

# **THE 2<sup>ND</sup> “MULTIFUNCTIONAL MATERIALS FOR DEFENSE” WORKSHOP**

**Theme ‘12: Sensing, Actuation & Energy Transduction**

30 July – 1 August 2012  
Hilton Arlington Hotel, 950 N. Stafford Street  
Arlington, VA 22203

**In conjunction with:**

**The 2012 Annual Grantees’/Contractors’ Meeting for  
AFOSR Program on “Mechanics of Multifunctional  
Materials & Microsystems”**

30 July – 3 August 2012  
Hilton Arlington Hotel, 950 N. Stafford Street

**The 2012 Annual Review for  
ONR Program on “Non-Destructive Evaluation & Prognostics:  
Advanced Sensors and Technologies”**

2 – 3 August 2012  
Liberty Conference Center, 4075 Wilson Boulevard

**SPONSORED BY:**



### **Workshop Co-Chairs:**

William Nothwang (*Army Research Lab*)  
Gregory Reich (*Air Force Research Lab*)  
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Daniel O'Brien (*Army Research Lab*)  
Gregory Reich (*Air Force Research Lab*)  
James Thomas (*Naval Research Lab*)

### **Workshop Speakers & Co-PI's:**

Anna Balazs (*Univ. of Pittsburgh*)  
Stephen Bartolucci (*Army Benet Lab*)  
Ray Baughman (*Univ. of Texas at Dallas*)  
Jeffery Baur (*Air Force Research Lab - AFRL/RXP*)  
Sarah Bedair (*Army Research Lab - ARL/SEDD*)  
Sven Bilén (*Pennsylvania State Univ.*)  
Hugh Bruck (*Univ. of Maryland*)  
Greg Carman (*Univ. of California, Los Angeles*)  
Fu-Kuo Chang (*Stanford Univ.*)  
Ioannis Chasiotis (*Univ. of Illinois*)  
Wonbong Choi (*Florida Int'l Univ.*)  
Gary Dale (*Air Force Research Lab - AFRL/RBAL*)  
Thuy Dang (*Air Force Research Lab - AFRL/RXBN*)  
Mark Derriso (*Air Force Research Lab - AFRL/RBSI*)  
Ben Dickinson (*Air Force Research Lab - AFRL/RWGN*)  
Aaron Dollar (*Yale Univ.*)  
Douglas Dudis (*Air Force Research Lab - AFRL/RXBT*)  
Martin Dunn (*Univ. of Colorado*)  
Michael Durstock (*Air Force Research Lab - AFRL/RXBN*)  
Peter Finkel (*Naval Underwater Warfare Center*)  
Steve Forrest (*Univ. of Michigan*)  
Victor Giurgiutiu (*Univ. of South Carolina*)  
Nakhiah Goulbourne (*Univ. of Michigan*)  
Ming Han (*Univ. of Nebraska*)  
John Hart (*Univ. of Michigan*)  
Brian Holloway (*DARPA*) – *to be confirmed*  
Haiying Huang (*Univ. of Texas at Arlington*)  
Sean Humbert (*Univ. of Maryland*)

