sener**, Boise State Univ.

10:30 am: Film sensor using carbon particles for monitoring integrity of steel structures, T. Terada, Shimizu Corp. (Japan) . . . . [5391-21]

10:50 am: Dielectrostriction effect for NDE of polymeric materials, Y. M. Shkel, H. Y. Lee, Univ. of Wisconsin/Madison . . . . [5391-22]

11:10 am: Packaging of Lamb wave components for structural health monitoring, S. S. Kessler, Metis Design Corp.; S. M. Spearing, Massachusetts Institute of Technology [5391-23]

11:30 am: Comparison of piezoresistive and capacitive ultrasonic transducers, J. J. Neumann, D. W. Greve, I. J. Oppenheim, Carnegie Mellon Univ. . . . . [5391-24]

11:50 am: Resonant-type MEMS transducers excited by two acoustic emission simulation techniques, D. Ozevin, Lehigh Univ.; D. W. Greve, I. J. Oppenheim, Carnegie Mellon Univ.; S. Pessiki, Lehigh Univ. . . . . [5391-25]

12:10 pm: Smart TLCD using synthetic hydrocarbon-based MR fluid: an experimental study, J. Ko, S. Zhan, Y. Ni, Y. Duan, Hong Kong Polytechnic Univ. (Hong Kong) . . . . [5391-86]

Lunch/Exhibition Break . . . . . . 12:30 to 1:30 pm

Smart Structures and Materials

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SESSION 6
Room: Royal Palm III
Tues. 1:30 to 3:10 pm

Optimization I

Chair: **Robert L. Clark**, Duke Univ.

1:30 pm: **Combined design of recurve actuators and drive electronics for maximum energy efficiency,** D. K. Lindner, S. A. Ragon, Z. Gurdal, M. M. Abdalla, O. Seresta, H. Zhu, Virginia Polytechnic Institute and State Univ. . . . . [5383-25]

1:50 pm: **Improving the performance of compliant mechanisms,** J. M. Gibert, E. M. Austin, Clemson Univ. [5383-26]

2:10 pm: **Economical sensor/ actuator selection and its application to flexible structure control,** R. E. Skelton, F. Li, Univ. of California/San Diego [5383-27]

2:30 pm: **Passive damping of beam vibrations through distributed piezoelectric transducers and resonant electric networks: comparison of different network topologies,** M. Porfiri, Univ. degli Studi di Roma La Sapienza (Italy) and Virginia Polytechnic Institute and State Univ.; C. Maurini, Univ. de Versailles/Saint-Quentin-en-Yvelines (France) and Univ. degli Studi di Roma La Sapienza (Italy); F. dell'Isola, Univ. degli Studi di Roma La Sapienza (Italy); J. Pouget, Univ. de Versailles/Saint-Quentin-en-Yvelines (France) . . . . [5383-28]

2:50 pm: **Prediction of the applicability of active damping elements in high-precision machines,** J. Holterman, T. J. de Vries, Univ. Twente (Netherlands) . . . . [5383-29]

Coffee Break . . 3:10 to 3:40 pm

SESSION 5
Room: Golden West
Tues. 1:30 to 5:20 pm

Fiber Grating Sensors I

Chair: **Stephen T. Kreger**, Blue Road Research

1:30 pm: **Fiber optic sensors for deformation measurements: criteria and method to put them to the best possible use** *(Invited Paper),* W. R. Habel, Bundesanstalt für Materialforschung und -prüfung (Germany) . . . . [5384-23]

2:10 pm: **Modified transfer matrix model for Bragg grating strain sensors,** M. Prabhugoud, A. Gill, K. Peters, North Carolina State Univ. . . . . [5384-24]

2:30 pm: **Key metrology considerations for fiber Bragg grating sensors,** S. D. Dyer, P. A. Williams, R. J. Espejo, J. D. Kofler, S. M. Etzel, National Institute of Standards and Technology . . . . [5384-25]

2:50 pm: **Interface transferring mechanism and error modification of FBG strain sensor,** J. Li, Z. Zhou, J. Ou, Harbin Institute of Technology (China) . . . . [5384-26]

Coffee Break . . 3:10 to 3:40 pm

SESSION 5
Room: Town & Country
Tues. 1:30 to 3:10 pm

Modeling Ionic EAP II

Chairs: **Kwang J. Kim**, Univ. of Nevada/Reno; **Donald J. Leo**, Virginia Polytechnic Institute and State Univ.

1:30 pm: **Modeling the polypyrrole water interface by molecular dynamics,** T. F. Otero, J. J. Lopez Cascales, Univ. Politécnica de Cartagena (Spain) . . . . [5385-20]

1:50 pm: **Investigation of novel microstructured conducting polymer actuators,** R. E. Pytel, H. A. Kang, T. Swager, E. Thomas, I. Hunter, Massachusetts Institute of Technology . . . . [5385-21]

2:10 pm: **MD modeling of electro-active polymer/gel materials,** J. Karo, Tartu Univ. (Estonia); H. Kasemägi, Tartu Univ. (Estonia) and Uppsala Univ. (Sweden); M. Kruusmaa, A. Aabloo, Tartu Univ. (Estonia); J. Thomas, Uppsala Univ. (Sweden) . . . . [5385-22]

2:30 pm: **Modeling of the electromechanical response of ionic polymer metal composites (IPMC),** K. Asaka, National Institute of Advanced Industrial Science and Technology (Japan) and The Institute of Physical and Chemical Research (RIKEN) (Japan); N. Mori, K. Hayashi, Kinki Univ. (Japan); Y. Nakabo, T. Mukai, Z. Luo, The Institute of Physical and Chemical Research (RIKEN) (Japan) . . . . . . [5385-23]

2:50 pm: **Poly (3,4-ethylenedioxythiophene) actuators: the role of cation and anion choice,** N. A. Vandesteeg, P. Anquetil, I. Hunter, Massachusetts Institute of Technology . . . . [5385-24]

Coffee Break . . 3:10 to 3:40 pm

SESSION 6
Room: Royal Palm I
Tues. 1:30 to 2:50 pm

MR/ER Fluid Damping III

Chairs: **Roger Stanway**, Univ. of Sheffield (United Kingdom); **Samir A. Nayfeh**, Massachusetts Institute of Technology

1:30 pm: **Fail-safe large-scale magnetorheological fluid,** F. Gordaninejad, G. Hitchcock, X. Wang, B. K. Kiran, C. Evrensel, A. Fuchs, J. Elkins, Univ. of Nevada/ Reno; S. Ruan, M. Siino, M. Q. Kerns, Enidine Inc. . . . [5386-25]

1:50 pm: **Comparative analysis of passive twin tube and skyhook MRF dampers for motorcycle front suspensions,** M. Ahmadian, J. Gravatt, Virginia Polytechnic Institute and State Univ.[5386-27]

2:10 pm: **Visco-elastic properties of a magnetorheological composite,** F. Gordaninejad, X. Wang, G. Hitchcock, M. Xin, A. Fuchs, Univ. of Nevada/ Reno . . . . [5386-28]

2:30 pm: **Theoretical and experimental investigation into dynamics characteristics of a rotor supported on a disk-type magnetorheological fluid damper,** C. Zhu, Zhejiang Univ. (China) . . . . [5386-29]

Coffee Break . . 2:50 to 3:40 pm

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Conference 5391
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TUESDAY 16 MARCH

SESSION 5
Room: California
Tues. 1:30 to 2:50 pm

Magnetic Shape-Memory Alloys II

Chairs: **Minoru Taya**, Univ. of Washington; **Ibrahim Karaman**, Texas A&M Univ.

1:30 pm: **Fundamental shape-memory characteristics of new CoNiAl shape-memory alloys,** H. E. Karaca, I. Karaman, J. S. Mather, B. W. Bagley, Texas A&M Univ.; Y. I. Chumlyakov, Siberian Physical-Technical Institute (Russia) . . . . [5387-26]

1:50 pm: **Phenomenological modeling and experimental characterization of ferromagnetic shape-memory alloys,** D. C. Lagoudas, I. Karaman, B. Kiefer, E. Karaca, Texas A&M Univ. . . . . [5387-27]

2:10 pm: **Training of NiMnGa-based magnetic shape-memory alloys,** M. A. Gharghouri, J. Chen, Dalhousie Univ. (Canada); C. Hyatt, Defence R&D Canada - Atlantic (Canada) . . . . [5387-28]

2:30 pm: **Magnetocrystalline anisotropy of NiMnGa magnetic shape-memory alloys,** S. P. Farrell, S. D. Morrison, Defence R&D Canada - Atlantic (Canada); R. A. Dunlap, Dalhousie Univ. (Canada); C. V. Hyatt, Defence R&D Canada - Atlantic (Canada); C. Bennett, Acadia Univ. (Canada); M. A. Gharghouri, Dalhousie Univ. (Canada); L. M. Cheng, Defence R&D Canada - Atlantic (Canada) . . . . [5387-29]

Coffee Break . . 2:50 to 3:40 pm

SESSION 3
Room: San Diego
Tues. 1:30 to 3:10 pm

Shape-Memory Alloy Applications

Chair: **Marc E. Regelbrugge**, Rhombus Consultants Group

1:30 pm: **Design and control of a proof-of-concept variable area exhaust nozzle using shape-memory alloy actuators,** G. Song, N. Ma, Univ. of Houston[5388-08]

1:50 pm: **Shape-memory polymer configurative tooling,** M. C. Everhart, E. Havens, Cornerstone Research Group, Inc. . [5388-09]

2:10 pm: **NiTinol performance and characterization and rotary actuator design,** J. H. Mabe, R. T. Ruggeri, Boeing Co.; M. Yu, E. Rosenzweig, Naval Air Systems Command . . . . [5388-11]

2:30 pm: **Application of SMA spring actuators to a lightweight modular compliant surface bio-inspired robot,** D. L. Stone, Unmanned Systems Technology Lab., Inc.; M. Taya, R. Liang, Univ. of Washington . . . . . . [5388-12]

2:50 pm: **Quadrature mechatronic actuator (QMA) drives for heavy ship systems,** G. J. Knowles, M. J. Goehrig, R. W. Bird, W. C. Knoll, QorTek Inc.; H. Hofmann, J. Park, The Pennsylvania State Univ. . . . . [5388-49]

Coffee Break . . 3:10 to 3:40 pm

SESSION 6
Room: Meeting House/ Sunset
Tues. 1:30 to 3:10 pm

Functionalized Nanomaterials

Chair: **Satoshi Kishimoto**, National Institute for Materials Science (Japan)

1:30 pm: **Dispersive coating on electro-ceramic particles for fabrication of flexible sheet,** M. Kobayashi, M. Egashira, K. Saito, T. Dan, N. Shinya, National Institute for Materials Science (Japan) . . . . [5389-25]

1:50 pm: **New fabrication method of metallic closed cellular materials containing organic materials,** S. Kishimoto, N. Shinya, National Institute for Materials Science (Japan) . . . . [5389-26]

2:10 pm: **Nanoscale hybrid protein/polymer functionalized materials,** D. Ho, B. Chu, C. D. Montemagno, Univ. of California/ Los Angeles . . . . [5389-27]

2:30 pm: **Functionalized carbon nanotube/tin oxide nanocomposite as high-performance electrode,** J. Xie, V. K. Varadan, The Pennsylvania State Univ. . . . . [5389-28]

2:50 pm: **Nanostructured smart microgels from a combination of lithography and self assembly,** V. R. Tirumala, Argonne National Lab.; G. T. Caneba, Michigan Technological Univ.; D. C. Mancini, Argonne National Lab. . . . . [5389-29]

Coffee Break . . 3:10 to 3:40 pm

SESSION 6
Room: Meeting House/ Towne
Tues. 1:30 to 3:10 pm

Variable Shape Systems

Chairs: **Gregory P. Carman**, Univ. of California/Los Angeles; **Christopher Niezrecki**, Univ. of Florida

1:30 pm: **Adaptive structural systems and compliant skin technology of morphing aircraft structures,** J. Manzo, Cornell Univ. . . . . [5390-26]

1:50 pm: **Smart material actuators for airfoil-morphing applications,** R. M. Tieck, G. P. Carman, Univ. of California/Los Angeles . . . . [5390-27]

2:10 pm: **Active and passive material layout in a tendon-actuated morphing aircraft wing,** S. Bharti, M. I. Frecker, G. A. Lesieutre, D. Ramrakhyani, The Pennsylvania State Univ. . . . . [5390-28]

2:30 pm: **Design and testing of a servotab actuated trailing-edge flap for rotor vibration suppresion,** J. Falls, I. Chopra, Univ. of Maryland/College Park . . . . [5390-29]

Coffee Break . . 3:10 to 3:40 pm

SESSION 6
Room: Meeting House/ Sunrise
Tues. 1:30 to 3:10 pm

Fiber Optics II

Chairs: **Amr M. Baz**, Univ. of Maryland/College Park; **Richard H. Selfridge**, Brigham Young Univ.

1:30 pm: **Development and installation of Picostrain™ sensors in structural systems,** J. C. Sener, Boise State Univ. . . . . [5391-26]

1:50 pm: **Affect of static, dynamic, and thermal loading on fatigue life of fiber optic cables,** A. M. Baz, A. El-Sabbagh, Univ. of Maryland/College Park [5391-27]

2:10 pm: **Enhanced temperature sensing using in-fiber polymer waveguides,** R. H. Selfridge, K. H. Smith, B. L. Ipson, S. M. Schultz, Brigham Young Univ. . [5391-28]

2:30 pm: **Distributed Brillouin scattering sensor for structural health monitoring of optical ground wire,** L. Zou, F. Ravet, X. Bao, L. Chen, Univ. of Ottawa (Canada) . . . . [5391-29]

2:50 pm: **Simultaneous strain and temperature measurement using Brillouin frequency, power, and bandwidth with polarization-maintaining fibers for the Brillouin gain/loss-based distributed sensor,** Q. Yu, X. Bao, L. Chen, Univ. of Ottawa (Canada) . . . . [5391-30]

Coffee Break . . 3:10 to 3:40 pm

Smart Structures and Materials

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TUESDAY 16 MARCH

SESSION 7
Room: Royal Palm III
Tues. 3:40 to 5:40 pm

Optimization II

Chair: **Douglas K. Lindner**, Virginia Polytechnic Institute and State Univ.

3:40 pm: **Optimal placement of active material actuators using genetic algorithm,** T. Johnson, M. I. Frecker, The Pennsylvania State Univ. . . . . [5383-30]

4:00 pm: **Collocated actuator/ sensor design for shape control of sub-regions of structures,** M. Krommer, M. Nader, Johannes Kepler Univ. Linz (Austria) . . . . [5383-31]

4:20 pm: **New compliant mechanism design methodology based on flexible building blocks,** P. Bernardoni II, CEA-LIST (France) and Univ. Pierre et Marie Curie (France); P. Bidaud, Univ. Pierre et Marie Curie (France); C. Bidard, F. Gosselin, CEA-LIST (France) . . . . [5383-32]

4:40 pm: **Modeling and genetic algorithm-based piezoelectric actuator configuration optimization of an adaptive circular composite panel,** S. Yan, M. N. Ghasemi Nejhad, Univ. of Hawaii/Manoa . . . . . . [5383-33]

5:00 pm: **Design of piezoelectric bilaminar and C-block actuators using topology optimization,** E. C. Nelli Silva, M. Kogl, Univ. de São Paulo (Brazil) . . . . [5383-34]

5:20 pm: **Topology optimization applied to the design of multi-actuated piezoelectric microtools,** E. C. Nelli Silva, R. C. Carbonari, Univ. de São Paulo (Brazil); S. Nishiwaki, Kyoto Univ. (Japan) . . . . [5383-35]

SESSION 5 *cont.*

3:40 pm: **Modeling and experimental strain measurements on a non-homogeneous cylinder under transverse load,** J. A. Viator, Oregon Health and Science Univ. and Blue Road Research; S. T. Kreger, E. Udd, Blue Road Research . . . . [5384-27]

4:00 pm: **Static shape measurements using a multiplexed fiber Bragg grating sensor system,** C. S. Baldwin, T. J. Salter, J. S. Kiddy, Systems Planning and Analysis, Inc. . . . . [5384-28]

4:20 pm: **Infrastructure optics,** A. M. Abdi, A. Kost, Optical Sciences Ctr./Univ. of Arizona . . [5384-29]

4:40 pm: **High-speed dual-axis strain or single-axis strain with temperature compensation using a single fiber Bragg grating sensor,** S. G. Calvert, S. T. Kreger, E. Udd, M. Wintz, Blue Road Research . . . . [5384-30]

5:00 pm: **High-speed optical wavelength interrogator using a PLC-type optical filer for fiber Bragg grating sensors,** A. Hongo, S. Kojima, S. Komatsuzaki, Hitachi Cable, Ltd. (Japan); N. Takeda, Univ. of Tokyo (Japan) . . . . [5384-31]

SESSION 6
Room: Town & Country
Tues. 3:40 to 5:20 pm

Ionic EAP

Chairs: **Zhong-Yang Cheng**, Auburn Univ.; **Thomas Wallmersperger**, Univ. Stuttgart (Germany)

3:40 pm: **Improvement of electro-chemo-mechanical deformation of conducting polymers, strain, force, and response,** K. Kaneto, Kyushu Institute of Technology (Japan) . . . . [5385-25]

4:00 pm: **Behavior of ionic polymer-metal composites in a multilayer configuration,** J. Paquette, K. J. Kim, Univ. of Nevada/Reno . . . . [5385-26]

4:20 pm: **Ionic liquids as novel solvents for ionic polymer transducers,** M. D. Bennett, D. J. Leo, Virginia Polytechnic Institute and State Univ. . . . . . . [5385-27]

4:40 pm: **Water activities of fluorinated polymer electrolyte/ water systems using group-contribution method: applicability of modified perturbed-hard-sphere chain model and RPM in PEM fuel cell,** K. S. Kim, Y. C. Bae, Hanyang Univ. (South Korea) . . [5385-28]

5:00 pm: **Revisiting the electrochemical properties of conducting polymers,** T. F. Otero, J. Padilla, M. J. Ariza, J. Pascual, I. Suarez, M. Marquez, Univ. Politécnica de Cartagena (Spain) . . . . [5385-29]

SESSION 7
Room: Royal Palm I
Tues. 3:40 to 5:40 pm

Vibration and Damping Control I

Chairs: **George A. Lesieutre**, The Pennsylvania State Univ.; **Wei-Hsin Liao**, Chinese Univ. of Hong Kong (Hong Kong)

3:40 pm: **Harvesting energy from a cantilever piezoelectric beam,** T. Johnson, S. Kim, W. W. Clark, Univ. of Pittsburgh . . . [5386-30]

4:00 pm: **Vibration delocalization of mistuned bladed disks utilizing piezoelectric circuitry design,** H. Yu, J. Zhang, K. Wang, The Pennsylvania State Univ. . . . . [5386-31]

4:20 pm: **Active vibration damping using a self-sensing electrodynamic actuator,** C. K. Paulitsch, P. Gardonio, S. J. Elliott, Univ. of Southampton (United Kingdom) . . . . [5386-33]

4:40 pm: **Multidimensional digital control system for mechanical damping of suspended mass,** R. De Rosa, Istituto Nazionale di Fisica Nucleare (Italy) and Univ. degli Studi di Napoli Federico II (Italy); F. Acernese, Univ. degli Studi di Napoli Federico II (Italy) and Istituto Nazionale di Fisica Nucleare (Italy); F. Barone, Istituto Nazionale di Fisica Nucleare (Italy) and Univ. degli Studi di Salerno (Italy); A. Eleuteri, L. Milano, I. Ricciardi, Univ. degli Studi di Napoli Federico II (Italy) and Istituto Nazionale di Fisica Nucleare (Italy) . . . . [5386-34]

5:00 pm: **Active damping with piezoelectric MEMS devices,** M. Collet, P. Delobelle, V. Walter, Univ. de Franche-Comte (France) . . . . [5386-35]

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Conference 5387
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Conference 5388
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Conference 5389
Meeting House/Sunset

Conference 5390
Meeting House/Towne

Conference 5391
Meeting House/Sunrise

TUESDAY 16 MARCH

SESSION 6
Room: California
Tues. 3:40 to 5:20 pm

Shape-Memory Alloys I

Chairs: **Etienne Patoor**, Ecole Nationale Superieure d'Arts et Metiers (France); **Yuji Matsuzaki**, Nagoya Univ. (Japan)

3:40 pm: **Superelastic response of NiTi SMA at various strain rates and temperatures,** S. Nemat-Nasser, W. Guo, Univ. of California/San Diego . [5387-30]

4:00 pm: **Pseudo-elasticity: experimental observations, thermomechanical modeling, and identification of the material parameters,** D. Helm, Univ. Gesamthochschule Kassel (Germany) . . . . [5387-31]

4:20 pm: **Nonlinear dynamic behavior of a shape-memory alloy,** M. Collet, C. Lexcellent, E. Foltete, P. Malécot, Univ. de Franche-Comte (France) [5387-32]

4:40 pm: **Energy absorption material using buckling strength of shape-memory alloy plate,** S. Suzuki, Y. Urushiyama, Honda R&D Co., Ltd. (Japan); M. Taya, Univ. of Washington . . [5387-33]

5:00 pm: **Modeling of two-way shape-memory effect based on phase interaction energy function,** Y. Matsuzaki, Nagoya Univ. (Japan); H. Naito, National Rehabilitation Ctr. (Japan); J. Sato, Nagoya Univ. (Japan) . . . . [5387-34]

SESSION 4
Room: San Diego
Tues. 3:40 to 5:40 pm

Piezoactuators

Chair: **Emanuele Bianchini**, Vibration-X, Inc.

3:40 pm: **A comparison of packaged piezoactuators for industrial applications,** J. Pretorius, M. Hugo, R. L. Spangler, Jr., Midé Technology Corp. . . . . [5388-13]

4:00 pm: **Amplified piezoelectric actuators: from aerospace to underwater applications,** P. Bouchilloux, Adaptronics, Inc.; F. Claeyssen, R. Le Letty, Cedrat Technologies, S.A. (France) . . . . [5388-14]

4:20 pm: **Next-generation of Inchworm® actuators evolves with nanometer resolution, multimillimeter range, and power-off hold,** G. D. Powers, Q. Xu, J. Smith, EXFO . . . . [5388-15]

4:40 pm: **Affects of multilayer piezoelectric materials: analysis, design, and commercial applications,** E. Bianchini, Vibration-X, Inc. . . . . . [5388-16]

5:00 pm: **Piezoelectric actuator for flexible diesel operation,** B. MacLachlan, N. Elvin, C. Blaurock, N. Keegan, Midé Technology Corp. . . . . [5388-17]

5:20 pm: **QT bimorph activation for precision,** G. J. Knowles, QorTek Inc.; A. Vazques, FACE Corp. . . . . [5388-18]

SESSION 7
Room: Meeting House/ Sunset
Tues. 3:40 to 5:20 pm

Microsensors, Actuators, and MEMS I

Chairs: **Pratul K. Ajmera**, Louisiana State Univ.; **K. A. Jose**, The Pennsylvania State Univ.

3:40 pm: **Capabilities and limitations of micro-opto-electro-mechnical (MOEM) accelerometers: an analysis,** A. Selvarajan, Indian Institute of Science (India) . . . . . . [5389-30]

4:00 pm: **Robust design for micro- electro-thermal actuators,** S. Heo, Y. Y. Kim, G. H. Yoon, Seoul National Univ. (South Korea) . . . . [5389-31]

4:20 pm: **System optimization of thin-film SMA micropump,** M. Ujihara, D. Lee, G. P. Carman, Univ. of California/Los Angeles . . . . [5389-32]

4:40 pm: **Improved construction method of a surface micromachined pin-jointed actuator-tool using only two mechanical layers,** E. Saucedo-Flores, Univ. de Guadalajara (Mexico) . . . . [5389-33]

5:00 pm: **Development of hybrid SOI-based microgravimetric sensors,** N. Savalli, S. Baglio, S. Castorina, V. Sacco, Univ. degli Studi di Catania (Italy); V. Ferrari, Univ. degli studi di Brescia (Italy) . . . . [5389-35]

SESSION 7
Room: Meeting House/ Towne
Tues. 3:40 to 5:20 pm

Flow Control

Chairs: **Minoru Taya**, Univ. of Washington; **George A. Lesieutre**, The Pennsylvania State Univ.

3:40 pm: **Design of membrane actuators based on ferromagnetic shape-memory alloy composite for synthetic jet and insect robot actuators,** Y. Liang, M. Taya, Univ. of Washington . . . . [5390-31]

4:00 pm: **Design of a single-crystal piezoceramic-driven synthetic-jet actuator,** R. Rusovici, STI Technologies Inc.; G. A. Lesieutre, The Pennsylvania State Univ. . . . . [5390-32]

4:20 pm: **Active aerodynamic control of MAVs using synthetic jets,** S. Ugrina, A. B. Flatau, Univ. of Maryland/College Park . . . . [5390-33]

4:40 pm: **Modeling and design of smart vortex generators,** F. Geraci, J. E. Cooper, Univ. of Manchester (United Kingdom) . . . . [5390-35]

5:00 pm: **Design, fabrication, and testing of SMA enabled adaptive chevrons for jet noise reduction,** T. L. Turner, R. D. Buehrle, R. J. Cano, G. A. Fleming, NASA Langley Research Ctr. . [5390-36]

SESSION 7
Room: Meeting House/ Sunrise
Tues. 3:40 to 6:00 pm

Wireless Technologies

Chairs: **Steven D. Glaser**, Univ. of California/Berkeley; **Robert X. Gao**, Univ. of Massachusetts/Amherst

3:40 pm: **Hybrid wireless sensor network,** F. Casciati, S. Casciati, L. Faravelli, R. Rossi, Univ. degli Studi di Pavia (Italy) . . [5391-31]

4:00 pm: **Interfacing guided-wave ultrasound with wireless technology,** T. Hay, The Pennsylvania State Univ.; Y. Cho, Inje Univ. (South Korea); J. L. Rose, The Pennsylvania State Univ. . . . . [5391-32]

4:20 pm: **Self-powered sensing for mechanical-system condition monitoring,** R. X. Gao, Univ. of Massachusetts/Amherst; D. O. Kazmer, Univ. of Massachusetts/ Lowell; L. Zhang, C. B. Theurer, Univ. of Massachusetts/ Amherst . . . . [5391-33]

4:40 pm: **Embedded MEMS for health monitoring and management of civil infrastructure,** M. Saafi, P. Romine, Alabama A&M Univ. . . . . [5391-34]

5:00 pm: **Some real-world application of wireless sensor nodes,** S. D. Glaser, Univ. of California/Berkeley . . [5391-35]

5:20 pm: **Mobile sensor system for structural health monitoring,** Y. Xia, S. Aoki, M. Abe, Y. Fujino, Univ. of Tokyo (Japan) . [5391-36]

5:40 pm: **Wireless temperature sensor for bearing health monitoring,** Y. Jia, Univ. de Puerto Rico . . . . [5391-37]

Smart Structures and Materials

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TUESDAY 16 MARCH

✔ **Posters-Tuesday**
The following posters will be displayed in the formal Poster Session and Exhibition Reception on Tuesday evening from 6:00 to 7:30 pm. Authors will be present during this time for discussion. Poster authors will be able to set up their poster papers between 10:00 am and 4:00 pm Tuesday. Poster papers can be previewed after 4 pm before the formal poster session begins at 6:00 pm.

✔ **Deflection model for corner-supported plates with segmented in-plane actuators,** J. E. Massad, Sandia National Labs. and North Carolina State Univ.; H. Sumali, P. M. Chaplya, J. W. Martin, Sandia National Labs. . . . . [5383-11]

✔ **Fault tolerant control system subject to random actuator failures and plant parameter uncertainties,** M. M. Mah'd, Univ. of Massachusetts/ Lowell . . . . [5383-63]

✔ **Theory and trial of fault-detection experiment to bearing rolls and gear based on wavelet transform,** S. Zhang, D. Cui, Yanshan Univ. (China) . . . . [5383-66]

✔ **Multisensor information fusion technology based on fuzzy neural networks and its application,** S. Zhang, Y. Chen, Yanshan Univ. (China)[5383-67]

✔ **Simulation of a magnetostrictive actuator using MATLAB,** V. Ilic, I. Anderson, Univ. of Western Sydney (Australia) . [5383-68]

✔ **Investigation on properties of PZT ceramics embedded in concrete during concretion,** Y. Chen, Chongqing Univ. (China) . . . . [5383-69]

✔ **Laser interferometric adaptive optics system as light source of the IDGW-3P interferometer,** R. De Rosa, Univ. degli Studi di Napoli Federico II (Italy) and Istituto Nazionale di Fisica Nucleare (Italy); F. Barone, Univ. degli Studi di Salerno (Italy) and Istituto Nazionale di Fisica Nucleare (Italy); E. Calloni, L. Milano, Univ. degli Studi di Napoli Federico II (Italy) and Istituto Nazionale di Fisica Nucleare (Italy); S. Pardi, Univ. degli Studi di Napoli Federico II (Italy); I. Ricciardi, Univ. degli Studi di Napoli Federico II (Italy) and Istituto Nazionale di Fisica Nucleare (Italy) . . . . [5383-71]

✔ **Ultrashort Mach-Zehnder space switch based on quantum dot,** P. Ravindran, Technische Univ. Eindhoven (Netherlands) . . . . . [5383-72]

✔ **Mechanical modeling on the optical fiber braided in 3D braided composites,** X. Li, S. Yuan, X. Wang, Nanjing Univ. of Aeronautics and Astronautics (China); R. Huang, Nanjing PTRI (China) . . . . [5384-41]

✔ **Direct way to measure the density of SF6 gas based on the relationship between density and refractive index,** H. Xu, D. Li, Shenyang Univ. of Technology (China) . [5384-42]

✔ **Characterization of PbX-based micro-samples using high-pressure technique,** S. V. Ovsyannikov, V. V. Shchennikov, Y. S. Ponosov, S. V. Gudina, V. E. Mogilenskikh, Institute of Metal Physics (Russia) . . . . [5384-43]

✔ **Wireless intelligent sensor network for automatic structural health monitoring,** E. Sazonov, K. Janoyan, R. Jha, Clarkson Univ. . . . . . [5384-44]

✔ **Chaos theory used in crude oil pipeline leak detecting,** S. Zhang, W. Cai, Yanshan Univ. (China) . . . . [5384-45]

✔ **Development of self-diagnosis in addition to ability of repair concrete for damage,** W. J. Kim, K. Ie Sung, Kyungpook National Univ. (South Korea) . . . . [5384-46]

✔ **New kind of structural fatigue life-prediction smart sensor,** Z. Zhi, Harbin Institute of Technology (China) . [5384-47]

✔ **Behavior of uneven loading schemes on multi-axial fiber Bragg gratings,** M. Kunzler, Blue Road Research [5384-52]

✔ **Investigation of properties of PZT ceramics embedded in concrete during concretion,** Y. Wen, Y. Chen, Chongqing Univ. (China) . . . . [5384-54]

Chair: Peter Sommer-Larsen, Risø National Lab. (Denmark)

✔ **Polyacrylic acid/poly(vinyl sulfonic acid, sodium salt) copolymer hydrogel actuator under an electric field,** S. J. Park, S. G. Yoon, H. I. Kim, K. M. Shin, S. I. Kim, S. J. Kim, Hanyang Univ. (South Korea) . . . . [5385-31]

✔ **Biodegradable cellulose as potential electro-active actuators,** C. Je, S. McAllister, D. Kim, K. J. Kim, Univ. of Nevada/Reno . . . . . [5385-32]

✔ **Synthesis and characteristics of semi-interpenetrating polymer network hydrogels of chitosan and polyaniline,** S. R. Shin, S. J. Park, S. G. Yoon, C. K. Lee, I. Y. Kim, S. I. Kim, S. J. Kim, Hanyang Univ. (South Korea) . . . . [5385-39]

✔ **Electrical characterizations of smart hydrogel based on chitosan/poly (diallydimethylammonium chloride) in NaCl solutions,** S. G. Yoon, S. J. Park, J. Y. Lim, N. R. Lee, S. I. Kim, S. J. Kim, Hanyang Univ. (South Korea) . . . . [5385-53]

✔ **Temperature and humidity effects on electro-active paper actuators,** J. Kim, J. Park, Inha Univ. (South Korea) . [5385-65]

✔ **Yield stress properties of perchloric acid doped polythiophene/silicone oil suspensions,** D. Chotpattananont, A. Sirivat, Chulalongkorn Univ. (Thailand); A. Jamieson, Case Western Reserve Univ. . . . . . . [5385-66]

✔ **Recrystallization study of high-energy-electron irradiated P(VDF-TrFE) copolymer,** Z. Li, Z. Cheng, Auburn Univ. [5385-67]

✔ **Modeling of optical gel electro-active response,** A. M. Al-Jumaily, R. A. Paxton, M. V. Ramos, Auckland Univ. of Technology (New Zealand); A. J. Easteal, Univ. of Auckland (New Zealand) . . . . . [5385-69]

✔ **Role of backing layer on actuator performance of conducting polymer bilayer actuators: a phenomenological model,** S. Radhakrishnan, S. B. Kar, National Chemical Lab. (India) . . . . [5385-71]

✔ **Matrix damping of high torque loaded machinery mounts,** R. W. Bird, G. J. Knowles, QorTek Inc. . . . . [5386-63]

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TUESDAY 16 MARCH

> ✔ **Posters-Tuesday**
> The following posters will be displayed in the formal Poster Session and Exhibition Reception on Tuesday evening from 6:00 to 7:30 pm. Authors will be present during this time for discussion. Poster authors will be able to set up their poster papers between 10:00 am and 4:00 pm Tuesday. Poster papers can be previewed after 4 pm before the formal poster session begins at 6:00 pm.

Conference 5387

Chair: **William D. Armstrong**, Univ. of Wyoming

✔ **Design and modeling of a single-crystal iron-gallium large magnetostrictive dynamic research transducer,** L. M. Twarek, S. J. Haack, A. Flatau, Univ. of Maryland/College Park . . . . . . [5387-75]

✔ **Crystallographic orientation of NiMnGa magnetic shape-memory alloys,** S. P. Farrell, C. V. Hyatt, Defence R&D Canada - Atlantic (Canada); C. Bennett, Acadia Univ. (Canada); L. M. Cheng, Defence R&D Canada - Atlantic (Canada) . . [5387-77]

✔ **Response time of rotor systems with a disk-type magnetorheological fluid damper,** C. Zhu, Zhejiang Univ. (China) . . . . [5387-78]

✔ **Functional phase diagram mapping of ternary systems containing ferromagnetic shape-memory alloys,** I. Takeuchi, J. Hattrick-Simpers, O. Famodu, M. Aranova, M. Murakami, K. Chang, M. Wuttig, Univ. of Maryland/College Park; S. L. Lofland, Rowan Univ. . . . . . . [5387-79]

✔ **Crack growth in lead magnesium niobate: lead titanate ceramics by cyclic electric fields,** S. Ferguson, H. W. King, Univ. of Victoria (Canada); D. F. Waechter, R. Blacow, E. Prasad, Sensor Technology Ltd. (Canada) . . . . [5387-80]

✔ **High-energy absorption in ferromagnetic shape-memory alloy (Ni51Mn28Ga21),** E. Gans, C. Henry, G. P. Carman, Univ. of California/Los Angeles; C. Wong, Naval Surface Warfare Ctr.; M. Cole, Army Research Lab.; M. Wun-Fogle, Naval Surface Warfare Ctr. [5387-81]

✔ **Dynamic behavior and delta-E effect in solenoid-based NiMnGa transducers,** L. E. Faidley, M. J. Dapino, G. N. Washington, The Ohio State Univ.; T. A. Lograsso, Iowa State Univ. . . . . [5387-82]

✔ **Quasi-static modeling of NiMnGa magnetic shape-memory alloy,** R. N. Couch, Univ. of Maryland/College Park . . . . [5387-84]

Conference 5388

✔ **Development of damage monitoring system for aircraft structure using a PZT actuator/FBG sensor hybrid system,** T. Ogisu, M. Shimanuki, S. Kiyoshima, Fuji Heavy Industries Ltd. (Japan); Y. Okabe, N. Takeda, Univ. of Tokyo (Japan) . . . . [5388-48]

✔ **Ultracompact power drive electronics for firepower for advanced warheads and miniaturized munitions,** R. W. Bird, W. C. Knoll, QorTek Inc. . . . . [5388-50]

✔ **Smart structures to improve precision and quality of machine tools,** W. G. Drossel, R. Neugebauer, H. Roscher, Fraunhofer-Institut für Werkzeugmaschinen und Umformtechnik (Germany) . . . . [5388-52]

Conference 5389

✔ **Wind turbine generators with active Doppler suppression blades,** A. Tennant, B. Chambers, Univ. of Sheffield (United Kingdom) . . [5389-60]

✔ **Electroless Ni-Co-P coating of cenospheres using silver nitrate activator,** A. Zeng, Changsha Univ. of Electric Power (China); W. Xiong, Huazhong Univ. of Science and Technology (China) . [5389-61]

✔ **BaFe12O19 coated fly ash cenospheres by sol-gel,** A. Zeng, Changsha Univ. of Electric Power (China); W. Xiong, Huazhong Univ. of Science and Technology (China) . . . . [5389-62]

✔ **In-situ test structure for simultaneously determining multimaterial properties of a film,** C. H. Pan, National Chin-Yi Institute of Technology (Taiwan) . . . . [5389-64]

Conference 5390

✔ **Electroactive smart polymers for space optics,** A. J. Gavrin, Triton Systems, Inc.; D. J. Leo, Virginia Polytechnic Institute and State Univ.; M. Sutton, Triton Systems, Inc.; M. Bennett, Virginia Polytechnic Institute and State Univ. . . . . [5390-73]

✔ **Self-sensing miniature electromagnetic actuators for a cardiac assist device application,** B. M. Hanson, P. G. Walker, Univ. of Leeds (United Kingdom); K. Watterson, Leeds General Infirmary (United Kingdom); R. Richardson, Univ. of Manchester (United Kingdom); M. C. Levesley, M. Yang, Univ. of Leeds (United Kingdom) . . . . [5390-74]

✔ **Complementary Inchworm® actuator for high-force high-precision applications,** D. F. Waechter, E. Prasad, R. Blacow, B. Yan, Sensor Technology Ltd. (Canada); S. Salisbury, R. Ben Mrad, Univ. of Toronto (Canada) . . . . [5390-75]

✔ **Novel pole-placement switching technique for amplitude suppression in forced systems,** R. G. Scott, A. P. Weightman, M. C. Levesley, Univ. of Leeds (United Kingdom) . . . . [5390-76]

✔ **Wireless strain sensor based on resonant rf cavities,** J. Chuang, D. Thomson, G. Bridges, Univ. of Manitoba (Canada) . . . . [5390-77]

✔ **Built-in diagnostic imaging for structural health monitoring,** J. Ihn, F. Chang, Stanford Univ. . . . . [5390-79]

✔ **Detection of fastener failure in a thermal protection system,** M. Derriso, Air Force Research Lab. . . . . [5390-80]

Conference 5391

✔ **Structural integrity recovery system,** C. V. Hedberg, Consultant . . . . [5391-80]

✔ **Self-diagnostic self-healing multifunctional fiber optic networks for composite structures,** C. A. Schuetz, A. F. Lipiecki, M. Golt, A. P. Schmalz, S. Yarlagadda, D. Prather, Univ. of Delaware . . . . [5391-81]

✔ **Smart sensing and remote detection of impact loads,** L. Sun, Catholic Univ. of America . . . . [5391-82]

✔ **Sensor networks at the urban-rural interface: making smart structures smarter,** A. Sharma, D. M. Doolin, M. Chen, S. Glaser, N. Sitar, Univ. of California/Berkeley [5391-83]

✔ **Experimental demonstration of fiber Bragg grating strain sensors for structural vibration control,** K. K. Chau, Intelligent Fiber Optics Systems; G. Song, V. Sethi, Univ. of Houston; B. Kutner, B. Moslehi, Intelligent Fiber Optic Systems [5391-84]

✔ **Development of a field-portable small-size impedance analyzer for structural health monitoring using the electromechanical impedance technique,** V. Giurgiutiu, B. Lu, Univ. of South Carolina . . . . [5391-92]

✔ **Unpowered wireless analog resistance sensor,** M. M. Andringa, D. P. Neikirk, S. L. Wood, Univ. of Texas/Austin . . . . [5391-93]

✔ **Signal loss, spatial resolution, and sensitivity of long coaxial crack sensors,** D. Pommerenke, S. Sun, G. Chen, Univ. of Missouri/Rolla . . . . [5391-94]

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✔ **Design of an adaptive reconfigurable control system using extended Kalman filter-based system identification and Eigen structure assignments,** X. Wang, V. L. Syrmos, Univ. of Hawaii/ Manoa . . . . [5383-74]	✔ **Effect of morphological characteristics of polypyrrole,** J. J. Pak, D. Kim, Korea Univ. (South Korea) . . . . . [5384-55]	✔ **Composites PVDF-TrFE/BT used as bio-active membranes for enhancing bone regeneration,** R. Gimenes, M. A. Zaghete, M. Bertolini, L. O. Coelho, N. F. Silva, Jr., Univ. Estadual Paulista (Brazil) . . . . [5385-74]	
✔ **Michelson interferometer system for seismic noise measurement,** F. Barone, Istituto Nazionale di Fisica Nucleare (Italy) and Univ. degli Studi di Salerno (Italy); F. Acernese, A. Eleuteri, R. De Rosa, L. Milano, Univ. degli Studi di Napoli Federico II (Italy) and Istituto Nazionale di Fisica Nucleare (Italy) [5383-75]	✔ **An innovative method for monitoring impact events on complicated structures using system identification technique,** J. Park, F. Chang, Stanford Univ. . . . . . [5384-60]	✔ **Liquid crystalline elastomers as artificial muscles,** J. W. Naciri, Naval Research Lab.; A. Srinivasan, Geo-Centers, Inc.; B. R. Ratna, Naval Research Lab. . . . . [5385-75]	
✔ **Identification of Nottingham Wilford bridge modal parameters using the wavelet transform,** M. Meo, Cranfield Univ. . . . . [5383-76]			
✔ **Stiffness matrix of a clamped beam cantilever,** S. S. Dana, A. R. Andrade, M. S. Castro, Univ. Federal da Paraíba (Brazil) . . . . [5383-77]			
✔ **Wavelet-based denoising techniques in structural health monitoring,** T. Yu, Massachusetts Institute of Technology; J. Pei, Univ. of Oklahoma . . . . [5383-78]			
✔ **Numerical technique for the solution of an integro-differential equation in inverse scattering problem,** M. Razzaghi, Mississippi State Univ. . . . . [5383-79]			
✔ **Distributed fiber Bragg grating sensors information fusion and decoupling,** X. Chen, Southeast Univ. (China) . . . . [5383-80]			
✔ **Simple techniques for the identification and control of semi-active dampers,** G. Walsh, H. Esmonde, S. Hashmi, Dublin City Univ. (Ireland) . . . . [5383-81]			
✔ **Recrusive estimation of the Preisach density function for a smart actuator,** R. Venkataraman, Texas Tech Univ. . . . . [5383-82]			
✔ **Aero-elastic control using V-stack piezoelectric actuator and Q-parameterized system identification,** E. V. Ardelean, M. A. McEver, D. G. Cole, R. L. Clark, Duke Univ. . . [5383-83]			
✔ **A thermomechanically coupled model for pseuso-elastic Nitinal wires,** S. Seelecke, O. Heintz, North Carolina State Univ. . . . . [5383-85]			

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Conference 5387 — Room: California

✔ **Influence of composition and thermomechanical treatments on the magnetic shape memory effect of NiMnGa single crystals,** L. M. Cheng, S. P. Farrell, C. V. Hyatt, Defence R&D Canada - Atlantic (Canada) . . . . [5387-85]

✔ **Nonlinear dielectric behavior of high-dielectric constant ceramics CaO-CuO-TiO2,** M. D. Arbatti, S. Li, Z. Cheng, Auburn Univ. . . . . [5387-89]

✔ **Smart optical materials with the varying index of refraction,** Y. Park, Science and Technology Corp.; G. C. King, NASA Langley Research Ctr.; S. Chu, National Institute of Aerospace; S. H. Choi, NASA Langley Research Ctr. [5387-90]