Shiv Joshi (*NextGen*)  
Daniel Inman (*Univ. of Michigan*)  
John Jennings (*Office of Secretary of Defense*)  
James Joo (*Air Force Research Lab - AFRL/RBSA*)  
Shiv Joshi (*NextGen, Inc.*)  
Hiroyuki Kato (*Hokkaido Univ.*)  
Frank Ko (*Univ. of British Columbia*)  
Sridhar Krishnaswamy (*Northwestern Univ.*)  
Cynthia Lundgren (*Army Research Lab - ARL/SEDD*)  
Amy Marschilok (*State Univ. of New York at Buffalo*)  
Benji Maruyama (*Air Force Research Lab - AFRL/RXBN*)  
Patrick Mather (*Syracuse Univ.*)  
Brian Morgan (*Army Research Lab - ARL/SEDD*)  
Jeffery Moore (*Univ. of Illinois*)  
Khalil Najafi (*Univ. of Michigan*)  
William Nothwang (*Army Research Lab - ARL/SEDD*)  
Daniel O'Brien (*Army Research Lab - ARL/WMRD*)  
Becky Peterson (*Univ. of Michigan*)  
Shashank Priya (*Virginia Tech*)  
Jeff Pulskamp (*Army Research Lab*)  
Jerry Qi (*Univ. of Colorado*)  
Gregory Reich (*Air Force Research Lab - AFRL/RBSA*)  
John Rogers (*Univ. of Illinois*)  
Bill Saric (*Texas A&M Univ.*)  
Benjamin Shapiro (*Univ. of Maryland*)  
John Shaw (*Univ. of Michigan*)  
Max Shtein (*Univ. of Michigan*)  
Elisabeth Smela (*Univ. of Maryland*)  
Gabriel Smith (*Army Research Lab*)  
Henry Sodano (*Univ. of Florida*)  
Michael Strano (*Massachusetts Inst. of Technology*)  
Sharon Swartz (*Brown Univ.*)  
Minoru Taya (*Univ. of Washington*)  
James Thomas (*Naval Research Lab*)  
Nicolas Triantafyllidis (*Univ. of Michigan*)  
Richard Vaia (*Air Force Research Lab - AFRL/RXBN*)  
Jeffrey Warrender (*Army Benet Lab*)  
Ed White (*Boeing*)  
Gleb Yushin (*Georgia Inst. of Technology*)  
Nicole Zacharia (*Texas A&M Univ.*)  
Jeremy Zimmerman (*Univ. of Michigan*)

## AGENDA

### The 2<sup>nd</sup> Multifunctional Materials for Defense Workshop Theme '12: **Sensing, Actuation & Energy Transduction**

(Incl. the speakers for: **The 2012 Annual Grantees'/Contractors' Meeting for AFOSR Program on "Mechanics of Multifunctional Materials & Microsystems"**)

(Incl. the speakers for: **The 2012 Annual Review for ONR Program on "Non-Destructive Evaluation & Prognostics: Advanced Sensors and Technologies"**)

Monday, July 30		
Time	Speaker	Title of Project
07:30		Registration
08:00	Jim Thomas NRL Greg Reich AFRL/RBSA William Nothwang ARL/SEDD	Opening Remarks
08:15	Les Lee AFOSR Ignacio Perez ONR David Stepp ARO	Welcome Remarks
<b>Session Chair: Cynthia Lundgren (ARL/SEDD)</b>		
08:30	William Nothwang ARL/SEDD	Defense System Perspectives on Multifunctional Design for Sensing
08:55	Ed White Boeing	Defense System Perspectives on Multifunctional Design for Actuation
09:20	Brian Holloway DARPA	Defense System Perspectives on Multifunctional Design for Energy Performance
09:45	Coffee	Break
<b>Session Chair: Jim Thomas (NRL)</b>		
10:15	Daniel O'Brien ARL/WMRD	Multifunctional Power and Energy for Army Applications
10:40	Hugh Bruck U Maryland	Principles for Designing Compliant Multifunctional Wing Structures with Integrated Solar Cells for MAVs
11:05	Max Shtein U Michigan	(PECASE) Energy Harvesting Textile Composites for Air Vehicle Applications
11:30	Ioannis Chasiotis U Illinois	Influence of Mechanical Loading on the Integrity and Performance of Energy Harvesting and Storage Materials at the Micron and Sub-micron Scales
12:00	Lunch	Break

### ***Luncheon Talk - Moderator: Les Lee (AFOSR)***

<b>12:20</b>	<b>John Jennings</b> OSD	<b>Guest Lecture:</b> Long Term Need for Energy Savings in Different Classes of DoD Systems
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### ***Session Chair: Mike Durstock (AFRL/RXBN)***

<b>13:30</b>	<b>Sven Bilén</b> Penn State U	Energy Harvesting on Spacecraft Using Electrodynamic Tethers
13:55	<b>Michael Strano</b> MIT	Environmental Hydrocarbon Harvesting for Micro-scale Power Sources Using Carbon Nanotube Arrays
14:20	<b>Greg Carman</b> UCLA	Nanoscale Based Thermal Energy Harvesting
14:45	<b>Douglas Dudis</b> AFRL/RXBT	Superatom Thermoelectric Materials
<b>15:10</b>	<b>Coffee</b>	<b>Break</b>