✔ **Shear lag micromechanics model for effective properties of piezoelectric fiber reinforced composites,** N. Mallik, Indian Institute of Technology (India) . [5387-91]

✔ **Stress-strain behavior of Cu-Al-Ni single crystal shape-memory alloy at high temperature: shape-memory effects,** G. K. Kannarpady, S. Trigwell, A. Bhattacharyya, Univ. of Arkansas/Little Rock . . . . [5387-92]

✔ **Mechanism of stress-induced mechanoluminescence,** Y. Jia, Univ. de Puerto Rico [5387-93]

✔ **Fabrication of lead-free piezoelectric materials using a hybrid sintering process,** J. Qiu, J. Tani, K. Orikasa, Tohoku Univ. (Japan); H. Takahashi, Fuji Ceramics Corp. (Japan) . . . . [5387-94]

✔ **Microstructure and solidification behavior of Ni-Mn-Ga magnetic shape-memory alloys,** J. Chen, M. Gharghouri, Dalhousie Univ. (Canada); C. Hyatt, Defence R&D Canada - Atlantic (Canada) . . . . [5387-95]

✔ **Development of active materials based on composites,** H. Asanuma, Chiba Univ. (Japan) . [5387-96]

✔ **Hygrothermal effects on metal-fiber composite plates,** R. Kolar, Naval Postgraduate School . . . . [5387-97]

✔ **Molecular dynamics study on the internal stress of piezoelectric thin film deposited by magetron sputtering,** F. Shang, T. Kitamura, Y. Umeno, Kyoto Univ. (Japan) . . . . . . [5387-98]

✔ **SMA honeycomb design and properties,** M. R. Hassan, F. L. Scarpa, C. Boller, Univ. of Sheffield (United Kingdom) . . . . [5387-99]

Conference 5391 — Meeting House/Sunrise

✔ **Design and implementation of smart sensor nodes for wireless disaster monitoring systems,** Y. Chen, W. Wu, C. Chen, H. Tsai, C. Wen, M. Jin, National Taiwan Univ. (Taiwan); C. Gau, C. Chang, Institute of Occupational Safety and Health (Taiwan); C. Lee, National Taiwan Univ. (Taiwan) . . . . [5391-95]

✔ **Transmission-component monitoring and comparison of two artificial neural network schemes,** M. Pan, Y. Liu, National Central Univ. (Taiwan) . . . . [5391-96]

✔ **Application of FBG sensors to monitor the mechanical behavior of FRP reinforced wooden structures,** B. Marchetti, Univ. Politecnica delle Marche (Italy); C. Rondini, Univ. degli Studi di Perugia (Italy); S. Copparoni, F. Calabro, Univ. Politecnica delle Marche (Italy) . . . . . [5391-97]

✔ **Auxetic magnetic foams for integrated mechanical-EM shielding sandwich applications,** F. L. Scarpa, Univ. of Sheffield (United Kingdom); F. C. Smith, Univ. of Hull (United Kingdom); W. A. Bullough, Univ. of Sheffield (United Kingdom) . . [5391-99]

Smart Structures and Materials

Conference 5383	Conference 5384	Conference 5385	Conference 5386
Room: Royal Palm III	Room: Golden West	Room: Town & Country	Room: Royal Palm I

WEDNESDAY 17 MARCH

8:00 to 8:55 am • Town and Country Ballroom

Smart Structures Product Implementation Award Presentation

Plenary Presentation

Building Robust Systems out of Non-Robust Components

Pradeep K. Khosla, Carnegie Mellon Univ.

SESSION 8
Room: Royal Palm III
Wed. 9:00 to 10:00 am

Control Design I

Chair: **Robert L. Clark**, Duke Univ.

9:00 am: **Control of a NiTi wire actuator using a load-dependent Preisach operator,** W. S. Galinaitis, Ferrum College . . . . [5383-36]

9:20 am: **Semi-active control of magnetorheological damper system,** W. Yim, S. N. Singh, Univ. of Nevada/Las Vegas; M. Minnicino, Army Research Lab. . . . . [5383-37]

9:40 am: **Open-loop control of class 2 tensegrity towers,** M. Masic, R. E. Skelton, Univ. of California/San Diego . [5383-38]

Coffee Break   10:00 to 10:30 am

SESSION 6
Room: Golden West
Wed. 9:00 am to 12:30 pm

Fiber Grating Sensors II

Chairs: **Stephen T. Kreger**, Blue Road Research; **Marc Niklès**, Omnisens SA (Switzerland)

9:00 am: **Si-based Fabry-Perot filter for detecting strain in FBG sensor,** G. Coppola, Istituto per la Microelettronica e Microsistemi (Italy) . . . . [5384-32]

9:20 am: **Accurate strain measurements with fiber Bragg sensors and wavelength references,** E. Rivera, D. Thomson, Univ. of Manitoba (Canada) . . . . [5384-33]

9:40 am: **Use of multidimensional fiber grating strain sensors for damage detection in composite tanks,** M. Kunzler, Blue Road Research . . . . [5384-34]

Coffee Break   10:00 to 10:30 am

SESSION 7
Room: Town & Country
Wed. 9:00 to 11:10 am

Other EAP Materials

Chairs: **Keiichi Kaneto**, Kyushu Institute of Technology (Japan); **Minoru Taya**, Univ. of Washington

9:00 am: **Electrically conducting shape-memory polymer composites for electro-active actuator,** Y. C. Jung, N. S. Goo, J. W. Cho, Konkuk Univ. (South Korea) . . . . [5385-30]

9:20 am: **Toward nanobiomimetic muscles: polyacrylonitrile nanofibers,** K. J. Kim, K. Choe, R. Samatham, Univ. of Nevada/Reno; J. Nam, Sung Kyun Kwan Univ. (South Korea); M. Shahinpoor, Environmental Robots Inc.; J. Adams, Univ. of Nevada/Reno . . . . [5385-62]

9:40 am: **Electromechanical flapping produced by ionic polymer-metal composites,** H. C. Park, Konkuk Univ. (South Korea); K. J. Kim, Univ. of Nevada/Reno . . . . [5385-63]

Coffee Break   10:00 to 10:30 am

SESSION 8
Room: Royal Palm I
Wed. 9:00 to 10:00 am

Design and Applications I

Chair: **Amr M. Baz**, Univ. of Maryland/College Park

9:00 am: **Damping augmentation design for rafted machinery mounts,** G. J. Knowles, QorTek Inc.; A. Baz, Univ. of Maryland . . . . [5386-37]

9:20 am: **Optimization of a state-switched absorber applied to a continuous vibrating system,** M. H. Holdhusen, K. A. Cunefare, Georgia Institute of Technology . . . . [5386-38]

Coffee Break   10:00 to 10:30 am

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Conference 5387 Room: California	**Conference 5388** Room: San Diego	**Conference 5389** Meeting House/Sunset	**Conference 5390** Meeting House/Towne	**Conference 5391** Meeting House/Sunrise

WEDNESDAY 17 MARCH

8:00 to 8:55 am • Town and Country Ballroom

Smart Structures Product Implementation Award Presentation

Plenary Presentation

Building Robust Systems out of Non-Robust Components

Pradeep K. Khosla, Carnegie Mellon Univ.

SESSION 7
Room: California
Wed. 9:00 am to 12:10 pm

Shape-Memory Alloys II

Chairs: **Abhijit Bhattacharyya**, Univ. of Arkansas/Little Rock; **Muhammad A. Qidwai**, Geo-Centers, Inc.

9:00 am: **Stability of a dispersive nanoscale thermomechanical model for bi-atomic crystals,** R. S. Elliott, J. A. Shaw, N. Triantafyllidis, Univ. of Michigan . . . . [5387-37]

9:20 am: **Multiscale continuum mechanics model for phase transformations in SMA single crystals,** V. M. Stoilov, Univ. of Windsor (Canada); A. Bhattacharyya, Univ. of Arkansas/Little Rock . [5387-38]

9:40 am: **Thermomechanical behavior of CuAlNi single crystal high-temperature shape-memory alloy: reorientation,** S. Trigwell, G. K. Kannarpady, A. Bhattacharyya, Univ. of Arkansas/Little Rock; M. Qidwai, Geo-Centers, Inc. . . . . [5387-39]

Coffee Break   10:00 to 10:30 am

SESSION 5
Room: San Diego
Wed. 9:00 to 10:00 am

Aero/Aircraft Applications I

Chair: **Janet M. Sater**, Institute for Defense Analyses

9:00 am: **Adaptive aerostructures: the first decade of flight on uninhabited aerospace systems,** R. M. Barrett, Technische Univ. Delft (Netherlands) and Auburn Univ. . . . . [5388-19]

9:20 am: **Development and whirl-tower test of the smart material actuated rotator technology (SMART) active flap rotor,** F. K. Straub, D. K. Kennedy, A. M. D. Stemple, V. Anand, T. S. Birchette, Boeing Co. . [5388-55]

9:40 am: **Morphing aircraft concepts, classification, and challenges,** A. Jha, J. N. Kudva, NextGen Aeronautics . [5388-21]

Coffee Break   10:00 to 10:30 am

SESSION 8
Room: Meeting House/Sunset
Wed. 9:00 to 10:00 am

Microsensors, Actuators, and MEMS II

Chair: **Taeksoo Ji**, The Pennsylvania State Univ.

9:00 am: **Differential laterally movable gate FETs (LMGFETs) as a position sensor,** I. Song, P. K. Ajmera, Louisiana State Univ. . . . . [5389-36]

9:20 am: **Relaxor ferroelectric-normal ferroelectric polymer solid-solution-like systems and flexible arrays of electro-active polymer micro-actuators and microsensors,** C. Huang, K. Ren, Q. Zhang, The Pennsylvania State Univ. . . . . [5389-37]

9:40 am: **Light-driven actuation of fluids at microscale,** M. Deshpande, L. Saggere, Univ. of Illinois/Chicago . . . . . [5389-38]

Coffee Break   10:00 to 10:30 am

SESSION 8
Room: Meeting House/Towne
Wed. 9:00 to 10:00 am

FSMA/SMA Applications

Chairs: **Marcelo J. Dapino**, The Ohio State Univ.; **Reginald DesRoches**, Georgia Institute of Technology

9:00 am: **Design of torque actuator based on ferromagnetic shape-memory alloy composite,** V. J. Cheng, M. Taya, M. Kusaka, Univ. of Washington; T. Wada, Yokohama National Univ. (Japan) . . . . [5390-37]

9:20 am: **Design of FSMA spring actuators,** H. Chen, M. Taya, Univ. of Washington . . . . . . [5390-38]

9:40 am: **Affect of cyclical modeling parameters on the behavior of SMAs for seismic applications,** R. DesRoches, J. McCormick, B. Andrawes, Y. Kajita, Georgia Institute of Technology . . . . [5390-39]

Coffee Break   10:00 to 10:30 am

SESSION 8
Room: Meeting House/Sunrise
Wed. 9:00 to 10:00 am

Signal Processing for Damage Detection I

Chairs: **Jann N. Yang**, Univ. of California/Irvine; **ChungBang Yun**, Korea Advanced Institute of Science and Technology (South Korea)

9:00 am: **Physically based traffic excitation models for system identification of highway bridges,** Y. Chen, Univ. of California/Irvine; C. Tan, Wayne State Univ.; M. Q. Feng, Univ. of California/Irvine . . . . . [5391-38]

9:20 am: **Identification of parametric changes for structural health monitoring using an adaptive filtering technique,** J. N. Yang, S. Lin, R. Wang, Univ. of California/Irvine; L. Zhou, Nanjing Univ. of Aeronautics and Astronautics (China) . . [5391-39]

9:40 am: **Thermal affects on modal properties and frequency-based damage detection in plate-girder bridges,** J. Kim, Pukyong National Univ. (South Korea); C. Yun, Korea Advanced Institute of Science and Technology (South Korea) . . . . [5391-40]

Coffee Break   10:00 to 10:30 am

Smart Structures and Materials

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SESSION 9
Room: Royal Palm III
Wed. 10:30 to 11:50 am

Control Design II

Chair: **Donald J. Leo**, Virginia Polytechnic Institute and State Univ.

10:30 am: **Implementation of an actuator/controller switching policy in flexible plates using PZT actuators,** M. A. Demetriou, T. Moghani, Worcester Polytechnic Institute . . . . [5383-39]

10:50 am: **Recursive generalized predictive control for systems with disturbance measurements,** S. Moon, R. L. Clark, D. G. Cole, Duke Univ. . . . . [5383-40]

11:10 am: **Adaptive generalized predictive control combined with a least-squares lattice filter,** S. Moon, R. L. Clark, D. G. Cole, Duke Univ. . . . . [5383-41]

11:30 am: **Adaptive control of smart fin angle using piezoelectric beam actuator,** W. Yim, S. N. Singh, M. B. Trabia, Univ. of Nevada/Las Vegas; W. Drysdale, Army Research Lab. . . . . [5383-43]

Lunch/Exhibition Break . . . . 11:50 to 1:30 pm

SESSION 6 *cont.*

10:30 am: **Fiber optic distributed sensing using optical frequency domain reflectometry: recent developments,** D. K. Gifford, R. G. Duncan, Luna Innovations, Inc. . . . . [5384-35]

10:50 am: **High-spatial resolution temperature monitoring of an industrial motor using a distributed fiber optic sensing technique,** R. G. Duncan, D. K. Gifford, B. A. Childers, Luna Innovations, Inc.; V. Rajeendran, GE Global Research . . [5384-36]

11:10 am: **Interferometric techniques for high-density multiplexing and high-spatial resolution of multi-axis fiber grating strain sensors,** S. T. Kreger, M. Winz, S. Calvert, E. Udd, Blue Road Research . . . . [5384-37]

11:30 am: **Smart current collector based on embedded fiber grating sensors for monitoring train interface to electrical overhead contact line,** W. Ecke, K. Schroeder, M. Kautz, Institut für Physikalische Hochtechnologie eV (Germany); P. Joseph, S. Willett, Morganite Electrical Carbon Ltd. (United Kingdom); T. Bosselmann, Siemens AG (Germany); M. Jenzer, BLS Loetschbergbahn AG (Switzerland); P. Ferdinand, CEA Saclay (France); Y. Lebeau, MTBE Paris Traversiere (France) . . . . [5384-38]

11:50 am: **Long FBG sensor characterization of residual strains in AS4/PPS thermoplastic laminates,** L. K. Sorensen, L. Humbert, T. Gmür, J. Botsis, Ecole Polytechnique Fédérale de Lausanne (Switzerland) [5384-39]

12:10 pm: **Impact monitoring in smart composites using stabilization controlled FBG sensor system,** H. Bang, D. Kim, C. Hong, C. Kim, Korea Advanced Institute of Science and Technology (South Korea) . . . . [5384-40]

Lunch/Exhibition Break . . . . . . 12:30 to 1:30 pm

SESSION 6 *cont.*

10:30 am: **Carbon-nanotubes-sheet actuator: theoretical and experimental investigations,** M. H. Haque, I. Kolaric, Fraunhofer-Technologie-Entwicklungsgruppe (Germany); U. Vohrer, Fraunhofer-Institut für Grenzflächen- und Bioverfahrenstechnik (Germany); T. Wallmersperger, B. Kröplin, Univ. Stuttgart (Germany) . . . . [5385-34]

10:50 am: **New electro-active paper actuator using conducting polypyrrole,** S. D. Deshpande, J. Kim, Inha Univ. (South Korea) . . . . [5385-46]

Current Status and Outlook for the Future of EAP Panel
11:10 am to 12:10 pm

Chair: **Yoseph Bar-Cohen**, Jet Propulsion Lab.

Moderator: **Yoseph Bar-Cohen,** Jet Propulsion Lab.

Panelists: **Peter Sommer-Larsen,** Risø National Lab. (Denmark); **Qibing Pei,** SRI International; Jaedo Nam, Sung Kyun Kwan Univ. (South Korea); **Toribio F. Otero,** Univ. Politécnica de Cartagena (Spain); **Hugh Herr,** MIT Artificial Intelligence Lab.; **Keiichi Kaneto,** Kyushu Institute of Technology (Japan); **Elisabeth Smela,** Univ. of Maryland/College Park

Discussion Topics:

- Areas of EAP weakness/shortcoming of the EAP technology infrastructure
- What is the gap between the needed and available EAP and how to bridge it
- Future science and engineering directions

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

SESSION 9
Room: Royal Palm I
Wed. 10:30 am to 12:10 pm

Vibration and Damping Control II

Chairs: **Daniel J. Inman**, Virginia Polytechnic Institute and State Univ.; **Chin A. Tan**, Wayne State Univ.

10:30 am: **Active control of two-dimensional periodic structures,** A. M. Baz, Y. J. Kim, Univ. of Maryland/College Park [5386-39]

10:50 am: **Active vibration control of a three-stage tensegrity structure,** W. L. Chan, F. Bossens, R. E. Skelton, Univ. of California/San Diego . . . . [5386-40]

11:10 am: **Active periodic struts for gearbox support system,** A. M. Baz, S. Asiri, D. Pines, Univ. of Maryland/College Park [5386-41]

11:30 am: **Online adaptation to improve the tradeoff between tuned vibration absorbers and tuned vibration dampers,** K. A. Williams, Univ. of Alabama . . . . [5386-42]

11:50 am: **Dynamic tire forces in vehicles with semi-active suspensions,** A. V. Pesterev, Institute of Systems Analysis (Russia); C. A. Tan, Wayne State Univ.; L. A. Bergman, Univ. of Illinois/Urbana-Champaign . . . . [5386-43]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

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WEDNESDAY 17 MARCH

SESSION 7 cont.

10:30 am: **Indentation characteristics of superelastic NiTi wires and Cu-bonded joints between them,** A. J. Muir Wood, Univ. of Cambridge (United Kingdom); J. H. You, Max-Planck-Institut für Plasmaphysik (Germany) and Univ. of Cambridge (United Kingdom); T. W. Clyne, V. Gergely, Univ. of Cambridge (United Kingdom) . . . . [5387-40]

10:50 am: **Morphing of composite plate actuated by SMA,** M. Cho, S. Kim, Seoul National Univ. (South Korea) . . . . [5387-41]

11:10 am: **Spectral element formulation for SMA beam under random vibration excitation,** F. L. Scarpa, Univ. of Sheffield (United Kingdom); M. Ruzzene, Georgia Institute of Technology; M. R. Hassan, Univ. of Sheffield (United Kingdom) . . . . [5387-42]

11:30 am: **High-corrosion-resistance FeMnSi-based alloys exhibiting nearly perfect shape-memory effects,** Z. Dong, S. Kajiwara, T. Kikuchi, N. Shinya, National Institute for Materials Science (Japan) . . . . . . [5387-43]

11:50 am: **Finite element model for the analysis of linear multiferroic continua,** G. J. Bush, G. P. Carman, Univ. of California/Los Angeles; L. Fuentes, Ctr. de Investigación en Materiales Avanzados (Mexico) . . [5387-44]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

SESSION 6
Room: San Diego
Wed. 10:30 am to 12:10 pm

Aero/Aircraft Applications II

Chair: **Brian P. Sanders**, Air Force Research Lab.

10:30 am: **Overview of the DARPA/AFRL Next Generation Morphing Aircraft Structures (N-MAS) program,** J. N. Kudva, NextGen Aeronautics; B. Sanders, Air Force Research Lab.; T. Weisshaar, DARPA . . [5388-22]

10:50 am: **Adaptive wing structures,** D. Perkins, E. Havens, Cornerstone Research Group, Inc. . . . . [5388-23]

11:10 am: **Variable sweep geometry primary structure actuation,** G. J. Knowles, R. W. Bird, QorTek Inc.; E. V. White, Boeing Co.; M. Valentino, Air Force Research Lab. . . [5388-24]

11:30 am: **High-power smart material-hydraulic actuation,** E. H. Anderson, S. O. Fahey, CSA Engineering, Inc.; M. Regelbrugge, Rhombus Consultants Group . . . [5388-25]

11:50 am: **High-pressure magnetostrictive pump development: a comparison of prototype and modeled performance,** K. Bridger, J. Lutian, J. Sewell, D. Kohlhafer, A. V. Cooke, G. Small, Active Signal Technologies . . . . [5388-26]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

SESSION 9
Room: Meeting House/Sunset
Wed. 10:30 am to 12:30 pm

Biosensors and BioMEMS

Chair: **Vijay K. Varadan**, The Pennsylvania State Univ.

10:30 am: **Molecular-systems-on-a-chip: steps forward for programmable biosystems,** P. F. Wagler, U. Tangen, Fraunhofer-Forschungseinheit für Biomolekulare Informationsverarbeitung (Germany) . . . . [5389-39]

10:50 am: **Development of novel-biosensor based on MEMS,** Z. Cheng, S. Li, Z. Li, B. A. Chin, Auburn Univ. . . . . [5389-40]

11:10 am: **Deep-brain stimulator and control of Parkinson's disease,** V. K. Varadan, K. A. Jose, The Pennsylvania State Univ. . . . . [5389-41]

11:30 am: **BioMEMS-based microdiagnostic kit for tuberculosis,** S. Kumar, R. P. Bajpai, L. M. Bqharadwaj, Central Scientific Instruments Organisation (India) . . [5389-42]

11:50 am: **Endoscopic optical coherence tomography imaging probe using a MEMS actuator,** J. M. Zara, George Washington Univ.; J. A. Izatt, Duke Univ.; B. J. Oberhardt, Memscept Inc.; S. W. Smith, Duke Univ. . . . . [5389-43]

12:10 pm: **Smart drug-delivery system employing molecular motors,** S. Kumar, E. Bagga, R. P. Bajpai, L. M. Bharadwaj, Central Scientific Instruments Organisation (India) . . [5389-44]

Lunch/Exhibition Break . . . . . . 12:30 to 1:30 pm

SESSION 9
Room: Meeting House/Towne
Wed. 10:30 am to 12:10 pm

Applications I: Vibration Reduction/Energy Harvesting

Chairs: **Balakumar Balachandran**, Univ. of Maryland/College Park; **Fred Nitzsche**, Carleton Univ. (Canada)

10:30 am: **Piezoelectric active control for workpiece chatter reduction during milling,** N. D. Sims, Y. Zhang, Univ. of Sheffield (United Kingdom) . . . . [5390-40]

10:50 am: **Experimental validation of a semi-active friction control device,** P. Masson, P. Buaka, P. Micheau, Univ. de Sherbrooke (Canada) . . . . [5390-41]

11:10 am: **Smart spring: a novel adaptive impedance control approach for active vibration suppression applications,** V. Wickramasinghe, C. Yong, D. Zimcik, National Research Council Canada (Canada); T. Harold, F. Nitzsche, Carleton Univ. (Canada) . . . . . . [5390-42]

11:30 am: **Experimental comparison between several active composite actuators for power generation,** H. A. Sodano, J. Lloyd, D. J. Inman, Virginia Polytechnic Institute and State Univ. . . . . [5390-43]

11:50 am: **High-efficiency piezoelectric vibration energy reclamation,** E. Lefeuvre, A. Badel, C. Richard, D. Guyomar, INSA de Lyon (France) . [5390-44]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

SESSION 9
Room: Meeting House/Sunrise
Wed. 10:30 am to 12:30 pm

Signal Processing for Damage Detection II

Chairs: **David Chelidze**, Univ. of Rhode Island; **Carlos E. Cesnik**, Univ. of Michigan/Ann Arbor

10:30 am: **Health monitoring of beam structures using traveling waves induced by ambient loads,** A. Masuda, A. Sone, S. Yamamoto, Kyoto Institute of Technology (Japan) . . . [5391-41]

10:50 am: **Optimization of piezoelectrics-based Lamb wave testing parameters for structural health monitoring,** A. Raghavan, C. E. Cesnik, K. H. Lee, Univ. of Michigan/Ann Arbor . . [5391-42]

11:10 am: **Identifying a two-mode damage accumulation process,** D. Chelidze, Univ. of Rhode Island . . . . [5391-43]

11:30 am: **Optimal sensor placement strategy and sensor design for high-quality system monitoring,** R. X. Gao, Univ. of Massachusetts/Amherst; C. Wang, General Electric Corp. . . . . [5391-44]

11:50 am: **Frequency response-based damage detection approach using shunted piezoelectric transducer with variable inductance,** J. Tang, Univ. of Connecticut; Y. Ding, Texas A&M Univ. . . . . . [5391-45]

12:10 pm: **Damage localization in plate structures from flexibility and its derivatives,** D. Wu, S. S. Law, Hong Kong Polytechnic Univ. (Hong Kong) . . . . [5391-91]

Lunch/Exhibition Break . . . . . . 12:30 to 1:30 pm

Smart Structures and Materials

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SESSION 10
Room: Royal Palm III
Wed. 1:30 to 3:10 pm

Control Design III

Chair: **Michael A. Demetriou**, Worcester Polytechnic Institute

1:30 pm: **Decentralized vibration control with networked embedded systems,** T. Tao, K. Frampton, Vanderbilt Univ. . . . . [5383-44]

1:50 pm: **Experimental study on active gear mesh vibration control,** Y. H. Guan, W. S. Shepard, Univ. of Alabama; M. Li, T. C. Lim, Univ. of Cincinnati . . . . [5383-45]

2:10 pm: **Robust vibration control of the metal-core assisted piezoelectric fiber embedded in CFRP composite,** K. Takagi, H. Sato, M. Saigo, National Institute of Advanced Industrial Science and Technology (Japan) [5383-46]

2:30 pm: **Dynamic stress compensation by smart actuation,** H. Irschik, Johannes Kepler Univ. Linz (Austria); M. Gusenbauer, PROFACTOR Produktionsforschungs GmbH (Austria); U. Pichler, Johannes Kepler Univ. Linz (Austria) . . . . [5383-47]

2:50 pm: **Research of the electro-magneto-elastic integral dynamic characteristics of the magnetorestrictive actuator,** Y. Zhang, L. Li, Beijing Univ. of Aeronautics and Astronautics (China) . . . . [5383-48]

Coffee Break . . 3:10 to 3:40 pm

SESSION 7
Room: Golden West
Wed. 1:30 to 2:10 pm

Post Deadline Session

1:30 pm: **Comparison of point and integrated fiber optic sensing techniques for ultrasound detection and location of damage,** D. C. Betz, DaimlerChrysler AG (Germany); G. Thursby, B. Culshaw, Univ. of Strathclyde (United Kingdom); W. J. Staszewski, Univ. of Sheffield (United Kingdom) . . . . [5384-58]

1:50 pm: **Non-contact material evaluation for characterization and wear detection using laser-generated ultrasound and interferometric ultrasonic detection,** G. Thursby, B. Culshaw, B. Sorazu, F. Dong, Univ. of Strathclyde (United Kingdom) . . . . [5384-59]

Panel Discussion
2:15 to 3:10 pm

Fiber Optic Sensor Opportunities and Obstacles for Aerospace and Civil Structure Applications

Panelists: **Eric Udd,** Blue Road Research; **Daniele Inaudi,** SMARTEC SA (Switzerland); **Brian Clushaw,** Univ. of Strathclyde (United Kingdom); **Wolfgang Ecke,** Institut Für Physikalische Hochtechnologie eV (Germany)

Conference End ■

SESSION 8
Room: Town & Country
Wed. 1:30 to 3:10 pm

Fabrication and Characterization Techniques I

Chairs: **John D. W. Madden**, Univ. of British Columbia (Canada); **Siavouche Nemat-Nasser**, Univ. of California/ San Diego

1:30 pm: **Fabrication of ionic-polymer-metal-composite (IPMC) micropump using a commercial Naflon,** J. J. Pak, Korea Univ. (South Korea); S. Lee, Dankook Univ. (South Korea); B. Kim, Korea Institute of Science and Technology (South Korea); Y. H. Kwak, Korea Univ. (South Korea); S. H. Cho, Daewoo Electronics Corp. (South Korea); J. Park, Korea Institute of Science and Technology (South Korea); S. W. Oh, Korea Univ. (South Korea) . . . . [5385-35]

1:50 pm: **Fatigue tests on a dielectric polymer linear actuator,** M. Hafez, C. Bolzmacher, Commissariat a l'Energie Atomique (France) . . . . [5385-36]

2:10 pm: **Self-assembled nanostructured conducting elastomeric electrodes,** R. O. Claus, Virginia Polytechnic Institute and State Univ. [5385-37]

2:30 pm: **Actuator based on conducting polymer/PEO/ elastomer IPNs,** F. Vidal, C. Plesse, C. Chevrot, D. Teyssie, Univ. de Cergy-Pontoise (France) . . . . [5385-72]

2:50 pm: **Electro-active paper actuators based on cellulose,** J. Kim, S. Yoon, C. Park, Inha Univ. (South Korea) . . . . [5385-45]

Coffee Break . . 3:10 to 3:40 pm

SESSION 10
Room: Royal Palm I
Wed. 1:30 to 3:10 pm

Shunted Piezoelectric Damping I

Chairs: **Conor D. Johnson**, CSA Engineering, Inc.; **Gareth J. Knowles**, QorTek Inc.

1:30 pm: **Evaluation of an enhanced semipassive technique for the reduction of structural noise and vibrations,** M. Calmon, ONERA (France); D. Guyomar, INSA de Lyon (France); R. Ohayon, Conservatoire National des Arts et Métiers (France) . . . . [5386-44]

1:50 pm: **Adaptive shunted piezo approach to reduce structural vibrations,** O. M. Fein, L. Gaul, Univ. Stuttgart (Germany) . . . . [5386-45]

2:10 pm: **Noise control in a duct system with adaptively shunted piezoeletric materials,** D. Niederberger, ETH Zürich (Switzerland); S. Pietrzko, EMPA Duebendorf (Switzerland); M. Morari, ETH Zürich (Switzerland) . . . . [5386-46]

2:30 pm: **Broadband semipassive piezoelectric technique for structural damping,** L. Petit, E. Lefeuvre, C. Richard, D. Guyomar, INSA de Lyon (France) . . . . [5386-47]

2:50 pm: **New control approach for switching shunt damping,** D. Niederberger, M. Morari, ETH Zürich (Switzerland); S. Pietrzko, EMPA Duebendorf (Switzerland) . . . . [5386-48]

Coffee Break . . 3:10 to 3:40 pm

Conference 5387
Room: California

Conference 5388
Room: San Diego

Conference 5389
Meeting House/Sunset

Conference 5390
Meeting House/Towne

Conference 5391
Meeting House/Sunrise

Smart Structures

WEDNESDAY 17 MARCH

SESSION 8
Room: California
Wed. 1:30 to 3:10 pm

Ferroelectrics I

Chairs: **Christopher S. Lynch**, Georgia Institute of Technology; **Chad M. Landis**, Rice Univ.

Keynote
1:30 pm: **Constitutive models and fracture mechanics for ferroelectric ceramics** *(Invited Paper)*, R. M. McMeeking, Univ. of California/Santa Barbara . . . . [5387-45]

2:10 pm: **Phase field modeling of domain structures in ferroelectric materials,** W. S. Oates, A. Malbec, C. Lynch, Georgia Institute of Technology [5387-46]

2:30 pm: **Nonlinear fracture mechanics for ferroelastic materials,** C. M. Landis, Rice Univ. . . . . [5387-47]

2:50 pm: **Large strain actuation by domain switching in ferroelectric single crystals,** D. Shilo, R. Zhang, G. Ravichandran, K. Bhattacharya, California Institute of Technology [5387-48]

Coffee Break . . 3:10 to 3:40 pm

SESSION 7
Room: San Diego
Wed. 1:30 to 3:10 pm

Aero/Aircraft Applications III

Chair: **Jayanth N. Kudva**, NextGen Aeronautics

1:30 pm: **Self-contained high-authority control of miniature flight-control systems,** G. J. Knowles, R. W. Bird, QorTek Inc.; R. Barrett, Auburn Univ.; M. Valentino, Air Force Research Lab. . . . . [5388-27]

1:50 pm: **Aircraft interior ANC with flat panel speakers,** C. Gerner, D. Sachau, Univ. der Bundeswehr Hamburg (Germany); H. Breitbach, Airbus Germany GmbH (Germany) . . . . [5388-28]

2:10 pm: **Reducing aerodynamic vibration with piezoelectric actuators: a genetic algorithm optimization,** Z. Hu, M. Jakiela, Washington Univ. in St. Louis; D. M. Pitt, J. K. Burnham, Boeing Co. . . . . [5388-29]

2:30 pm: **Mechanical strain energy shuttle for aircraft morphing via wing twist or structural deformation,** D. Clingman, Boeing Co. . [5388-20]

2:50 pm: **Smart circuit breakers for high-power applications,** G. J. Knowles, QorTek Inc. . [5388-51]

Coffee Break . . 3:10 to 3:40 pm

SESSION 10
Room: Meeting House/ Sunset
Wed. 1:30 to 3:10 pm

Microsensors, Actuators, and MEMS III

Chair: **Julian W. Gardner**, Univ. of Warwick (United Kingdom)

1:30 pm: **Development of multilayer actuators with piezoelectric single crystals for implantable hearing aid,** Y. R. Roh, J. Seon, S. Lee, X. Lu, Kyungpook National Univ. (South Korea); S. Lee, iBULE Photonics Co., Ltd. (South Korea) [5389-45]

1:50 pm: **Smart ASIC chip for vapor detection based upon carbon black/polymer composite nanomaterials,** J. W. Gardner, Univ. of Warwick (United Kingdom) . . . . [5389-46]

2:10 pm: **Distributed MEMS-microvalves suitable structure for improving performances of intelligent pneumatic two-dimensional microconveyer,** Y. Chapuis, Y. Fukuta, Y. Mita, H. Fujita, Univ. of Tokyo (Japan) . . . . [5389-47]

2:30 pm: **Ultrafast chemical sensing microsystem employing resistive nanomaterials,** S. L. Tan, J. A. Covington, J. W. Gardner, Univ. of Warwick (United Kingdom) . . . . [5389-48]

2:50 pm: **Feasibility study of a self-powered piezoelectric sensor,** T. Ng, W. Liao, Chinese Univ. of Hong Kong (Hong Kong) . . . . [5389-49]

Coffee Break . . 3:10 to 3:40 pm

SESSION 10
Room: Meeting House/ Towne
Wed. 1:30 to 3:10 pm

Microsystems

Chairs: **Bingen Yang**, Univ. of Southern California; **Philip W. Loveday**, CSIR (South Africa)

1:30 pm: **Data glove-based fuzzy control of piezoelectric forceps actuator,** K. Susanto, B. Yang, Univ. of Southern California . . . . [5390-45]

1:50 pm: **Mechanics of MEMS: a review of modeling, analysis, and design,** E. Garcia, N. Lobontiu, Cornell Univ.; Y. Nam, Kangwon National Univ. (South Korea) . . . . [5390-46]

2:10 pm: **Design and analysis of a microscanning mirror,** I. Bucher, Technion-Israel Institute of Technology (Israel) . [5390-47]

2:30 pm: **Shape optimization of microcantilevers for mass variation detection and AFM applications,** E. Garcia, N. Lobontiu, Cornell Univ.; Y. Nam, Kangwon National Univ. (South Korea) . . . . [5390-48]

2:50 pm: **Development and operational optimization of microspray system,** A. Palevicius, K. Ragulskis, V. Ostasevicius, A. Bubulis, M. Ragulskis, Kaunas Univ. of Technology (Lithuania) . . . . [5390-49]

Coffee Break . . 3:10 to 3:40 pm

SESSION 10
Room: Meeting House/ Sunrise
Wed. 1:30 to 3:10 pm

Signal Processing for Damage Detection III

Chair: **Mahendra P. Singh**, Virginia Polytechnic Institute and State Univ.

1:30 pm: **Comparative study of some health monitoring techniques used for civil structures under dynamic load,** S. S. Bisht, M. P. Singh, Virginia Polytechnic Institute and State Univ. . . . . [5391-46]

1:50 pm: **Extreme value statistics from differential evaluation for damage detection,** K. Worden, G. Manson, Univ. of Sheffield (United Kingdom); H. Sohn, G. Park, C. R. Farrar, Los Alamos National Lab. . . . . [5391-47]

2:10 pm: **Development of an adaptive time-prediction model for monitoring time-varying structures,** H. Sohn, A. N. Robertson, Los Alamos National Lab.; K. Worden, Univ. of Sheffield (United Kingdom); G. Park, C. R. Farrar, Los Alamos National Lab. . . . . [5391-49]

2:30 pm: **Investigation on improved Gabor order tracking technique,** M. Pan, C. Chiu, National Central Univ. (Taiwan) . . . . [5391-50]

2:50 pm: **Damage-detection-oriented model for a cracked rectangular plate,** D. Wu, S. S. Law, Hong Kong Polytechnic Univ. (Hong Kong) . . . . [5391-90]

Coffee Break . . 3:10 to 3:40 pm

Smart Structures and Materials

Conference 5383		Conference 5385	Conference 5386
Room: Royal Palm III		Room: Town & Country	Room: Royal Palm I

SESSION 11
Room: Royal Palm III
Wed. 3:40 to 5:40 pm

Control Design IV

Chair: **Andrew G. Hatch**, North Carolina State Univ.

3:40 pm: **Integral equation approach applied to the piezo-patch vibration control of beams with Kelvin-Voigt damping,** J. C. Bruch, Jr., O. Kayacik, J. M. Sloss, Univ. of California/Santa Barbara; S. Adali, Univ. of Natal (South Africa); I. S. Sadek, American Univ. of Sharjah (United Arab Emirates) [5383-49]

4:00 pm: **Adaptive vibration suppression of a smart flexible beam using direct model reference adaptive control (MRAC),** J. Fei, North Carolina State Univ.; G. Song, Univ. of Houston . . . . [5383-50]

4:20 pm: **Resonance tracking in nonlinear system: application to a squeeze film levitation device,** I. Bucher, Technion-Israel Institute of Technology (Israel) . . . . [5383-51]

4:40 pm: **Hybrid techniques for the digital control of mechanical and optical systems,** F. Barone, Istituto Nazionale di Fisica Nucleare (Italy) and Univ. degli Studi di Salerno (Italy); F. Acernese, R. De Rosa, A. Eleuteri, L. Milano, Univ. degli Studi di Napoli Federico II (Italy) and Istituto Nazionale di Fisica Nucleare (Italy); S. Pardi, Univ. degli Studi di Napoli Federico II (Italy); K. Qipiani, Istituto Nazionale di Fisica Nucleare (Italy); I. Ricciardi, Univ. degli Studi di Napoli Federico II (Italy) and Istituto Nazionale di Fisica Nucleare (Italy) . . . . . [5383-52]

5:00 pm: **Model reduction based on modal Hankel singular values,** W. Chang, National Univ. of Singapore (Singapore) [5383-53]

5:20 pm: **Active sound control on boundary layers,** W. Chang, National Univ. of Singapore (Singapore); J. Zhang, DSO National Labs. (Singapore) . . . . [5383-54]

SESSION 9
Room: Town & Country
Wed. 3:40 to 5:20 pm

Sensors and Actuators

Chairs: **Hugh Herr**, MIT Artificial Intelligence Lab.; **James J. Pak**, Korea Univ. (South Korea)

3:40 pm: **Development of velocity sensor using ionic polymer-metal composites,** M. Konyo, Y. Konishi, S. Tadokoro, T. Kishima, Kobe Univ. (Japan) . . . . [5385-40]

4:00 pm: **Gel electrolyte candidates for electrochromic devices (ECDs),** S. E. Legenski, C. Xu, M. Taya, Univ. of Washington . . . . [5385-41]

4:20 pm: **Developing a polymeric sensor to monitor intracellular conditions,** T. C. Mudarri, D. J. Leo, Virginia Polytechnic Institute and State Univ.; P. K. Shires, B. C. Wood, Virginia-Maryland Regional College of Veterinary Medicine . . . . [5385-42]

4:40 pm: **Nonlinear dynamics of thin film polyvinylidene fluoride cantilevers,** A. Shukla, Miami Univ. of Ohio . . . . [5385-43]

5:00 pm: **Feasibility study of actuators and sensors using electro-active polymers reinforced with carbon nanotubes,** N. Jalili, A. Ramaratnam, Clemson Univ. . . . . [5385-44]

SESSION 11
Room: Royal Palm I
Wed. 3:40 to 5:00 pm

Design and Applications II

Chairs: **Gregory S. Agnes**, Jet Propulsion Lab.; **Arnold Lumsdaine**, Univ. of Tennessee/Knoxville

3:40 pm: **Design and fabrication of optimal constrained layer damping topologies,** R. V. Pai, A. Lumsdaine, M. Parsons, Univ. of Tennessee/Knoxville   . [5386-49]

4:00 pm: **Development of master design curve for particle impact dampers,** M. Y. Yang, G. Koopmann, G. Lesieutre, S. Hambric, The Pennsylvania State Univ. . . . . [5386-50]

4:20 pm: **Numerical investigation of particle impact dampers,** S. Ramachandran, G. Lesieutre, The Pennsylvania State Univ. . . . . [5386-51]

4:40 pm: **Genetic algorithms to tune vibration dampers for multimode systems with complex periodic inputs,** D. Anaspure, K. A. Williams, C. L. Karr, K. S. Graham, Univ. of Alabama . . . . [5386-53]

Conference 5387
Room: California

Conference 5388
Room: San Diego

Conference 5389
Meeting House/Sunset

Conference 5390
Meeting House/Towne

Conference 5391
Meeting House/Sunrise

WEDNESDAY 17 MARCH

SESSION 9
Room: California
Wed. 3:40 to 6:00 pm

Ferroelectrics II

Chairs: **Jiangyu Li**, Univ. of Nebraska/Lincoln; **John E. Huber**, Univ. of Cambridge (United Kingdom)

3:40 pm: **Modeling and design of ferroelectric beam actuators,** J. Huber, Univ. of Cambridge (United Kingdom) . . . . [5387-49]

4:00 pm: **Micromechanical model for ferroelectric and ferroelastic single crystals,** M. Elhadrouz, T. Ben Zineb, E. Patoor, Ecole Nationale Superieure d'Arts et Metiers (France) . . . . [5387-50]

4:20 pm: **Oxygen vacancy diffusion and its impact on fatigue in ferroelectric thin films,** Y. Xiao, K. Bhattacharya, California Institute of Technology . . . . [5387-51]

4:40 pm: **Modeling of electromechanical response of ferroelectric ceramics under combined electromechanical loading,** J. Rödel, Technische Univ. Dresden (Germany) . . . . [5387-52]

5:00 pm: **Ferroelectric crystals with engineered domain configurations,** J. Li, D. Liu, Univ. of Nebraska/Lincoln . . [5387-53]

5:20 pm: **Modeling of electrically induced fatigue crack growth in ferroelectric materials,** I. Arias, S. Serebrinsky, M. Ortiz, California Institute of Technology [5387-54]

5:40 pm: **Affect of residual stresses on domain switching in ferroelectric ceramic materials,** A. Achuthan, C. Sun, Purdue Univ. . . . . [5387-55]

SESSION 8
Room: San Diego
Wed. 3:40 to 5:40 pm

Automotive and Other Applications

Chair: **Edward V. White**, Boeing Phantom Works

3:40 pm: **Design of fish fin actuators using shape-memory alloy composites,** N. Ono, C. Wang, M. Kusaka, M. Taya, Univ. of Washington . . . . . . [5388-31]

4:00 pm: **Mechamatronics: an automotive perspective,** A. L. Browne, N. K. Bucknor, Y. T. Cheng, General Motors Corp.; N. L. Johnson, General Moters Corp.; W. Lin, C. Namuduri, Z. Sun, P. Usoro, General Motors Corp. . . . . [5388-54]

4:20 pm: **Design and analysis of ultrasonic horn for USDC (ultrasonic/sonic driller/corer),** Z. Chang, S. Sherrit, X. Bao, Y. Bar-Cohen, Jet Propulsion Lab. . . . . [5388-34]

4:40 pm: **Onboard strain measurement of a cryogenic composite tank mounted on a reusable rocket using FBG sensors,** T. Mizutani, K. Hayashi, Y. Okabe, N. Takeda, Univ. of Tokyo (Japan); H. Takeya, Mitsubishi Electric Corp. (Japan) . . . . [5388-35]

5:00 pm: **Semi-active vibration isolation of a rigid platform,** Y. Krishna, B. S. Sarma, Defence Research and Development Lab. (India) . . . . [5388-36]

5:20 pm: **Novel hybrid actuation system for controllable industrial and automotive brakes and clutches,** V. A. Neelakantan, G. N. Washington, The Ohio State Univ.; N. K. Bucknor, General Motors Corp. . . . . [5388-30]

SESSION 11
Room: Meeting House/Sunset
Wed. 3:40 to 5:20 pm

Microsensors, Actuators, and MEMS IV

Chair: **Tian-Bing Xu**, NASA Langley Research Ctr.