### ***Session Chair: William Nothwang (ARL/SEDD)***

<b>15:40</b>	<b>Cynthia Lundgren</b> ARL/SEDD	State of the Art in Energy/Power Materials
16:05	<b>Sarah Bedair</b> ARL/SEDD	Integrated Micro-scale Power Conversion
16:30	<b>Brian Morgan</b> ARL/SEDD	Power Considerations for Micro-Autonomous Systems
16:55	<b>Steve Forest</b> <b>Jeremy Zimmerman</b> U Michigan	Integrated, Flexible, High-efficiency Solar Cells
17:20	<b>Stephen Bartolucci</b> Army Benet Lab	Transient Thermal Stability of Polymer Nanocomposites for Energy Transduction
<b>17:45</b>	<b>Adjournment</b>	<b>Adjournment</b>

### ***Evening Colloquium***

<b>20:00</b>		(Meeting room available for ad hoc group discussions)
<b>21:30</b>	<b>Adjournment</b>	<b>Adjournment</b>

### ***Tuesday, July 31***

<b><i>Time</i></b>	<b><i>Speaker</i></b>	<b><i>Title of Project</i></b>
<b>08:00</b>		Housekeeping
<b><i>Session Chair: Dan O'Brien (ARL/WMRD)</i></b>		
08:05	<b>Mike Durstock</b> <b>Benji Maruyama</b> <b>Thuy Dang</b>	Architectural Control of Nanomaterials for Structural Batteries

	AFRL/RXBN	
08:30	<b>Wonbong Choi</b> Florida Int'l U	High Efficiency Flexible Battery Based on Graphene-Carbon Nanotube Hybrid Structures
08:55	<b>Gleb Yushin</b> GA Tech	(YIP'09) Multifunctional Ultra-Light Mg-Li Alloy Nanocomposites
09:20	<b>Amy Marschilok</b> SUNY Buffalo	Porous AG/ICP/RVC Composite Electrodes - A New Approach for Metal/Air Batteries
<b>09:45</b>	<b>Coffee</b>	<b>Break</b>
<b>Session Chair: Jeff Baur (AFRL/RXP)</b>		
10:15	<b>Dan Inman</b> U Michigan	Simultaneous Vibration and Energy Harvesting
10:40	<b>Henry Sodano</b> U Florida	Active Structural Fibers for Multifunctional Composite Materials
11:05	<b>Peter Finkel</b> Naval Underwater Warfare Center	Broad Band Energy Harvesting Utilizing Phase Transitions in Piezoelectric Single Crystals
11:30	<b>Jim Thomas</b> NRL	Multifunctional Poro-Vascular Composites for UAV Performance Enhancement
<b>12:00</b>	<b>Lunch</b>	<b>Break</b>

<b>Luncheon Talk - Moderator: Bill Baron (AFRL/RBSA)</b>		
<b>12:20</b>	<b>Fu-Kuo Chang</b> Stanford U	<b>Briefing on AFOSR MURI '09:</b> "Bio-Inspired Intelligent Sensing Materials for Fly-by-Feel Autonomous Vehicle" (3 <sup>rd</sup> Annual Review in Ft. Lauderdale, FL, on October 18, 2012; <b>Stanford U / UCLA / U Colorado / NYIT / Johns Hopkins U / U Brit Columbia</b> ; PI: <b>Fu-Kuo Chang</b> ; Co-PI's: <b>Peter Peumans, Shan-Xiang Wang, Ricardo Dolmetsch, Boris Murmann, Philip Levis, Andrew Ng, Greg Carman, Yong Chen, Robert McLeod, Rahmat Shoureshi, Somnath Ghosh, Frank Ko</b> ; PM: Les Lee; Co-PM: Hugh DeLong)
<b>Session Chair: Ignacio Perez (ONR)</b>		
<b>13:30</b>	<b>Mark Derriso</b> AFRL/RBSI	Sensors in IVHM Architecture
13:55	<b>John Rogers</b> U Illinois	Conformal Sheets of Thin Film Sensors, Electronics and Energy Harvesters for Structural Monitoring
14:20	<b>Shashank Priya</b> VA Tech	Self-Biased Dual Field Energy Harvesting System for Structural Health Monitoring Sensors
14:45	<b>Sridhar Krishnaswamy</b> Northwestern U	Adaptive Multi-Channel Fiber Bragg Grating Interrogation System for Rapid Detection of Acoustic Emission and Impact
<b>15:10</b>	<b>Coffee</b>	<b>Break</b>
<b>Session Chair: Mark Derriso (AFRL/RBSI)</b>		
<b>15:40</b>	<b>Ming Han</b> U Nebraska	Highly Sensitive pi-phase-shifted Fiber Bragg Grating Ultrasonic Sensors for Structural Health Monitoring
16:05	<b>Victor Giurgiutiu</b> U So Carolina	A Hybrid Acousto-Ultrasonic Optical-Fibre System for In-Situ SHM of Military Structures
16:30	<b>Haiying Huang</b> U Texas Arlington	Remote Generation and Steering of Ultrasound Using Microwave Radiation
16:55	<b>Gabriel Smith</b> ARL	Haltere Based Angular Rate Sensors

17:20	<b>Sean Humbert</b> U Maryland	Integrated, Distributed Sensing
<b>17:45</b>	<b>Adjournment</b>	<b>Adjournment</b>

<b>Evening Colloquium</b>		
<b>20:00</b>		(Meeting room available for ad hoc group discussions)
<b>21:30</b>	<b>Adjournment</b>	<b>Adjournment</b>

<b>Wednesday, August 1</b>		
<b>Time</b>	<b>Speaker</b>	<b>Title of Project</b>
<b>08:00</b>		<i>Housekeeping</i>
<b>Session Chair:</b> <i>Rich Vaia (AFRL/RXBN)</i>		
08:05	<b>Ben Dickinson</b> AFRL/RWGN <b>Greg Reich</b> AFRL/RBSA <b>Jeff Baur</b> AFRL/RXBC	Embedded Sensors and Actuators for Micro Munition Air Vehicles
08:30	<b>Jeff Pulskamp</b> ARL	Monolithically Integrated Micro Flapping Vehicles
08:55	<b>Khalil Najafi</b> <b>Becky Peterson</b> U Michigan	HAIR Based Sensing and Actuation
09:20	<b>Jeff Warrender</b> Army Benet Lab	Black Silicon for Next Generation Infrared Sensors
<b>09:45</b>	<b>Coffee</b>	<b>Break</b>
<b>Session Chair:</b> <i>Ben Dickinson (AFRL/RWGN)</i>		
10:15	<b>John Hart</b> U Michigan	(YIP'11) Morphing Carbon Nanotube Microstructures
10:40	<b>Anna Balazs</b> U Pittsburgh	Using Theory and Simulation to Design Active Materials with Sensory and Adaptive Capabilities
11:05	<b>Rich Vaia</b> AFRL/RXBN	Nanostructured, Mechanically-Responsive Polymers: Morphology-Performance-Efficiency Correlations
11:30	<b>Nicole Zacharia</b> Texas A&M	Mechano-Responsive Polymer Systems
<b>12:00</b>	<b>Lunch</b>	<b>Break</b>

<b>Luncheon Talk - Moderator: David Stepp (ARO)</b>		
<b>12:20</b>	<b>Jeffery Moore</b> U Illinois	<b>Briefing on ARO MURI '07:</b> "Mechano-chemically Active Polymer Composites" (4 <sup>th</sup> Annual Review in Rosemont, IL on April 20, 2011; <b>U Illinois Urbana-Champaign / U Texas Austin / Duke U / Stanford U</b> ; PI: <b>Jeffrey Moore</b> ; Co-PIs: <b>Chris Bielawski, Paul</b>