3:40 pm: **Evaluation of elecro-active polymer-based micropump diaphragm,** T. Xu, National Institute of Aerospace and NASA Langley Research Ctr.; J. Su, NASA Langley Research Ctr. . . . . [5389-50]

4:00 pm: **Oscillator microfabrication, micromagnets, and magnetic resonance force microscopy,** J. T. Markert, C. W. Miller, U. M. Mirsaidov, Y. J. Lee, W. Lu, M. D. Chabot, J. Choi, Univ. of Texas/Austin . . . . . . [5389-51]

4:20 pm: **Analytical and experimental approach for characterization of sputtered thin film micro thermocouples (STFMT),** M. Imran, A. Bhattacharyya, Univ. of Arkansas/Little Rock . [5389-52]

4:40 pm: **Integrated CMOS dew point sensors for relative humidity measurement,** N. Savalli, S. Baglio, S. Castorina, V. Sacco, C. Tringali, Univ. degli Studi di Catania (Italy) [5389-53]

5:00 pm: **Ultra-sharp micrometer probe for impedance measurement,** Y. Tao, F. Prinz, Stanford Univ. . . . . [5389-55]

SESSION 11
Room: Meeting House/Towne
Wed. 3:40 to 5:40 pm

Applications II: Pumps

Chairs: **Ron Barrett**, Auburn Univ. (Netherlands); **Sang M. Lim**, Konkuk Univ. (South Korea)

3:40 pm: **Torsional actuator motor using solid freeform fabricated PZT ceramics,** C. C. Wu, Naval Research Lab. and Office of Naval Research; C. Kim, B. Bender, Naval Research Lab. . . . . [5390-50]

4:00 pm: **Ultrasonic motor resonator design using shape and topology optimization,** P. W. Loveday, CSIR (South Africa); C. S. Long, A. A. Groenwold, Univ. of Pretoria (South Africa) [5390-51]

4:20 pm: **Design and testing of piezoelectric flight control actuators for hard-launch munitions,** R. M. Barrett, Technische Univ. Delft (Netherlands) and Auburn Univ. (Netherlands) . . . . [5390-52]

4:40 pm: **Application of CFD in design and analysis of a piezo-hydraulic actuator,** S. John, N. M. Wereley, C. Cadou, Univ. of Maryland/College Park [5390-53]

5:00 pm: **Design and testing of a bidirectional magnetostrictive-hydraulic hybrid actuator,** J. A. Ellison, Univ. of Maryland/College Park . . . . [5390-54]

5:20 pm: **Development of stacked ceramic thin actuation layer IDEAL using interdigitated electrodes,** G. Kim, J. D. Lee, N. S. Goo, H. C. Park, K. J. Yoon, Konkuk Univ. (South Korea) . . . . [5390-55]

SESSION 11
Room: Meeting House/Sunrise
Wed. 3:40 to 6:20 pm

Signal Processing for Damage Detection IV

Chairs: **Gangbing Song**, Univ. of Houston; **Victor Giurgiutiu**, Univ. of South Carolina

3:40 pm: **Structural health monitoring for rails,** G. Zumpano, M. Meo, Cranfield Univ. (United Kingdom) . . . . [5391-51]

4:00 pm: **Signal processing techniques for damage detection with piezoelectric wafer active sensors and embedded ultrasonic structural radar defect detection,** L. Yu, Univ. of South Carolina; J. Bao, Racer Technology Ltd. Co. (China); V. Giurgiutiu, Univ. of South Carolina . . . . [5391-52]

4:20 pm: **Covariance-driven asymptotic wavelet analysis for modal identification,** Z. Sun, C. Chang, Hong Kong Univ. of Science and Technology (Hong Kong) . . . . [5391-53]

4:40 pm: **Harmonic wavelet packet transform for on-line system health diagnosis,** R. X. Gao, R. Yan, Univ. of Massachusetts/Amherst . . . . [5391-54]

5:00 pm: **Discrete wavelet transform to improve guided-wave-based health monitoring of tendons and cables,** P. Rizzo, F. Lanza di Scalea, Univ. of California/San Diego . [5391-55]

5:20 pm: **Damage diagnosis of framework structure based on wavelet packet,** H. Li, Dalian Univ. of Technology (China); H. Sun, Shenyang Architectural and Civil Engineering Institute (China); G. Song, Univ. of Houston . . . . [5391-56]

5:40 pm: **Time-delay estimation in buried pipeline leak detection using the LMS adaptive filter combined with wavelet decomposition and threshholding,** P. Li, Y. Wen, Z. Zhou, J. Yang, Chongqing Univ. (China) . . . . [5391-57]

6:00 pm: **Theoretical and experimental studies on semi-active feedback control of cable vibration using MR dampers,** Y. Duan, Y. Ni, J. Ko, Hong Kong Polytechnic Univ. (Hong Kong) . . . . [5391-87]

Smart Structures and Materials

Conference 5383 Room: Royal Palm III		**Conference 5385** Room: Town & Country	**Conference 5386** Room: Royal Palm I

THURSDAY 18 MARCH

8:00 to 8:55 am • Town and Country Ballroom

ASME Adaptive Structures and Materials Systems Best paper Awards Presentation
Smart Structures and Materials/ASME Best Student Paper Award Presentation

Plenary Presentation
The CIRCE Project: Of Bats And Robots
Herbert Peremans, Univ. of Antwerp

SESSION 12
Room: Royal Palm III
Thurs. 9:00 to 10:00 am

Micro-Applications

Chair: **Eric M. Austin**, Clemson Univ.

9:00 am: **Model development and control design for high-speed atomic force microscopy,** A. G. Hatch, R. C. Smith, North Carolina State Univ.; T. De, Iowa State Univ. . . . . [5383-55]

9:20 am: **From the mechanical analysis of a poly-articulated micro gripper to the design of a compliant micro gripper,** P. Bernardoni, CEA-LIST (France) and Univ. Pierre et Marie Curie (France); H. Tsitsiris, A. Riwan, CEA-LIST (France); P. Bidaud, S. Régnier, Univ. Pierre et Marie Curie (France); O. Millet, L. Buchaillot, CNRS (France) . . . . [5383-56]

9:40 am: **Quantitative piezo-force microscopy to detect the influence of individual grain boundaries on piezoelectric properties,** B. D. Huey, D. Saylor, G. White, J. Blendell, National Institute of Standards and Technology . . . . [5383-57]

Coffee Break   10:00 to 10:30 am

SESSION 10
Room: Town & Country
Thurs. 9:00 to 10:00 am

Applications of EAP I

Chairs: **David F. Hanson**, Univ. of Texas/Dallas; **Hsing-Lin Wang**, Los Alamos National Lab.

9:00 am: **Micro-inchworm robot actuated by artificial muscle actuator based on dielectric elastomer** *(Invited Paper),* K. Jung, J. Nam, H. Choi, Sung Kyun Kwan Univ. (South Korea) . . . . [5385-47]

9:40 am: **Braille display device using soft actuator,** S. W. Lee, K. Jung, S. Lee, H. Choi, J. Jeon, J. Nam, H. Choi, Sung Kyun Kwan Univ. (South Korea) . . [5385-48]

Coffee Break   10:00 to 10:30 am

SESSION 12
Room: Royal Palm I
Thurs. 9:00 to 9:40 am

Characterization, Model, and Analysis II

Chair: **William W. Clark**, Univ. of Pittsburgh

9:00 am: **Load history dependence in problems of microslip evolution,** H. Gopal, L. Gorbatikh, Univ. of New Mexico . . . . [5386-55]

9:20 am: **Influence of experimental testing set-up and geometric parameters on damping measurements,** E. Monaco, F. Ricci, F. Marulo, Univ. degli Studi di Napoli Federico II (Italy) . . . . [5386-56]

SESSION 13
Room: Royal Palm I
Thurs. 9:40 to 11:50 am

Shunted Piezoelectric Damping II

Chairs: **Roger Ohayon**, Conservatoire National des Arts et Métiers (France); **Kenneth A. Cunefare**, Georgia Institute of Technology

9:40 am: **Vibration isolation using a shunted electromagnetic transducer,** S. Behrens, A. Fleming, R. Moheimani, Univ. of Newcastle (Australia) . [5386-58]

Coffee Break   10:00 to 10:30 am

Conference 5387
Room: California

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Conference 5389
Meeting House/Sunset

Conference 5390
Meeting House/Towne

Conference 5391
Meeting House/Sunrise

THURSDAY 18 MARCH

8:00 to 8:55 am • Town and Country Ballroom

ASME Adaptive Structures and Materials Systems Best paper Awards Presentation
Smart Structures and Materials/ASME Best Student Paper Award Presentation

Plenary Presentation
The CIRCE Project: Of Bats And Robots
Herbert Peremans, Univ. of Antwerp

SESSION 10
Room: California
Thurs. 9:00 am to 12:10 pm

Piezoceramics
Chairs: **Wolfgang Seemann**, Univ. Karlsruhe (Germany); **Stewart Sherrit**, Jet Propulsion Lab.

Keynote
9:00 am: **Piezoelectric and electromagnetic materials for fuel injection systems: on system requirements and reliability issues,** V. Knoblauch, G. Schneider, M. Selten, B. Sugg, Robert Bosch GmbH (Germany) . . . . [5387-83]

9:30 am: **Microscopically motivated constitutive model for piezoceramics under general electromechanical loading,** M. Kamlah, Z. Wang, Forschungszentrum Karlsruhe (Germany) . . . . [5387-56]

9:50 am: **Micromechanical simulation of piezoelectric materials using probability functions,** W. Seemann, Univ. Karlsruhe (Germany); A. ArockiaRajan, B. Delibas, Technische Univ. Kaiserslautern (Germany) . . . . [5387-57]

Coffee Break . 10:10 to 10:30 am

SESSION 9
Room: San Diego
Thurs. 9:00 to 10:00 am

Magnetorheological Fluids
Chair: **J. David Carlson**, Lord Corp.

9:00 am: **Fuzzy skyhook control of a vehicle suspension system using magnetorheological fluid damper,** Y. Liu, F. Gordaninejad, C. Evrensel, E. S. Karakas, U. Dogruer, Univ. of Nevada/Reno . . . . [5388-37]

9:20 am: **Magnelok™ technology: a compliment to magnetorheological fluids,** J. D. Carlson, Lord Corp. . . . [5388-38]

Coffee Break   10:00 to 10:30 am

SESSION 12
Room: Meeting House/Sunset
Thurs. 9:00 to 11:10 am

Fuel Cells, Power Devices, and Wireless Network
Chair: **Glen C. King**, NASA Langley Research Ctr.

9:00 am: **Fabrication of cell structures for bio-nanobattery,** S. Chu, National Institute of Aerospace; G. D. Watt, Brigham Young Univ.; J. Kim, Y. Park, Science and Technology Corp.; R. C. Davis, J. N. Harb, Brigham Young Univ.; G. C. King, P. T. Lillehei, S. H. Choi, NASA Langley Research Ctr. . . . . [5389-56]

9:20 am: **Electro-chemical reconstitution of biomolecules,** J. Kim, Science and Technology Corp.; P. T. Lillehei, NASA Langley Research Ctr.; S. Chu, National Institute of Aerospace; G. D. Watt, Brigham Young Univ.; Y. Park, Science and Technology Corp.; G. C. King, S. H. Choi, NASA Langley Research Ctr. . . . . [5389-57]

9:40 am: **Development of a bio-nanobattery for distributed power storage systems,** G. C. King, NASA Langley Research Ctr.; S. Chu, National Institute of Aerospace; J. Kim, Y. Park, Science and Technology Corp.; P. T. Lillehei, S. H. Choi, NASA Langley Research Ctr.; G. D. Watt, R. C. Davis, J. N. Harb, Brigham Young Univ. . . . . [5389-58]

Coffee Break   10:00 to 10:30 am

SESSION 12
Room: Meeting House/Towne
Thurs. 9:00 to 10:00 am

Health Monitoring I
Chair: **Victor Giurgiutiu**, Univ. of South Carolina

9:00 am: **Embedded multisensor bearing health-monitoring and fault-diagnostic system,** D. Zheng, L. Wang, Harbin Institute of Technology (China) . [5390-56]

9:20 am: **Debonding monitoring of a composite repair patch using small-diameter FBG sensors,** S. Takeda, Univ. of Tokyo (Japan) . . . . [5390-57]

9:40 am: **Characterization of embedded fiber optic sensors for structural health-management system,** D. Lee, A. Stewart, Univ. of California/Los Angeles; L. Richards, NASA Dryden Flight Research Ctr.; G. P. Carman, Univ. of California/Los Angeles . . . . [5390-58]

Coffee Break   10:00 to 10:30 am

SESSION 12
Room: Meeting House/Sunrise
Thurs. 9:00 to 10:00 am

Passive, Semi-Active and Active Vibration Control
Chair: **Genda Chen**, Univ. of Missouri/Rolla

9:00 am: **Fuzzy logic and genetic algorithms for intelligent control of structure using MR dampers,** L. L. Zhou, G. Yan, Nanjing Univ. of Aeronautics and Astronautics (China) . . . . [5391-58]

9:20 am: **Experimental study of instantaneous probabilistic energy control for seismically excited structures,** K. Min, Dankook Univ. (South Korea); J. Hwang, Chonnam National Univ. (South Korea); S. Lee, Seoul National Univ. (South Korea); H. Kim, Dankook Univ. (South Korea) . . . . [5391-59]

9:40 am: **Comparative study on semi-active control algorithms for piezoelectric friction dampers,** G. Chen, C. Chen, Univ. of Missouri/Rolla . . . . [5391-60]

Coffee Break   10:00 to 10:30 am

Smart Structures and Materials

Conference 5383
Room: Royal Palm III

Conference 5385
Room: Town & Country

Conference 5386
Room: Royal Palm I

THURSDAY 18 MARCH

SESSION 13
Room: Royal Palm III
Thurs. 10:30 am to 12:10 pm

Control Applications

Chair: **Julie K. Raye**, Virginia Commonwealth Univ.

10:30 am: **Health monitoring of adhesively bonded composite patches using wavelet analysis of Lamb wave signals,** R. Gubbala, V. S. Rao, Univ. of Missouri/Rolla . . . . . . [5383-58]

10:50 am: **Nonlinear stress-based control of a rotary SMA-actuated manipulator,** M. H. Elahinia, T. M. Seigler, M. Ahmadian, Virginia Polytechnic Institute and State Univ.[5383-59]

11:10 am: **Smart fabric and extension springs: a new active vibration absorber,** A. Albanese, K. Cunefare, Georgia Institute of Technology . . . . [5383-60]

11:30 am: **Integrated control strategy for autonomous decentralized conveyance systems based on distributed MEMS arrays,** L. Zhou, Univ. Louis Pasteur/Strasbourg (France); Y. Chapuis, Univ. of Tokyo (Japan); J. Blonde, H. Berviller, Univ. Louis Pasteur/ Strasbourg (France); Y. Fukuta, H. Fukuta, Univ. of Tokyo (Japan) . . . . [5383-61]

11:50 am: **Magnetostrictive/ piezoelectric laminate devices for actuators and sensor,** T. Ueno, T. Higuchi, Univ. of Tokyo (Japan) . . . . [5383-62]

Conference End ■

SESSION 11
Room: Town & Country
Thurs. 10:30 am to 12:10 pm

Fabrication and Characterization Techniques II

Chairs: **Toshihiro Hirai**, Shinshu Univ. (Japan); **Kinji Asaka**, National Institute of Advanced Industrial Science (Japan)

10:30 am: **Parallel synthesis and characterization of conducting polymer actuator molecules,** P. A. Anquetil, I. W. Hunter, Massachusetts Institute of Technology . . . . [5385-49]

10:50 am: **Characterization of bending EAP beams,** X. Bao, Y. Bar-Cohen, Z. Chang, S. Sherrit, Jet Propulsion Lab. . . . [5385-50]

11:10 am: **Interferometric measurement of the transverse strain response of electro-active polymers,** W. Ren, B. K. Mukherjee, Royal Military College of Canada (Canada); J. P. Szabo, Defence Research and Development Canada (Canada) . . . . [5385-51]

11:30 am: **Fabrication and characterization of solid-state polyaniline actuators,** H. Wang, Los Alamos National Lab. . . . . [5385-52]

11:50 am: **Affects of electrode morphology on the performance of BPSH and PATS ionic polymer transducers,** B. J. Akle, D. J. Leo, Virginia Polytechnic Institute and State Univ. . . . . [5385-73]

Lunch Break . . 12:10 to 1:30 pm

SESSION 13 *cont.*

10:30 am: **Synthesis of optimal piezoelectric shunt impedances for structural vibration control,** A. J. Fleming, S. O. R. Moheimani, Univ. of Newcastle (Australia) . . . . [5386-59]

10:50 am: **Vibration control via shunted embedded piezoelectric fibers,** A. Belloli, D. Niederberger, ETH Zürich (Switzerland); X. Kornmann, EMPA Duebendorf (Switzerland); P. Ermanni, M. Morari, ETH Zürich (Switzerland); S. Pietrzko, EMPA Duebendorf (Switzerland) . . . . . . [5386-60]

11:10 am: **Experiments on passive damping of beam vibrations through distributed electric networks and piezoelectric materials,** M. Porfiri, Univ. degli Studi di Roma La Sapienza (Italy) and Virginia Polytechnic Institute and State Univ.; C. Maurini, Univ. degli Studi di Roma La Sapienza (Italy) and Univ. de Versailles/Saint-Quentin-en-Yvelines (Italy); F. dell'Isola, Univ. degli Studi di Roma La Sapienza (Italy) . . . . [5386-61]

11:30 am: **Passive control of vibrations using a circuit shunt,** S. S. Dana, A. R. Andrade, M. S. Castro, Univ. Federal da Paraíba (Brazil) . . . . [5386-62]

Conference End ■

THURSDAY 18 MARCH

SESSION 10 cont.

10:30 am: **Resonance analysis of high-temperature piezoelectric materials for actuation and sensing,** S. Sherrit, X. Bao, Y. Bar-Cohen, Z. Chang, Jet Propulsion Lab. . . . . [5387-58]

10:50 am: **Material properties of piezoceramics at elevated temperatures,** E. P. Gnanamanickam, J. P. Sullivan, Purdue Univ.; W. Shelly II, Piezo Technologies . . . . [5387-59]

11:10 am: **Electromechanical characterization of 10x10x0.2-mm piezoelectric single crystal patches bonded on plates,** D. R. Osmont, M. Dupont, E. Fribourg-Blanc, ONERA (France) [5387-60]

11:30 am: **Piezoelectric behavior of pre-stressed curved actuators under load,** J. Costley, K. Mossi, Z. Ounaies, J. Moon, Virginia Commonwealth Univ.; R. C. Smith, B. Ball, North Carolina State Univ. . . . . [5387-61]

11:50 am: **Integration of RAINBOW piezoelectric ceramics and SMA films,** S. Xing, Nanjing Univ. of Aeronautics and Astronautics (China) . . [5387-62]

Lunch Break . . 12:10 to 1:30 pm

SESSION 10
Room: San Diego
Thurs. 10:30 am to 11:50 pm

Composites

Chair: **Eric H. Anderson**, CSA Engineering, Inc.

10:30 am: **Graphite-epoxy coatings for electrically induced thermal actuation of shape-memory alloys,** A. Bhattacharyya, E. Dervishi, Univ. of Arkansas/Little Rock; H. Kim, Pulaski Academy; S. Bourdo, B. Berry, T. Viswanathan, Univ. of Arkansas/Little Rock . . . . [5388-41]

10:50 am: **Microstructured polymer composites with enhanced thermal and electrical conduction capabilites,** G. Kim, D. K. Moeller, Y. M. Shkel, Univ. of Wisconsin/Madison . . [5388-42]

11:10 am: **Self-repairing composites for various industrial applications,** C. M. Dry, Natural Process Design . . . . . . [5388-43]

11:30 am: **Rubber to rigid: composite structures with electronically controllable stiffness and damping,** R. D. Kornbluh, R. Pelrine, H. Prahlad, S. Stanford, SRI International . . . . [5388-53]

Lunch Break . . 11:50 to 1:30 pm

SESSION 12 cont.

10:30 am: **Frequency agile wireless sensor networks,** S. W. Arms, C. P. Townsend, D. L. Churchill, M. J. Hamel, J. H. Galbreath, S. W. Mundell, MicroStrain, Inc. . . . . . [5389-59]

10:50 am: **Smart millimeter-wave devices using liquid crystal,** T. X. Wu, S. Wu, Univ. of Central Florida . . . . [5389-65]

Conference End ■

SESSION 13
Room: Meeting House/Towne
Thurs. 10:30 am to 12:10 pm

Health Monitoring II

Chairs: **Charles R. Farrar**, Los Alamos National Lab.; **Douglas E. Adams**, Purdue Univ.