		<i>Braun, Stephen Craig, Todd Martinez, Nancy Sottos; PM's: David Stepp, Doug Kiserow)</i>
<b>Session Chair: Sarah Bedair (ARL/SEDD)</b>		
<b>13:30</b>	<b>Ray Baughman</b> U Texas Dallas	New Types of Artificial Muscles for Large Stroke and High Force Applications
13:55	<b>Nicolas Triantafyllidis</b> <b>John Shaw</b> U Michigan	Cellular Shape Memory Structures: Experiments and Modeling
14:20	<b>Pat Mather</b> Syracuse U <b>Jerry Qi / Martin Dunn</b> U Colorado	(DCT'09) Reversible Shape Memory Polymers and Composites
14:45	<b>Greg Reich</b> <b>James Joo</b> AFRL/RBSA	Spatially Targeted Activation of a Shape Memory Polymer Based Reconfigurable Skin System
<b>15:10</b>	<b>Coffee</b>	<b>Break</b>
<b>Session Chair: Greg Reich (AFRL/RBSA)</b>		
<b>15:40</b>	<b>Aaron Dollar</b> Yale U	(YIP'11) Active Cells for Multifunctional Structures
16:05	<b>Benjamin Shapiro</b> <b>Elisabeth Smela</b> U Maryland	(DCT'09) Electroosmotically-Actuated Shape-Changing Materials
16:30	<b>Shiv Joshi</b> NextGen Aeronautics <b>Nakhiah Goulbourne</b> U Michigan <b>Sharon Swartz</b> Brown U <b>Greg Reich</b> AFRL/RBSA	(DCT'09) Reconfigurable, Ultra-Maneuverable Bat Technologies
16:55	<b>Minoru Taya</b> U Washington <b>Frank Ko</b> U British Columbia <b>Hiroyuki Kato</b> Hokkaido U	(DCT'10) Bio-inspired Design of Super-configurable Multifunctional Structures
17:20	<b>Bill Saric</b> Texas A&M <b>Gary Dale</b> AFRL/RBAL	Distributed Roughness for Laminar Flow
<b>17:45</b>	<b>Adjournment</b>	<b>Adjournment</b>

<b>Evening Colloquium</b>		
<b>20:00</b>		(Meeting room available for ad hoc group discussions)
<b>21:30</b>	<b>Adjournment</b>	<b>Adjournment</b>



## AGENDA

### The 2012 Annual Grantees'/Contractors' Meeting for AFOSR Program on "Mechanics of Multifunctional Materials & Microsystems" (Cont'd)

<b>Thursday, August 2</b>		
<b>Time</b>	<b>Speaker</b>	<b>Title of Project</b>
<b>08:00</b>	Les Lee AFOSR	<i>Opening Remarks</i>
<b>Session Chair: Jason Foley (AFRL/RWMFS)</b>		
08:05	<b>Ioannis Chasiotis</b> U Illinois	Influence of Grain Structure and Doping on the Deformation and Fracture of Polycrystalline Silicon for MEMS and NEMS
08:30	<b>Xin Zhang</b> Boston U	Materials and Mechanics of Metamaterial Enhanced MEMS for Terahertz Technology
08:55	<b>Brandon Arritt</b> AFRL/RVSVS	<i>(Invited)</i> Predicting the Strain and Temperature Dependence of Electromagnetic Metamaterials
09:20	<b>C. T. Sun</b> Purdue U	Development and Application of Acoustic Metamaterials with Locally Resonant Microstructures
<b>09:45</b>	<b>Coffee</b>	<b>Break</b>
<b>Session Chair: Ty Pollak (EOARD)</b>		
10:15	<b>Jason Foley</b> AFRL/RWMFS	<i>(Invited)</i> Shock-Mitigating Mechanical Metamaterials
10:40	<b>Dan Inman</b> U Michigan	<i>(Invited)</i> Damping and Vibration Mitigation: Critical Issues
11:05	<b>Thomas Siegmund</b> <b>Ray Cipra</b> Purdue U	Macroscale Meta-Materials: From Manufacturing to Multifunctional Properties
11:30	<b>Naresh Thadhani</b> GA Tech <b>Sarah Stewart</b> Harvard U <b>John Borg</b> Marquette U	Dynamic High-Pressure Behavior of Geo Materials
<b>12:00</b>	<b>Lunch</b>	<b>Break</b>