10:30 am: **Damage identification by merging statistical methods with PZT impedance measurements,** D. W. Allen, D. M. Peairs, D. J. Inman, Virginia Polytechnic Institute and State Univ. . . . . [5390-59]

10:50 am: **Monitoring of welded joints using piezoelectric active-sensing techniques,** N. P. Limback, J. R. Wait, G. Park, H. Sohn, C. R. Farrar, Los Alamos National Lab. . . . . [5390-60]

11:10 am: **Nonlinear feature identification of impedance-based structural health monitoring,** A. C. Rutherford, G. Park, H. Sohn, C. R. Farrar, Los Alamos National Lab. . [5390-61]

11:30 am: **Structural damage identification using embedded sensitivity functions,** T. Johnson, C. Yang, D. E. Adams, Purdue Univ.; S. Yoo, Arvin Meritor . . . . [5390-62]

11:50 am: **New method in the health-monitoring field based on vibration measurements and neural networks on aeronautical structure,** I. Bovio, L. Lecce, M. Viscardi, E. Monaco, Univ. degli Studi di Napoli Federico II (Italy) . . . . [5390-63]

Lunch Break . . 12:10 to 1:30 pm

SESSION 13
Room: Meeting House/Sunrise
Thurs. 10:30 am to 12:30 pm

Smart Concrete Systems

Chairs: **Carolyn M. Dry**, Natural Process Design; **Lily L. Zhou**, Nanjing Univ. of Aeronautics and Astronautics (China)

10:30 am: **Smart aggregate structural concrete monitor,** R. P. Cain, Johns Hopkins Univ. . . . . [5391-61]

10:50 am: **Wireless sensors for monitoring corrosion in reinforced concrete members,** K. T. Grizzle, J. T. Simonen, M. M. Andringa, S. L. Wood, D. P. Neikirk, Univ. of Texas/Austin . . . . [5391-62]

11:10 am: **Smart health-monitoring system for a prestressed concrete bridge,** L. L. Zhou, Nanjing Univ. of Aeronautics and Astronautics (China); X. Wang, M. L. Wang, H. Chen, Y. Zhao, Univ. of Illinois/Chicago . . . . [5391-63]

11:30 am: **Self-repairing concrete bridges,** C. M. Dry, Natural Process Design . . . . . . [5391-64]

11:50 am: **Experimental study on structural health monitoring of RC columns using self-diagnosis materials,** H. Inada, Ohsaki Research Institute (Japan); Y. Okuhara, Japan Fine Ceramics Ctr. (Japan) . . . . [5391-65]

12:10 pm: **Thermomechanical analysis of the Kishwaukee Bridge from global and local deformation measurements,** G. M. Lloyd, M. Wang, Univ. of Illinois/Chicago . . . . . [5391-66]

Lunch Break . . 12:30 to 1:30 pm

Smart Structures

Conference 5385
Room: Town & Country

SESSION 12
Room: Town & Country
Thurs. 1:30 to 5:00 pm

Applications of EAP II

Chairs: **Jaedo Nam**, Sung Kyun Kwan Univ. (South Korea); **Jiangyu Li**, Univ. of Nebraska/Lincoln

1:30 pm: **Nucleation, non-stoiquiometry, and tactile muscles with conducting polymers** *(Invited Paper)*, T. F. Otero, Univ. Politécnica de Cartagena (Spain); M. T. Cortés, Univ. de los Andes (Colombia); I. Boyano, G. Vázquez, A. J. Fernández, Univ. Politécnica de Cartagena (Spain) . . . . [5385-54]

2:10 pm: **Bending induced by creeping of plasticized poly(vinyl chloride) gel,** T. Hirai, Shinshu Univ. (Japan) . . . . [5385-55]

2:30 pm: **Electrostrictive polymer multilayer actuators,** D. J. Arbogast, F. T. Calkins, J. H. Mabe, Boeing Co. . . . . [5385-56]

2:50 pm: **Application of EAPs: polypyrrole variable camber propellers,** J. D. W. Madden, M. Hechinger, Univ. of British Columbia (Canada); S. R. Lafontaine, B. Schmid, Molecular Mechanisms LLC; P. G. Madden, I. W. Hunter, F. S. Hover, Massachusetts Institute of Technology . . . . [5385-57]

Coffee Break . . 3:10 to 3:40 pm

3:40 pm: **Improved electro-active polymer for optical applications,** A. M. Al-Jumaily, I. Abbas, M. V. Ramos, Auckland Univ. of Technology (New Zealand) . . . . [5385-58]

4:00 pm: **Design of smart window based on electrochromic polymers: new derivatives of 3, 4-alkylenedioxythiophene and 3, 4-alkylenedioxypyrrole,** L. Liu, C. Xu, S. Legenski, D. Ning, M. Taya, Univ. of Washington . . [5385-59]

4:20 pm: **Hybrid actuator systems demonstrating significantly enhanced electromechanical performance,** J. Su, NASA Langley Research Ctr.; T. Xu, National Institute of Aerospace; S. Zhang, T. R. Shrout, Q. Zhang, The Pennsylvania State Univ. . . . . [5385-60]

4:40 pm: **Polypyrrole actuators as valves for controlled drug delivery,** C. Wang, H. Xu, C. Wang, M. Madou, Univ. of California/Irvine . . . . . [5385-61]

Conference End ■

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Conference 5391
Meeting House/Sunrise

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SESSION 11
Room: California
Thurs. 1:30 to 3:10 pm

Magnetic Materials I

Chairs: **William D. Armstrong**, Univ. of Wyoming; **Julie C. Slaughter,** Etrema Products, Inc.

1:30 pm: **Degradation of Terfenol-D particle epoxy composites under low-frequency cyclic magnetomechanical loading at the matrix glass transition start and finish temperatures,** W. D. Armstrong, M. Shanmugham, H. Bailey, Univ. of Wyoming . . . . [5387-64]

1:50 pm: **Static and dynamic properties of crystallographically aligned Terfenol-D/polymer composites,** C. P. Henry, W. Pulliam, Fortis Technologies, Inc.; G. P. Carman, Univ. of California/Los Angeles . . . . [5387-65]

2:10 pm: **Magnetic and mechanical properties of polycrystalline Galfeno,** E. M. Summers, J. D. Snodgrass, J. Slaughter, Etrema Products, Inc. [5387-66]

2:30 pm: **Comparison of transduction behavior of Galfenon and Terfenol-D,** J. C. Slaughter, E. Summers, J. Snodgrass, Etrema Products, Inc. . . . . [5387-67]

2:50 pm: **Magnetostriction of stress annealed FeGaAl alloys,** M. Wun-Fogle, J. B. Restorff, Naval Surface Warfare Ctr.; T. A. Lograsso, Iowa State Univ.; A. E. Clark, Clark Associates, Inc. . . . . [5387-68]

Coffee Break . . . . . . 3:10 to 3:40 pm

SESSION 12
Room: California
Thurs. 3:40 to 5:00 pm

Magnetic Materials II

Chairs: **Alison B. Flatau**, Univ. of Maryland/College Park; **Norman M. Wereley**, Univ. of Maryland/College Park

3:40 pm: **Measured iron-gallium alloy tensile properties under magnetic fields,** A. B. Flatau, J. Yoo, Univ. of Maryland/College Park . . . [5387-69]

4:00 pm: **Affect of stoichiometry on the behavior of iron-gallium,** J. Atulasimha, A. B. Flatau, I. Chopra, Univ. of Maryland/College Park; R. A. Kellogg, Sandia National Labs. . . . . [5387-70]

4:20 pm: **Remnant magnetization of an assemblage of magnetically interacting particles,** J. Li, H. Qu, Univ. of Nebraska/Lincoln . . . . . . [5387-71]

4:40 pm: **Rheological parameter estimation for a ferrous nanoparticle-based magnetorheological fluid using genetic algorithms,** A. Chaudhuri, N. M. Wereley, Univ. of Maryland/College Park . . . . [5387-72]

Conference End ■

SESSION 11
Room: San Diego
Thurs. 1:30 to 3:10 pm

Health Monitoring and Sensors

Chair: **Edward V. White**, Boeing Phantom Works

1:30 pm: **Certification of a submarine design using fiber Bragg grating sensors,** J. S. Kiddy, C. S. Baldwin, T. J. Salter, Systems Planning and Analysis, Inc. . . . . [5388-44]

1:50 pm: **Fiber optic strain and temperature sensors for directed-energy weapon target characterization,** R. S. Fielder, K. L. Stinson-Bagby, Luna Innovations, Inc. . . . . . [5388-45]

2:10 pm: **Advanced inline measurement and control tools,** K. D. Janoyan, M. J. Whelan, Clarkson Univ. . . . . . . [5388-33]

2:30 pm: **Application of FBG sensors to lightweight grid structures,** T. Ozaki, H. Takeya, S. Hahn, Mitsubishi Electric Corp. (Japan); N. Takeda, Univ. of Tokyo (Japan) . . . . [5388-46]

2:50 pm: **Distributed strain and temperature mapping in the safe affordable fission engine (SAFE-100) thermal simulator using fiber Bragg gratings,** K. L. Stinson-Bagby, R. S. Fielder, Luna Innovations, Inc. . . . . . [5388-47]

Conference End ■

SESSION 14
Room: Meeting House/Towne
Thurs. 1:30 to 2:30 pm

Health Monitoring III

Chair: **Tadanobu Sato**, Kyoto Univ. (Japan); Mark Derriso, Air Force Research Lab.

1:30 pm: **Piezoelectric active sensing using chaotic excitations,** T. R. Fasel, Los Alamos National Lab.; M. D. Todd, Univ. of California/San Diego; H. Sohn, G. Park, C. R. Farrar, Los Alamos National Lab. . . . . [5390-64]

1:50 pm: **Comparison of plain piezoceramics and inter-digital transducer for crack detection in plates,** S. T. Quek, J. Jin, P. S. Tua, National Univ. of Singapore (Singapore) . . . . [5390-65]

2:10 pm: **Damage detection in a plate with surface-bonded PZT patches based on time-reversal processing,** K. Adachi, K. Sakota, Kobe Univ. (Japan) . . . [5390-66]

Conference End ■

SESSION 14
Room: Meeting House/Sunrise
Thurs. 1:30 to 3:10 pm

Damage Assessment

Chairs: **Kevin K. Tseng**, Vanderbilt Univ.; **ChungBang Yun**, Korea Advanced Institute of Science and Technology (South Korea)

1:30 pm: **Critical assessment on parametric time-domain methods for the identification of vibrating structures,** C. Loh, T. Wu, National Taiwan Univ. (Taiwan) . . . . [5391-67]

1:50 pm: **Performance of smart piezoelectric transducers for structural health monitoring on composite laminates in cryogenic environments,** K. K. Tseng, Vanderbilt Univ. . . . . [5391-68]

2:10 pm: **Performance characteristics of the robust laser interferometer with respect to health monitoring needs for civil, mechanical, and aerospace infrastructure elements,** J. M. Zarroli, Consultant; M. Karchnak, Epoch Engineering, Inc. . . . . [5391-69]

2:30 pm: **Simultaneous monitoring of the corrosion activity and moisture inside aircraft lap joints,** K. R. Cooper, Luna Innovations, Inc.; Y. Ma, J. J. Wikswo, Vanderbilt Univ.; R. G. Kelly, Univ. of Virginia . . . . [5391-70]

2:50 pm: **Bolt loosening detection using vibration characteristics of thin plate with piezoelectric elements,** T. Nakahara, M. Yamamoto, Y. Ohya, M. Okuma, Tokyo Institute of Technology (Japan) . . . . [5391-71]

Coffee Break . . . . 3:10 to 3:40 pm

SESSION 15
Room: Meeting House/Sunrise
Thurs. 3:40 to 6:00 pm

System ID and Health Monitoring of Structures

Chairs: **John J. Myers**, Univ. of Missouri/Rolla; **Yumei Fu**, Chongqing Univ. (China)

3:40 pm: **Diagnosis of moisture damage in asphalt pavements,** J. S. Canning, C. Niezrecki, B. Birgisson, Univ. of Florida . . . . . . [5391-72]

4:00 pm: **Use of the total station for load testing of retrofitted bridges with limited access,** J. J. Myers, W. J. Merkle, Univ. of Missouri/Rolla . . . . [5391-73]

4:20 pm: **Damage detection and estimation of a steel frame through shaking table test and measurements,** K. Morita, M. Teshigawara, Building Research Institute (Japan) . [5391-74]

4:40 pm: **Impedance-based damage detection for civil infrastructures,** S. Park, J. Yi, C. Yun, Korea Advanced Institute of Science and Technology (South Korea); S. Lee, Y. Roh, Kyungpook National Univ. (South Korea) . . . . [5391-75]

5:00 pm: **Online monitoring of seismic damage on water distribution systems,** J. Liang, D. Xiao, X. Zhao, H. Zhang, Tianjin Univ. (China)[5391-76]

5:20 pm: **Optimal monitoring of water distribution systems (II),** D. Xiao, J. Liang, X. Zhao, H. Zhang, Tianjin Univ. (China) [5391-77]

5:40 pm: **Remote health-monitoring system for the Dafosi Yangtze River bridge,** Y. Fu, Y. Zhu, W. Chen, S. Huang, Chongqing Univ. (China) . . . . [5391-78]

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Smart Structures
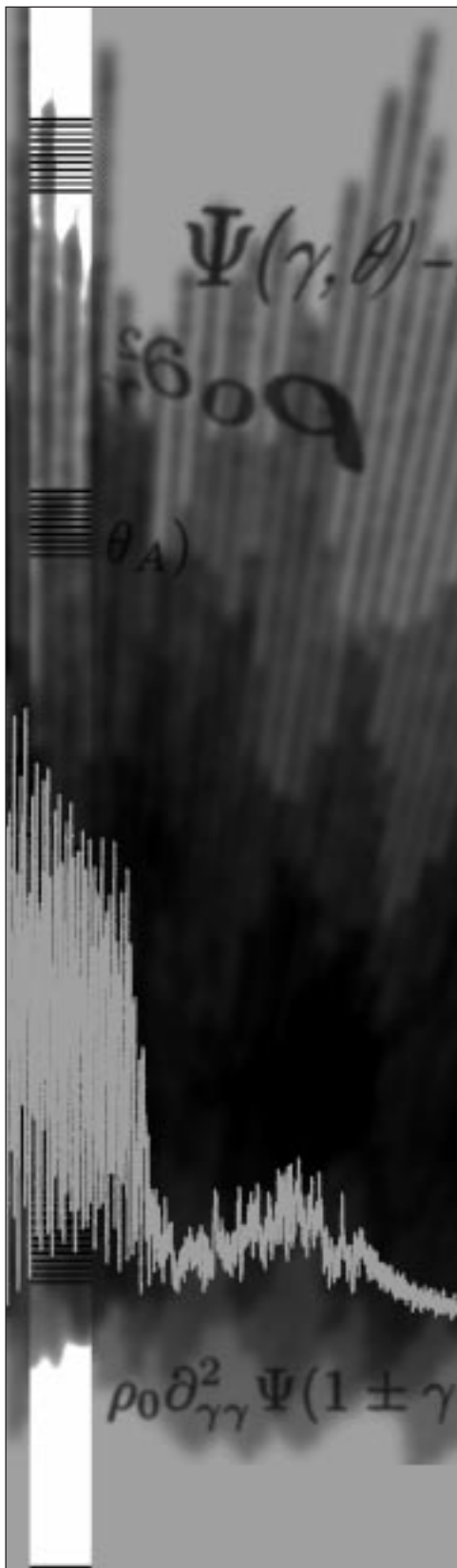
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NDE 2004 Lifetime Achievement Award

This award will be presented to an individual whose contributions have led to significant advances in research, development, or applications of NDE specifically related to NDE for health monitoring and diagnostics. The selection of this award will be made by the NDE Symposium Planning Committee.

For 2004, we are honored to present this award to:

Dr. Robert E. Green, Jr., John Hopkins Univ.

Brief Biography: **Dr. Robert E. Green, Jr.,** is the Theophilus Halley Smoot Professor of Engineering at Johns Hopkins Univ., Founder and Former Director of the Center for Nondestructive Evaluation (17 years) and a member of the Principal Professional Staff of the John Hopkins Applied Physics Laboratory. He was a Fulbright Scholar in Aachen, Germany, a Ford Foundation Resident Senior Engineer at the Radio Corporation of America (RCA), a Scientific Advisor at Aberdeen Proving Ground, a Consultant to the Metallurgy Division, Polymers Division, and the Office of Nondestructive Evaluation at the National Institute of Standards and Technology and a Materials Sciences Program Manager in the Defense Advanced Research Projects Agency (DARPA).

Conference 5392

Chairs: **Norbert Meyendorf,** Univ. of Dayton Research Institute;

George Y. Baaklini, NASA Glenn Research Ctr.;

Bernd Michel, Fraunhofer Institute for Reliability and Microintegration IZM Berlin (Germany)

Conference 5393
Chairs: **Peter J. Shull,** The Pennsylvania State Univ.;
Andrew L. Gyekenyesi, NASA Glenn Research Ctr.

Conference 5394

Chair: **Tribikram Kundu,** Univ. of Arizona

Conference 5395

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A. Emin Aktan, Drexel Univ.;

H. Felix Wu, National Institute of Standards and Technology

Conference 5392
Room: Royal Palm IV

Mon.-Wed. 15-17 March 2004
Proceedings of SPIE **Vol. 5392**

Testing, Reliability, and Application of Micro-and Nano-Material Systems II

Conference Chairs: **Norbert Meyendorf**, Univ. of Dayton Research Institute; **George Y. Baaklini**, NASA Glenn Research Ctr.; **Bernd Michel**, Fraunhofer Institute for Reliability and Mikrointegration IZM Berlin (Germany)

Program Committee: **Mark Bashkansky**, Naval Research Lab.; **Joachim F. Baumann**, Siemens AG (Germany); **James L. Blackshire**, Air Force Research Lab.; **Jurg Dual**, Swiss Federal Institute of Technology (Switzerland); **Robert E. Geer**, Univ. at Albany; **Gerald Gerlach**, Technische Univ. Dresden (Germany); **Thorsten Hesjedal**, Paul Drude Institute (Germany); **D. C. Hurley**, National Institute of Standards and Technology; **Chih-Hao Lee**, National Tsing Hua Univ. (Taiwan); **Tsuyoshi Mihara**, Tohoku Univ. (Japan); **Joseph A. Turner**, Univ. of Nebraska/Lincoln; **Matthias R. Werner**, Deutsche Bank AG (Germany); **Klaus-Juergen Wolter**, Technische Univ. Dresden (Germany); **Kazushi Yamanaka**, Tohoku Univ. (Japan)

Conference 5393
Room: Royal Palm V

Tues.-Wed. 16-17 March 2004
Proceedings of SPIE **Vol. 5393**

Nondestructive Evaluation and Health Monitoring of Aerospace Materials and Composites III

Conference Chairs: **Peter J. Shull**, The Pennsylvania State Univ.; **Andrew L. Gyekenyesi**, NASA Glenn Research Ctr.

Program Committee: **Ali Abdul-Aziz**, NASA Glenn Research Ctr.; **George Y. Baaklini**, NASA Glenn Research Ctr.; **David K. Hsu**, Iowa State Univ.; **Francesco Lanza di Scalea**, Univ. of California/San Diego; **Richard E. Martin**, Cleveland State Univ.; **Chiaki Miyasaka**, The Pennsylvania State Univ.; **Aftab A. Mufti**, Univ. of Manitoba (Canada); **Peter B. Nagy**, Univ. of Cincinnati; **Jaswinder S. Sandhu**, Santec Systems, Inc.; **Jerzy T. Sawicki**, Cleveland State Univ.; **Steven M. Shepard**, Thermal Wave Imaging, Inc.; **Graham H. Thomas**, Lawrence Livermore National Lab.; **Bernhard R. Tittmann**, The Pennsylvania State Univ.

Conference 5394
Room: Royal Palm VI

Mon.-Wed. 15-17 March 2004
Proceedings of SPIE **Vol. 5394**

Health Monitoring and Smart Nondestructive Evaluation of Structural and Biological Systems III

Conference Chair: **Tribikram Kundu**, Univ. of Arizona

Cochairs: **Ajit K. Mal**, Univ. of California/Los Angeles; **Yoseph Bar-Cohen**, Jet Propulsion Lab.

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Conference 5395
Room: Royal Palm II

Tues. 16 March 2004
Proceedings of SPIE **Vol. 5395**

Nondestructive Detection and Measurement for Homeland Security II

Conference Chairs: **Steven R. Doctor**, Pacific Northwest National Lab.; **Yoseph Bar-Cohen**, Jet Propulsion Lab.; **A. Emin Aktan**, Drexel Univ.; **H. Felix Wu**, National Institute of Standards and Technology

Program Committee: **George Y. Baaklini**, NASA Glenn Research Ctr.; **Alison B. Flatau**, Univ. of Maryland/College Park; **Forrest R. Frank**, Institute for Defense Analyses; **Tribikram Kundu**, Univ. of Arizona; **S.-C. Liu**, National Science Foundation; **Bernd Michel**, Fraunhofer-Institute IZM (Germany); **Kam W. Ng**, Office of Naval Research; **Paul D. Panetta**, Pacific Northwest National Lab.; **Glenn A. Washer**, Federal Highway Administration; **George Zentai**, Varian Medical Systems, Inc.

NDE

Conference 5392 Room: Royal Palm IV	Conference 5393 Room: Royal Palm V	Conference 5394 Room: Royal Palm VI	Conference 5395 Room: Royal Palm II

MONDAY 15 MARCH

8:00 to 10:00 am

NDE Achievement Award Presentation
Nondestructive Evaluation Best Paper Award Presentation

Plenary Presentation • Town and Country Ballroom
Future of Biomimetic Microelectronics
Mark Humayun, M.D., Ph.D., University of Southern California

SESSION 1
Room: Royal Palm IV
Mon. 10:30 am to 12:10 pm

Material Properties on the Nanoscale I

Chair: **Norbert Meyendorf**, Univ. of Dayton Research Institute

10:30 am: **Micro/nanoscale tribological and mechanical characterization for MEMS/NEMS** *(Invited Paper)*, B. Bhushan, The Ohio State Univ.　[5392-01]

11:10 am: **Digital Q-control of an AFM: dissipation, average forces, tip wear, and resolution** *(Invited Paper)*, R. Proksch, Asylum Research　. . . . . [5392-02]

11:50 am: **Nondestructive mechanical imaging of nanomaterials,** R. E. Geer, Y. Zheng, F. Heuchling, Univ. at Albany . . . . [5392-03]

Lunch Break　. . . . .　12:10 to 1:30 pm

SESSION 1
Room: Royal Palm VI
Mon. 10:30 am to 12:10 pm

Aerospace and Mechanical Engineering Applications

Chairs: **Tribikram Kundu**, Univ. of Arizona; **Wolfgang Grill**, Univ. Leipzig (Germany)

10:30 am: **Automated structural health monitoring system using acoustic emission and modal data,** A. K. Mal, Univ. of California/Los Angeles; F. Ricci, Univ. degli Studi di Napoli Federico II (Italy); S. Banerjee, S. Gibson, Univ. of California/ Los Angeles　. . . . . [5394-01]

10:50 am: **Corrosion damage detection with piezoelectric wafer active sensors,** D. T. Thomas, J. T. Welter, Air Force Research Lab.; V. Giurgiutiu, Univ. of South Carolina; J. Barnes, Air Force Research Lab.　. . . . . [5394-02]

11:10 am: **Demonstration of advanced life prediction and state awareness technologies necessary for prognosis of turbine engine disks,** S. Russ, A. Rosenberger, J. Larsen, Air Force Research Lab.; J. Littles, Jr., R. Singh, R. Pettit, R. Holmes, B. Cowles, R. Berkley, D. Carroll, J. J. Schirra, Pratt & Whitney　. . . [5394-03]

11:30 am: **Damage detection in metallic structures using ANN,** P. Banerji, B. Pandya, Indian Institute of Technology (India)　. [5394-04]

11:50 am: **Monitoring of impact damages in sandwich plates with a foam core using bonded PZT discs,** D. Barnoncel, M. Dupont, D. R. Osmont, ONERA (France)　. . . . . [5394-05]

Lunch Break　. . . . .　12:10 to 1:30 pm

MONDAY 15 MARCH

SESSION 2
Room: Royal Palm IV
Mon. 1:30 to 5:20 pm

Material Properties on the Nanoscale II

Chair: **Robert E. Geer**, Univ. at Albany

1:30 pm: **Nondestructive electric field probing in ferroelectrics, organic molecular films, and near-field optical nanodevices** *(Invited Paper),* L. M. Eng, Technische Univ. Dresden (Germany) . . . . [5392-04]

2:10 pm: **Evaluation of domain boundary in PZT by ultrasonic atomic force microscopy,** T. Tsuji, National Institute of Advanced Industrial Science and Technology (Japan) and Tohoku Univ. (Japan); H. Ogiso, J. Akedo, National Institute of Advanced Industrial Science and Technology (Japan); S. Saito, K. Fukuda, K. Yamanaka, Tohoku Univ. (Japan) . . . . [5392-05]

2:30 pm: **Evaluation of forces between alkaline earth metal fluoride particles and single crystal substrate using atomic-force microscopy,** Y. Tsai, V. Nalladega, S. Sathish, Univ. of Dayton; M. K. Stanford, NASA Glenn Research Ctr. . . . . [5392-06]

2:50 pm: **New nano-indention and scanning probe tools and techniques,** W. C. Oliver, E. Herbert, MTS Nano Instruments Innovation Ctr. . . . [5392-07]

Coffee Break . . . . 3:10 to 3:40 pm

SESSION 2
Room: Royal Palm VI
Mon. 1:30 to 3:10 pm

Guided Waves for Structural Health Monitoring

Chairs: **Francesco Lanza di Scalea**, Univ. of California/San Diego; **George Zentai**, Varian Medical Systems, Inc.

1:30 pm: **Characterization of Lamb waves in viscoelastic plates,** L. J. Jacobs, K. Luanvilai, J. Qu, Georgia Institute of Technology; P. Wilcox, Bristol Univ. (United Kingdom); M. Lowe, Imperial College (United Kingdom) . . . . [5394-06]

1:50 pm: **Guided acoustic emission waves in structural plates,** A. K. Mal, S. Banerjee, Univ. of California/Los Angeles . . . . [5394-07]

2:10 pm: **Plate damage identification using wave propagation and impedance methods,** J. R. Wait, G. Park, H. Sohn, C. R. Farrar, Los Alamos National Lab. . . . . [5394-08]

2:30 pm: **Disbond detection in adhesively bonded structures using piezoelectric wafer active sensors,** A. Cuc, V. Giurgiutiu, Univ. of South Carolina . . . . [5394-09]

2:50 pm: **Propagation of ultrasonic guided waves in lap-shear adhesive joints,** F. Lanza di Scalea, P. Rizzo, Univ. of California/San Diego; A. Marzani, Univ. della Calabria (Italy) . . . . [5394-10]

Coffee Break . . . . 3:10 to 3:40 pm

NDE

Conference 5392
Room: Royal Palm IV

Conference 5393
Room: Royal Palm V

Conference 5394
Room: Royal Palm VI

Conference 5395
Room: Royal Palm II

MONDAY 15 MARCH

SESSION 2 *cont.*

3:40 pm: **Effects of relative humidity on the measurement of nanoscale elastic properties with AFAM,** D. C. Hurley, National Institute of Standards and Technology; M. Kopycinska-Mueller, National Institute of Standards and Technology and IZFP (Germany); J. A. Turner, Univ. of Nebraska/Lincoln . . . . [5392-08]

4:00 pm: **Dynamic behavior of dagger-shaped atomic force microscope cantilevers,** J. A. Turner, Univ. of Nebraska/Lincoln; D. C. Hurley, National Institute of Standards and Technology; K. Shen, Univ. of Nebraska/Lincoln[5392-09]

4:20 pm: **Acoustic measurements at nanometer scale,** A. Daugela, O. L. Warren, T. J. Wyrobek, Hysitron Inc. . . . . [5392-10]

4:40 pm: **Characterization of microcracks by application of digital image correlation to SPM images,** J. Keller, A. Gollhardt, D. Vogel, B. Michel, Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration (Germany) . . . . [5392-11]

5:00 pm: **Positron annihilation to study nanoprecipitations of aluminum alloys,** N. Meyendorf, Univ. of Dayton Research Institute; G. Dlubek, Institute for Innovation Technologies GmbH (Germany) . . . . [5392-12]

SESSION 3
Room: Royal Palm VI
Mon. 3:40 to 6:20 pm

Civil Engineering and Infrastructure Applications

Chairs: **Hwai-Chung Wu**, Wayne State Univ.; **Fu-Kuo Chang**, Stanford Univ.

3:40 pm: **Characterization of reinforced concrete beams with embedded piezoelectric transducers for health monitoring,** S. Haran, Arkansas State Univ. . . . . [5394-11]

4:00 pm: **Bridge deck scanning system for delamination and internal integrity evaluation of concrete,** Y. Tinkey, D. Hollema, L. Olson, Olson Engineering, Inc. . . . . [5394-12]

4:20 pm: **Analysis of wave propagation in symmetrically periodic sinusoidal wave guide,** S. Banerjee, T. Kundu, Univ. of Arizona . . . . [5394-13]

4:40 pm: **Characterization of plastically deformed structures utilizing ultrasonic velocity measurements,** P. D. Panetta, B. Francini, S. Ahmed, M. Morra, Pacific Northwest National Lab.; G. Alers, EMAT Consulting; R. B. Thompson, Iowa State Univ.; K. Johnson, Pacific Northwest National Lab. . . . . [5394-14]

5:00 pm: **Proof-of-concept application of impedance-based health monitoring on space shuttle ground structures,** D. M. Peairs, B. L. Grisso, Virginia Polytechnic Institute and State Univ.; R. N. Margasahayam, NASA Kennedy Space Ctr.; K. R. Page, United Space Alliance; D. J. Inman, Virginia Polytechnic Institute and State Univ. . . . . [5394-15]

5:20 pm: **Optimal sensor placement on large-scale civil structures,** M. Meo, Cranfield Univ. (United Kingdom) . . . . [5394-16]

5:40 pm: **Airport pavement roughness evaluation based on aircraft dynamic response,** Q. Dong, Chuo Univ. (Japan); Y. Hachiya, National Institute for Land and Infrastructure Management (Japan); K. Endo, K. Himeno, Chuo Univ. (Japan); A. Kawamura, Kitami Institute of Technology (Japan); K. Matsui, Tokyo Denki Univ. (Japan) . . . . [5394-17]

6:00 pm: **High-sensitivity NDE in concrete: enhancement of energy dispersion using acoustic perturbation,** K. L. Warnemuende, H. Wu, Wayne State Univ. . . . . [5394-18]

Conference 5392
Room: Royal Palm IV

Conference 5393
Room: Royal Palm V

Conference 5394
Room: Royal Palm VI

Conference 5395
Room: Royal Palm II

TUESDAY 16 MARCH

8:00 to 8:55 am

Plenary Presentation • Town and Country Ballroom
The CIRCE Project: Of Bats And Robots
Herbert Peremans, University of Antwerp

SESSION 3
Room: Royal Palm IV
Tues. 9:00 to 11:50 am

Advanced Microscopic Techniques

Chair: **Lukas M. Eng**, Technische Univ. Dresden (Germany)

Keynote
9:00 am: **Micro- and nano-NDT in the Laboratory for Acoustic Diagnosis and Quality Assurance Dresden** *(Invited Paper)*, T. Baumbach, B. Bendjus, B. Frankenstein, D. Hentschel, M. Herms, V. Melov, J. Schreiber, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren (Germany) . . . . [5392-13]

9:40 am: **Introduction to EBSD analysis of micro- to nanoscale microstructures in metals and ceramics,** S. Sitzman, HKL Technology, Inc. . . . . [5392-14]

Coffee Break . . . . 10:00 to 10:30 am

10:30 am: **Raman spectroscopic investigation of stresses in microstructures of pyro-electric devices** *(Invited Paper)*, R. Krawietz, Hochschule für Technik und Wirtschaft Dresden (Germany) . . . . [5392-15]

11:10 am: **Barkhausen noise and eddy current microscopy: a new scanning probe technique for microscale characterization of materials,** K. Szielasko, S. Lugin, M. Kopp, I. Alpeter, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren (Germany) . . . . . [5392-17]

11:30 am: **Improved mechanical properties of metallic microstructures,** J. Schreiber, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren (Germany); S. Braun, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany); A. Gatto, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); T. Baumbach, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren (Germany) . . . . [5392-18]

Lunch/Exhibition Break . . . . 11:50 am to 1:30 pm

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SESSION 1
Room: Royal Palm V
Tues. 9:00 to 10:50 am

NDE and Health Monitoring of Aerospace Structures

Chairs: **Chiaki Miyasaka**, The Pennsylvania State Univ.; **Laura M. Harmon**, Cleveland State Univ.

9:00 am: **Novel zooming method for delamination monitoring of CFRP laminates using electrical potential change,** M. Ueda, A. Todoroki, Y. Shimamura, H. Kobayashi, Tokyo Institute of Technology (Japan) . . . . [5393-02]

9:20 am: **Ultrasonic spectroscopy for the inspection of airspace structures,** T. Stepinski, Uppsala Univ. (Sweden) . . . . [5393-03]

9:40 am: **High-speed 3D scanner with real-time 3D processing,** J. P. Lavelle, S. R. Schuet, NASA Ames Research Ctr. . . . . [5393-04]

Coffee Break . . . . 10:00 to 10:30 am

10:30 am: **Quantitative analysis using thermographic contrast data,** S. M. Shepard, J. R. Lhota, Y. L. Hou, T. Ahmed, Thermal Wave Imaging, Inc. . . . [5393-05]

SESSION 2
Room: Royal Palm V
Tues. 10:50 to 11:50 am

Ultrasonic Evaluation of Materials

Chairs: **Jerzy T. Sawicki**, Cleveland State Univ.; **Ali Abdul-Aziz**, NASA Glenn Research Ctr.

10:50 am: **Non-contact NDE of microscopic surface-breaking cracks using laser generated and detected ultrasonic surface waves,** A. Cooney, Univ. of Dayton; J. L. Blackshire, Air Force Research Lab. . . . . [5393-06]

11:10 am: **Comparison of the capabilities of portable shearography and portable electronic speckle pattern interferometry,** D. Findeis, J. Gryzagoridis, Univ. of Cape Town (South Africa) . . . . [5393-07]

11:30 am: **Application of a high numerical aperture acoustic lens to visualize disbonding between metallic films and polymer substrates,** S. Owens, J. L. Rose, The Pennsylvania State Univ. . . [5393-08]

Lunch/Exhibition Break . . . . 11:50 am to 1:30 pm

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SESSION 4
Room: Royal Palm VI
Tues. 9:00 to 10:00 am

Composite Material Characterization

Chairs: **Michel B. Lemistre**, ONERA (France); **Daniel R. Einstein**, Cleveland Clinic Foundation

9:00 am: **Monitoring of impact damages in stiffened and non-stiffened carbon epoxy plates using bonded PZT discs,** R. D. Reed, M. Dupont, D. R. Osmont, ONERA (France) . . . . [5394-19]

9:20 am: **Elastic wave propagation in laminated FRP plates,** S. Nayak, P. Banerji, Indian Institute of Technology (India) . . . . [5394-20]

9:40 am: **Evaluation of the performances of an electromagnetic SHM system: comparison between numerical simulation, experimental data, and ultrasonic investigations,** M. B. Lemistre, ONERA (France) . . . . [5394-21]

Coffee Break . . . . 10:00 to 10:30 am

SESSION 5
Room: Royal Palm VI
Tues. 10:30 am to 12:10 pm

Damage Diagnosis and Prediction

Chairs: **Amit Shukla**, Miami Univ. of Ohio; **Yuris A. Dzenis**, Univ. of Nebraska/Lincoln

10:30 am: **Wireless actuation and sensing for local structural damage prognosis,** J. P. Lynch, Univ. of Michigan . . . . [5394-22]

10:50 am: **Smart damage prediction: a distance to bifurcation-based methodology,** A. Shukla, A. Frederick, Miami Univ. of Ohio . . . . [5394-23]

11:10 am: **Novel computational modeling, damage indicators, and bio-inspired sensory architecture for structural health monitoring applications,** A. Ghoshal, NASA Langley Research Ctr. . . . [5394-24]

11:30 am: **Direct damage diagnosis of structural component using vibration response,** T. Ma, H. T. Yang, Univ. of California/Santa Barbara; C. C. Chang, Hong Kong Univ. of Science and Technology (Hong Kong) . . . . . [5394-25]

11:50 am: **Damage identification in beams via long-distance propagation of effective excitation signal,** P. Kolakowski, J. Holnicki-Szulc, Institute of Fundamental Technological Research (Poland)[5394-26]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

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SESSION 1
Room: Royal Palm II
Tues. 9:00 to 10:00 am

Homeland Security and Measurement Technologies I

Chairs: **Aaron A. Diaz**, Pacific Northwest National Lab.; **Michael A. Lind**, Pacific Northwest National Lab.

9:00 am: **SMART sensors for homeland security applications** *(Invited Paper)*, M. A. Lind, B. W. Wright, Pacific Northwest National Lab. . . . . [5395-01]

9:40 am: **GIS-based electrical power system performance under a major catastrophic event,** X. Dong, Univ. of California/Irvine . . . . [5395-02]

Coffee Break . . . . 10:00 to 10:30 am

SESSION 2
Room: Royal Palm II
Tues. 10:30 am to 12:10 pm

Homeland Security and Measurement Technologies II

Chairs: **Aaron A. Diaz**, Pacific Northwest National Lab.; **Michael A. Lind**, Pacific Northwest National Lab.

10:30 am: **Non-intrusive nondestructive method to detect fissile material,** S. Jayaraman, B. R. Tittmann, P. M. Lenahan, The Pennsylvania State Univ.; F. Ze, Lawrence Livermore National Lab. . . . . [5395-03]

10:50 am: **Radiation detection field test at the Federal Express (FedEx) air cargo facility at Denver International Airport (DIA),** A. Waters, D. Weirup, H. Hall, D. Trombino, G. Mattesich, E. L. Hull, S. Bahowick, A. Loshak, P. Weiss, J. Gruidl, Lawrence Livermore National Lab. . . . . [5395-04]

11:10 am: **Ultrasonic database development for the acoustic inspection device: the velocity-attenuation measurement system (VAMS),** A. A. Diaz, B. J. Burghard, J. D. Valencia, T. J. Samuel, Pacific Northwest National Lab. [5395-05]

11:30 am: **Remote sensing for urban damage detection,** M. Shinozuka, Univ. of California/Irvine; K. Loh, Johns Hopkins Univ. . . . . [5395-06]

11:50 am: **Eddy current-based technology for identification of dual-use metals,** T. J. Samuel, A. A. Diaz, R. A. Pappas, M. Flake, J. R. Skorpik, Pacific Northwest National Lab. . . . . [5395-07]

Lunch/Exhibition Break . . . . 12:10 to 1:30 pm

NDE

NDE for Health Monitoring and Diagnostics

Conference 5392	Conference 5393	Conference 5394	Conference 5395
Room: Royal Palm IV	Room: Royal Palm V	Room: Royal Palm VI	Room: Royal Palm II

TUESDAY 16 MARCH

SESSION 4
Room: Royal Palm IV
Tues. 1:30 to 5:20 pm

Surfaces and Cracks

Chair: **James L. Blackshire**, Air Force Research Lab.

1:30 pm: **Interferometric characterization of transient effects in MEMS,** E. Novak, P. Browne, Veeco Instruments Inc. [5392-19]

1:50 pm: **Comparison between the atomic force microscopy and x-ray reflectivity on the characterization of the roughness of a surface,** H. Su, C. Lee, National Tsing Hua Univ. (Taiwan) . . . . [5392-20]

2:10 pm: **Carbon buffer layers for smoothing substrates of EUV and x-ray multilayer mirrors,** S. Braun, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany); B. Bendjus, Fraunhofer-Institut für Zerstörungsfreie Prüverfahren (Germany); T. Foltyn, M. Menzel, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany); J. Schreiber, Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren (Germany); D. Weissbach, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany) . . . . . [5392-21]

2:30 pm: **Determination of stress intensity factor locally at crack tips using image correlation techniques,** Y. Tsai, Univ. of Dayton; J. Keller, Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration (Germany); D. Eylon, Univ. of Dayton; D. Vogel, B. Michel, Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration (Germany); N. Meyendorf, Univ. of Dayton Research Institute . . . . [5392-22]

2:50 pm: **Subharmonic waves from fatigue cracks using nonlinear ultrasound,** T. Mihara, Tohoku Univ. (Japan); M. Akino, Shinano Kenshi Co., Ltd. (Japan); K. Yamanaka, Tohoku Univ. (Japan) . . . . [5392-23]

Coffee Break . . . . 3:10 to 3:40 pm

SESSION 3
Room: Royal Palm V
Tues. 1:30 to 3:10 pm

Sensing and Structural Health Monitoring of Innovative Structures in Canada

Chairs: **Gamil Tadros,** SPECO Engineering (Canada); **John Newhook**, Dalhousie Univ. (Canada)

1:30 pm: **Centralized remote structural monitoring and management of real-time data,** L. Han, Univ. of Manitoba (Canada); J. P. Newhook, Dalhousie Univ. (Canada) and ISIS Canada (Canada); A. A. Mufti, Univ. of Manitoba (Canada) and ISIS Canada (Canada) . . . . [5393-09]

1:50 pm: **Distributed Brillioun temperature measuremments without frequency scan for dymanic process monitoring,** G. Ferrier, X. Bao, L. Zou, L. Chen, Univ. of Ottawa (Canada) [5393-10]

2:10 pm: **Fatigue and post-fatigue performance of Fabry-Perot FOS installed on CFRP-strengthened rc-beams,** C. Gheorghui, P. Labossiere, J. Proulx, Univ. de Sherbrooke (Canada) . . . . . [5393-11]

2:30 pm: **First application of second-generation steel-free deck slabs for bridge rehabilitation,** R. Eden, DOT and Government Services of Manitoba (Canada); D. Eddie, Earth Tech (Canada); C. Klowak, A. A. Mufti, B. Bakht, G. Tadros, ISIS Canada (Canada) . [5393-12]

2:50 pm: **Structural health monitoring of bridge decks reinforced with FRP bars: Wotton Bridge,** B. Benmokrane, E. El-Salakawy, Univ. of Sherbrooke (Canada); G. DesGagne, Ministry of Transportation (Canada); M. Quirion, Roctest Inc. . . . . [5393-13]

SESSION 6
Room: Royal Palm VI
Tues. 1:30 to 3:10 pm

Novel Instruments and Applications

Chairs: **Ajit K. Mal**, Univ. of California/Los Angeles; **Bernhard R. Tittmann**, The Pennsylvania State Univ.

1:30 pm: **Rolling dry-coupled transducers for ultrasonic inspections of aging aircraft structures,** I. N. Komsky, Northwestern Univ. . . . . [5394-27]

1:50 pm: **Structural boundary effects and their applications to health monitoring,** P. F. Pai, L. Huang, S. H. Gopalakrishnamurthy, Univ. of Missouri/Columbia; J. H. Chung, Global Contour, Inc. . . . . [5394-28]

2:10 pm: **Temperature effects on the wave propagation technique for use in supplementing impedance-based structural health monitoring,** B. L. Grisso, D. J. Leo, D. J. Inman, Virginia Polytechnic Institute and State Univ. and CIMSS . . . . [5394-29]

2:30 pm: **Precision measurement of acoustic reflectivity for a scanning acoustic microscope that measures amplitude and phase: applicability in biology,** W. Grill, W. Ngwa, S. Knauth, Univ. Leipzig (Germany); C. Laforsch, Ludwig-Maximilians-Univ. München (Germany) . . . . [5394-30]

2:50 pm: **Passive wireless strain monitoring of tire using capacitance change,** R. Matsuzaki, A. Todoroki, Tokyo Institute of Technology (Japan) [5394-31]

Coffee Break . . . . 3:10 to 3:40 pm

SESSION 3
Room: Royal Palm II
Tues. 1:30 to 3:10 pm

Homeland Security Technology for Monitoring Infrastructure I

Chairs: **H. Felix Wu**, National Institute of Standards and Technology; **Maria Q. Feng**, Univ. of California/Irvine

1:30 pm: **Microwave imaging techniques for field application** *(Invited Paper),* Y. J. Kim, Univ. of California/Irvine; L. Jofre, Univ. Politècnica de Catalunya (Spain); M. Q. Feng, H. Ko, F. De Flaviis, Univ. of California/Irvine . . . . [5395-08]

2:10 pm: **Design of a new power-efficient wireless sensor system for structural health monitoring,** L. Mastroleon, A. Kiremidjian, Stanford Univ.; J. Lynch, Univ. of Michigan; E. Carryer, K. Law, Stanford Univ. . . . . [5395-09]

2:30 pm: **Potential applications of SMART Layer® technology for homeland security,** M. Lin, Acellent Technologies, Inc.; H. F. Wu, National Institute of Standards and Technology; A. Kumar, S. Beard, X. Qing, C. Zhang, Acellent Technologies, Inc. . . . . [5395-10]

2:50 pm: **GIS-based automated management of highway surface crack inspection system,** H. Chung, M. Shinozuka, T. Soeller, Univ. of California/Irvine . . . . [5395-11]

Coffee Break . . . . 3:10 to 3:40 pm

TUESDAY 16 MARCH

SESSION 4 cont.

3:40 pm: **Characterization of materials with nanoscopic filler particles by AFM techniques,** D. Vogel, J. Keller, B. Michel, Fraunhofer-Institut für Zuverlässigkeit und Mikrointegration (Germany) [5392-24]

4:00 pm: **Characterization of microscopic surface breaking cracks using the near-field intensification of nondestructive laser generated surface waves,** A. Cooney, Univ. of Dayton; J. Blackshire, Air Force Research Lab. . . . . [5392-25]

4:20 pm: **Laser processing of microcracks for structural life extension,** J. L. Blackshire, Air Force Research Lab.; L. Dosser, K. Hix, Mound Laser & Photonics Ctr., Inc. . . . . [5392-26]

4:40 pm: **Dynamic holography and adaptive interferometry of vibrating functional components,** S. Sakai, Tohoku Univ. (Japan); K. Aizu, NEC Software (Japan); A. Mizukami, Tohoku Univ. (Japan); H. Cho, Aoyama Gakuin Univ. (Japan); K. Yamanaka, Tohoku Univ. (Japan) . . . . [5392-27]

5:00 pm: **Calibration of an electro-optical variable circular retarder with application in a nulling microellipsometer,** Q. Zhan, Y. Hor, Univ. of Dayton . . . . [5392-28]

SESSION 7
Room: Royal Palm VI
Tues. 3:40 to 6:00 pm

Biological and Medical Applications

Chairs: **Reiner Salzer,** Technische Univ. Dresden (Germany); **Christian P. Schultz,** Bruker Optics Inc.

3:40 pm: **Investigation of mechanical impact effects on biological cells with scanned image microscopy,** B. Tittmann, S. Jayaraman, C. Miyasaka, J. Welsch, W. Hymer, N. Nicholas, The Pennsylvania State Univ. . . . . [5394-32]

4:00 pm: **Health monitoring of biomaterial from molecular fingerprints,** R. Salzer, Technische Univ. Dresden (Germany) . . . . [5394-33]

4:20 pm: **Bio-soft-matter imaging and micrometrology by phase-sensitive ultrasonic microscopy,** W. Ngwa, W. Grill, Univ. Leipzig (Germany); T. Kundu, Univ. of Arizona . . . . [5394-34]

4:40 pm: **Osteoblast adhesion of breast cancer cells with scanned image microscopy,** C. Miyasaka, B. Tittmann, R. Mercer, A. Mastro, The Pennsylvania State Univ. . . . . [5394-35]

5:00 pm: **Observation of biodeteriorating microbes by scanning electron microscope with energy dispersive x-ray spectrometer,** T. Futagami, K. Yoshimoto, H. Tamai, T. Takamatsu, Hiroshima Institute of Technology (Japan) [5394-36]

5:20 pm: **Resonant optical scanner using cantilever waveguide,** W. Wang, Univ. of Washington . . . . [5394-37]

5:40 pm: **In-vivo wireless bio-diagnostic network system for long-term bioactivity monitoring,** W. Wu, C. Chen, Y. Chen, M. Jin, C. Wen, H. Tsai, Y. Huang, C. Kao, L. Huang, U. Lei, C. Lin, S. Lu, S. Lin, C. Lee, National Taiwan Univ. (Taiwan) [5394-38]

SESSION 4
Room: Royal Palm II
Tues. 3:40 to 6:20 pm

Homeland Security Technology for Monitoring Infrastructure II

Chairs: **H. Felix Wu,** National Institute of Standards and Technology; **Maria Q. Feng,** Univ. of California/Irvine

3:40 pm: **Wireless structural monitoring for homeland security applications,** G. K. Kiremidjian, Sensametrics, Inc.; A. S. Kiremidjian, Stanford Univ. and Sensametrics, Inc.; J. P. Lynch, Univ. of Michigan . . . . [5395-12]

4:00 pm: **Design and experimental validation of a wireless PVDF displacement sensor for structure monitoring,** H. Gu, G. Lloyd, M. Wang, Univ. of Illinois/Chicago . . . . . . [5395-13]

4:20 pm: **Homeland security: in the point of view of infrastructures,** Y. Zhao, M. Wang, Univ. of Illinois/Chicago [5395-14]

4:40 pm: **Exploration of ambient vibration test as principal experimentation tool for structural identification (St-Id),** K. Ciloglu, K. A. Grimmelsman, A. E. Aktan, Drexel Univ. . . . . [5395-15]

5:00 pm: **Structural integrity recovery system (SIRS),** C. V. Hedberg, Consultant . . . . [5395-16]

5:20 pm: **Multihazard vulnerability and post-hazard safety evaluation of existing highway bridges,** H. Ghasemi, Federal Highway Administration; E. Safak, U.S. Geological Survey; M. Saiidi, Univ. of Nevada/Reno; A. E. Aktan, Drexel Univ.; I. Buckle, Univ. of Nevada/Reno . [5395-17]

5:40 pm: **Hospital vulnerabilty analysis and applications of NDT technology,** A. Gonzalez, Jr., Univ. of Missouri/Rolla . . . . [5395-18]

6:00 pm: **PIN switched microstrip slot antenna array for 3D microwave reflection tomography,** H. Ko, Y. J. Kim, M. Q. Feng, F. D. Flaviis, Univ. of California/Irvine . . . . [5395-19]

✔ **Posters-Tuesday**
The following poster will be displayed in the formal Poster Session and Exhibition Reception on Tuesday evening from 6:00 to 7:30 pm. Authors will be present during this time for discussion. Poster authors will be able to set up their poster papers between 10:00 am and 4:00 pm Tuesday. Poster papers can be previewed after 4 pm before the formal poster session begins at 6:00 pm.

Chair: **Tribikram Kundu,** *Univ. of Arizona*

✔ **Monitoring of civil engineering structures,** V. E. Tyrsa, L. P. Burtseva, M. Rivas Lopez, Univ. Autónoma de Baja California (Mexico); V. V. Tyrsa, Automobile and Highway Technical Univ. (Ukraine) . . . . [5394-59]

✔ **Sensitive skin design for prosthetic limb interfacial force and condition analysis,** G. Rowe, A. V. Mamishev, Univ. of Washington . [5394-61]

✔ **Damage detection in laminated FRP plates using ANN,** A. Bage, P. Banerji, Indian Institute of Technology (India) . . . . [5394-63]

✔ **Progress in impact echo scanning technology,** Y. Tinkey, D. Sack, L. Olson, Olson Engineering, Inc. . . . . [5394-64]

✔ **Robotic systems for homeland security,** B. Esser, J. Miller, D. R. Huston, Univ. of Vermont [5395-20]

NDE

Conference 5392 Room: Royal Palm IV	**Conference 5393** Room: Royal Palm V	**Conference 5394** Room: Royal Palm VI	**Conference 5395** Room: Royal Palm II

WEDNESDAY 17 MARCH

8:00 to 8:55 am

Plenary Presentation • Town and Country Ballroom

Building Robust Systems out of Non-Robust Components

Pradeep K. Khosla, Carnegie Mellon University

SESSION 5
Room: Royal Palm IV
Wed. 9:00 am to 12:10 pm

Composites and Interfaces

Chair: **Joseph A. Turner**, Univ. of Nebraska/Lincoln

Keynote
9:00 am: **NDE of microstructured materials by x-ray diffraction and refraction topography** *(Invited Paper)*, M. P. Hentschel, Bundesanstalt für Materialforschung und -prüfung (Germany) . . . . [5392-29]

9:40 am: **Application of computer tomography in microelectronic packaging,** M Speck, K. Wolter, M. Danczak, Technische Univ. Dresden (Germany) . . . . [5392-30]

Coffee Break . . . . 10:00 to 10:30 am

10:30 am: **Mechanical wave propagation at phase and material interfaces of microstructures** *(Invited Paper)*, J. Vollmann, D. M. Profunser, J. Goossens, J. Dual, Swiss Federal Institute of Technology (Switzerland) . . . . . [5392-31]

11:10 am: **NDE of fiber-glass insulation material using acoustic emission,** F. Shu, V. Godinez, R. Finlayson, Physical Acoustics Corp. . . . . [5392-32]

11:30 am: **Continuum simulation of adhesive-adherend interface layer for USNDE,** V. R. Yerikalapudy, Andhra Univ. (India); S. Gopinathan, Gayatri Vidya Parishad College of Engineering (India) . . . . [5392-33]

11:50 am: **Nondestructive ultrasonic characterization of multilayer coatings,** S. Uzzaman, Univ. of Dayton; J. Hoffmann, S&K Technologies, Inc.; M. Khobaib, N. Meyendorf, Univ. of Dayton . . . [5392-34]

Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 4
Room: Royal Palm V
Wed. 9:00 am to 12:10 pm

NDE Monitoring and Methods

Chairs: **Bernhard R. Tittmann**, The Pennsylvania State Univ.; **Richard E. Martin**, Cleveland State Univ.

9:00 am: **Combined NDE/finite element study to evaluate matrix porosity influence on the matrix cracking stress of ceramic matrix composites,** A. Abdul-Aziz, L. J. Ghosn, G. Y. Baaklini, R. W. Rauser, NASA Glenn Research Ctr. [5393-14]

9:20 am: **Non-model-based approach to damage localization,** M. Camerino, K. Peters, North Carolina State Univ. . . . . [5393-15]

9:40 am: **Model for the ultrasonic detection of surface-breaking cracks by the scanning laser-source technique,** I. Arias, California Institute of Technology; J. D. Achenbach, Northwestern Univ. . . . . [5393-16]

Coffee Break . . . . 10:00 to 10:30 am

10:30 am: **Development of an automatic tapping device for practical application of tapping sound analysis,** J. S. Hwang, S. J. Kim, Seoul National Univ. (South Korea) . . . . [5393-17]

10:50 am: **Damage detection using wavelet packet transforms and ultrasonic images,** V. S. Rao, Univ. of Missouri/Rolla and National Science Foundation; A. Achanta, Univ. of Missouri/Rolla [5393-18]

11:10 am: **Bearing damage analysis and diagnosis in rotating machinery,** K. R. Bischof, Federal-Mogul Manufacturing Technology Development; J. T. Sawicki, Cleveland State Univ. . . . . [5393-19]

11:30 am: **Analysis of transient response of cracked flexible rotor,** J. T. Sawicki, Cleveland State Univ.; A. L. Gyekenyesi, G. Y. Baaklini, NASA Glenn Research Ctr. . . . . [5393-20]

11:50 am: **Damage location based on wavelet transform and active monitoring technology of Lamb wave,** G. Peng, S. Yuan, Nanjing Univ. of Aeronautics and Astronautics (China) . . . . [5393-21]

Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 8
Room: Royal Palm VI
Wed. 9:00 to 10:00 am

Novel Signal Processing for Structural Health Monitoring I

Chair: **Stephen T. Trickey**, Naval Research Lab.

9:00 am: **Tracking fatigued damage accumulation and predicting fracture,** D. Chelidze, Univ. of Rhode Island [5394-43]

9:20 am: **Detecting damage through the application of a continuous wavelet transformation-based algorithm,** S. A. Wimmer, V. DeGiorgi, Naval Research Lab. . . . . [5394-40]

9:40 am: **Health monitoring of an aero-elastic system with a freeplay nonlinearity,** S. T. Trickey, J. Nichols, M. Seaver, Naval Research Lab. . . [5394-41]

Coffee Break . . . . 10:00 to 10:30 am

SESSION 9
Room: Royal Palm VI
Wed. 10:30 am to 12:10 pm

Novel Signal Processing for Structural Health Monitoring II

Chairs: **Stephen T. Trickey**, Naval Research Lab.; **Alison B. Flatau**, Univ. of Maryland/College Park

10:30 am: **Online monitoring system for light-rail systems,** G. Thompson, A. N. Robertson, P. J. Cornwell, G. Park, H. Sohn, C. R. Farrar, Los Alamos National Lab. . . . . [5394-42]

10:50 am: **Nonlinear excitation and attractor mapping for detecting bolt preload loss in an aluminum frame,** M. D. Todd, Univ. of California/San Diego . . . . [5394-39]

11:10 am: **Detecting damage using recurrence quantification analysis,** J. M. Nichols, M. Seaver, S. T. Trickey, Naval Research Lab. . . . . [5394-44]

11:30 am: **Attractor-based damage detection in a plate subjected to supersonic flows,** B. I. Epureanu, S. Yin, Univ. of Michigan/Ann Arbor; M. M. Derriso, Air Force Research Lab. [5394-45]

11:50 am: **Detecting structural damage using adaptive feature extraction from transient signals,** L. W. Salvino, Naval Surface Warfare Ctr.; D. Pines, N. Fortner, Univ. of Maryland/College Park [5394-46]

Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 5
Room: Royal Palm II
Wed. 9:00 to 10:00 am

Integrating Homeland Security and Health Monitoring of Highway Infrastructures

Chair: A. Emin Aktan, Drexel Univ.

9:00 am: **Structural health monitoring approach for infrastructure assessment,** H. Ghasemi, Federal Highway Administration . . . . [5395-21]

9:20 am: **A long-term bridge performance monitoring program,** S. B. Chase, Federal Highway Administration . . . . . . [5395-22]

9:40 am: **A network of field-test sites as a platform for research and engineering and management of the highway transportation infrastructure,** H. W. Shenton III, Univ. of Delaware; A. E. Aktan, Drexel Univ.; D. M. Frangopol, Univ. of Colorado/Boulder; H. Ghasemi, Federal Highway Administration; M. Shinozuka, Univ. of California/Irvine; S. Madanat, Univ. of California/ Berkeley . . . . [5395-23]

Coffee Break . . . . 10:00 to 10:30 am

Panel Discussion
Room: Royal Palm II
Wed. 10:30 am to 12:00 pm

Moderator: **A. Emin Aktan,** Drexel Univ.

Panel Discussion to Conclude the 2nd SPIE/NDE Homeland Security Conference

Panelists: **Steve Chase,** Federal Highway Administration; **Steve McCabe,** National Science Foundation; **H. Felix Wu,** National Institute of Standards and Technology; **Masanobu Shinozuka,** Univ. of California/Irvine; **Mike Lind,** Pacific Northwest National Lab.

Conference End ∎

Conference 5392
Room: Royal Palm IV

Conference 5393
Room: Royal Palm V

Conference 5394
Room: Royal Palm VI

SESSION 6
Room: Royal Palm IV
Wed. 1:30 to 2:50 pm

Applications of MEMS and Micro-electronics

Chair: **Thomas Zerna**, Technische Univ. Dresden (Germany)

1:30 pm: **Real-time visualization of structural response with wireless MEMS sensors,** H. Chung, T. Enomoto, M. Shinozuka, Univ. of California/Irvine . . . . [5392-35]

1:50 pm: **Generation of corrosion damage images for different layers of a multilayer structure by fusion of multifrequency eddy current data,** S. Bajjuri, Univ. of Dayton; J. Hoffmann, S&K Technologies, Inc.; A. B. Siddoju, Univ. of Dayton; N. Meyendorf, Univ. of Dayton Research Institute . . . . [5392-36]

2:10 pm: **Processing of multifrequency eddy current data,** A. B. Siddoju, Univ. of Dayton; J. Hoffmann, S&K Technologies, Inc.; S. Bajjuri, N. Meyendorf, Univ. of Dayton . . . . [5392-37]

2:30 pm: **High-resolution nondestructive evaluation at the Center for Materials Diagnosis,** N. G. Meyendorf, S. Sathish, Q. Zhan, Univ. of Dayton; J. Blackshire, Air Force Research Lab. and Univ. of Dayton . . . . [5392-38]

Conference End ∎

SESSION 5
Room: Royal Palm V
Wed. 1:30 to 3:30 pm

Civionics

Chairs: **Aftab A. Mufti**, Univ. of Manitoba (Canada); **Douglas J. Thomson**, Univ. of Manitoba (Canada)

1:30 pm: **Civionics specifications for fiber optic sensors for structural health monitoring,** E. Rivera, A. A. Mufti, D. J. Thomson, Univ. of Manitoba (Canada) and ISIS Canada (Canada) . . . . [5393-22]

1:50 pm: **Interrogation of Bragg fiber optic sensors using real-time wavelength referencing to a gas cell,** D. J. Thomson, E. Rivera, Univ. of Manitoba (Canada); B. Brown, IDers Inc. (Canada) and SHM Systems Inc. (Canada) . . . . [5393-23]

2:10 pm: **Structural health monitoring of Provencher Pedestrian Bridge,** R. Haldane-Wilsone, E. Shehata, Wardrop Engineering Inc. (Canada); A. A. Mufti, Univ. of Manitoba (Canada) . . . [5393-24]

2:30 pm: **Novel event identification for SHM systems using unsupervised neural computation,** L. Card, D. K. McNeill, Univ. of Manitoba (Canada) . . . . [5393-25]

2:50 pm: **Structural health monitoring of Trout River Bridge, Alaska Highway, British Columbia,** R. Caluttung, Public Works and Government Services (Canada); A. A. Mufti, Univ. of Manitoba (Canada); H. Hawk, S. Reimer, Delcan Corp. (Canada); G. Tadros, ISIS Canada (Canada); J. J. R. Cheng, Univ. of Alberta (Canada); B. Bakht, ISIS Canada (Canada) . . . . [5393-26]

3:10 pm: **Embedded fiber optics for structural health monitoring of composite motor cases,** L. C. Heaton, M. Kranz, Morgan Research Corp. . . . . . . [5393-27]

Coffee Break . . . . 3:30 to 4:00 pm

SESSION 10
Room: Royal Palm VI
Wed. 1:30 to 3:10 pm

Novel Signal Processing for Structural Health Monitoring III

Chairs: **Victor Giurgiutiu**, Univ. of South Carolina; **Dustin T. Thomas**, Air Force Research Lab.

1:30 pm: **Comparison of feature-based classifiers for ultrasonic structural health monitoring,** J. E. Michaels, T. E. Michaels, Georgia Institute of Technology [5394-47]

1:50 pm: **Development of node decoupled extended Kalman filter (NDEKF) training method to design neural network diagnostic/prognostic reasoners,** K. Kaneshige, X. Wang, M. Saewong, V. Syrmos, Univ. of Hawaii/Manoa [5394-48]

2:10 pm: **Geometric approach to detecting and locating cracks in thin plates by Lamb-wave reflection: case of moving transducer,** V. Kreinovich, Univ. of Texas/El Paso . . . . [5394-49]

2:30 pm: **Dynamic characterization of a damaged beam using empirical-mode decomposition and Hilbert spectrum method,** C. Chang, C. Poon, Hong Kong Univ. of Science and Technology (Hong Kong) . . . . [5394-50]

2:50 pm: **Unsupervised statistical diagnosis for SHM of existing civil structure,** A. Iwasaki, Univ. of Tokyo (Japan); A. Todoroki, Tokyo Institute of Technology (Japan); S. Tsuneya, DMW Corp. (Japan); S. Sakai, Univ. of Tokyo (Japan) . . . . [5394-51]

Coffee Break . . . . 3:10 to 3:40 pm

NDE

Conference 5393
Room: Royal Palm V

Conference 5394
Room: Royal Palm VI

SESSION 6
Room: Royal Palm V
Wed. 4:00 to 5:40 pm

Ultrasonic Evaluation of Composite Materials

Chairs: **Steven M. Shepard**, Thermal Wave Imaging, Inc.; **Aftab A. Mufti**, Univ. of Manitoba (Canada)

4:00 pm: **Damage analysis of CF/AF hybrid fabric reinforced plastic laminates with scanned image microscopy,** C. Miyasaka, The Pennsylvania State Univ.; H. Kasano, Takushoku Univ. (Japan); P. J. Shull, The Pennsylvania State Univ. . . . . [5393-28]

4:20 pm: **Porosity determination in thin graphite-epoxy composite laminates using histograms of ultrasonic C-scans,** C. M. Darvennes, L. Lowe, C. Wilson, Tennessee Technological Univ. [5393-29]

4:40 pm: **Optimization of a guided-wave scanning system on a composite material,** L. Cosgriff, R. Martin, Cleveland State Univ. and NASA Glenn Research Ctr.; D. Roth, NASA Glenn Research Ctr. . . . . [5393-30]

5:00 pm: **Comparison of ultrasonic methods for the nondestructive evaluation of polymer matrix composites subjected to impact camage,** R. E. Martin, Cleveland State Univ. and NASA Glenn Research Ctr.; H. Wang, Santec Systems, Inc.; D. J. Roth, NASA Glenn Research Ctr.; J. Sandhu, Santec Systems, Inc. [5393-32]

5:20 pm: **Detection of delamination of composite plate using piezoceramic patches and wavelet packer analysis,** H. Gu, G. Song, Univ. of Houston; P. Qiao, Univ. of Akron . . . . [5393-33]

Conference End ■

SESSION 11
Room: Royal Palm VI
Wed. 3:40 to 6:00 pm

Novel Signal Processing for Structural Health Monitoring IV

Chairs: **Wei-Chih Wang**, Univ. of Washington; **Roy Ikegami**, Boeing Phantom Works

3:40 pm: **Detecting and quantifying friction nonlinearity using the Hilbert transform,** M. A. Minnicino II, Army Research Lab.; H. J. Sommer III, The Pennsylvania State Univ. . . . . . [5394-52]

4:00 pm: **Semi-real-time monitoring of cracking on couplings by neural network analysis of acoustic emission signals,** V. Godinez, Physical Acoustics Corp. . . . . [5394-53]

4:20 pm: **Structural damage assessment using principal component analysis,** C. Chang, V. Sze, Hong Kong Univ. of Science and Technology (Hong Kong) . . [5394-54]

4:40 pm: **Remote online machine fault diagnostic system,** M. Pan, P. Li, National Central Univ. (Taiwan) . . . . [5394-55]

5:00 pm: **Structural damage detection using neural network and ∞ filter algorithm,** H. Tang, T. Sato, Kyoto Univ. (Japan) . . . . [5394-56]

5:20 pm: **Efficient system identification algorithm using Monte Carlo filter and its application,** Y. Tanaka, T. Sato, Kyoto Univ. (Japan) . . . . [5394-57]

5:40 pm: **Nonlinear structural system identification using shaking table test data of 5-story model building,** K. Ogiyama, T. Sato, Kyoto Univ. (Japan) . . . . [5394-58]

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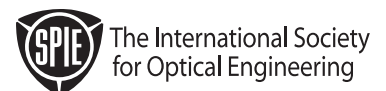
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