<b>Luncheon Talk - Moderator: Lalit Chhabildas (AFRL/RW)</b>		
<b>12:20</b>	<b>G. Ravichandran</b> California Inst. of Technol.	<b>Briefing on AFOSR/RW Center of Excellence '12:</b> "High-Rate Deformation Physics of Heterogeneous Materials" ( <i>Kick-off Meeting at Eglin AFB, FL, on April 26-27, 2012; California Inst. of Technol. / UCLA; PI: G. Ravichandran; Co-PI's: Jose Andrade, Kaushik Bhattacharya, Chiara Daraio, Michael Ortiz, Christopher Lynch, Greg Carman; PM: Les Lee; TD PoC: Lalit Chhabildas</i> )

<b>Session Chair: Brandon Arritt (AFRL/RVSV)</b>		
<b>13:30</b>	<b>John Kieffer</b> U Michigan	Multiscale Simulation of Interfacial Phenomena and Nanoparticle Placement in Polymer Matrix Composites
13:55	<b>Mrinal Saha</b> U Oklahoma	Experimental and Theoretical Studies of Carbon Nanotube Hierarchical Structures in Multifunctional Polymer Composites
14:20	<b>Tsu-Wei Chou</b> U Delaware <b>Yuntian Zhu</b> NC State U	Multifunctional Flexible Composites Based on Continuous Carbon Nanotube Fibers
14:45	<b>Nicholas Kotov</b> U Michigan	Engineering of High Toughness in Hierarchically Laminated Carbon Nanotube Composites
<b>15:10</b>	<b>Coffee</b>	<b>Break</b>
<b>Session Chair: Ajit Roy (AFRL/RXBT)</b>		
<b>15:40</b>	<b>Alex Bogdanovich</b> <b>Philip Bradford</b> NC State U	Multifunctional Shear Pressed Carbon Nanotube Sheets for Strain Sensing and Composite Joint Toughening
16:05	<b>Erik Thostenson</b> U Delaware	(YIP'09) Novel Micro- and Nano-Structured Composites for Sensing and Actuation
16:30	<b>Mina Pelegri</b> Rutgers U	Multifunctional Graphene Composites for Lightning Strike Protection
16:55	<b>Jimmy Xu</b> Brown U	Nanotube-Polymer Composites for Thermal Signature Reduction and EMI Shielding
17:20	<b>Liping Liu</b> Rutgers U	Designing Microstructures/Structures for Desired Functional Material and Local Fields
<b>17:45</b>	<b>Adjournment</b>	<b>Adjournment</b>

<b>Evening Colloquium</b>		
<b>20:00</b>		<i>(Meeting room available for ad hoc group discussions)</i>
<b>21:30</b>	<b>Adjournment</b>	<b>Adjournment</b>

<b>Friday, August 3</b>		
<b>Time</b>	<b>Speaker</b>	<b>Title of Project</b>
<b>08:00</b>		<b>Housekeeping</b>
<b>Session Chair: To be nominated</b>		
08:05	<b>Ajit Roy</b> AFRL/RXBT	Multifunctional Hybrid Composites for Thermal Management
08:30	<b>Vikas Prakash</b> Case-Western Reserve U	Carbon Nanotube Based Epoxy Matrix Thermal Interface Materials for Thermal Management in Load Bearing Aerospace Structures
08:55	<b>Abraham Stroock</b> Cornell U <b>Noel Holbrook</b>	Plant-mimetic Heat Pipes for Operation with Large Inertial and Gravitational Stresses

	Harvard U	
09:20	<b>Patrick Kwon</b> Michigan State U	Development of New Generation of Perspirable Skin
<b>09:45</b>	<b>Coffee</b>	<b>Break</b>
<b>Session Chair: John Volakis (Ohio State U)</b>		
10:15	<b>George Lesieutre</b> <b>Mary Frecker</b> <b>James Adair</b> Penn State U	(DCT'11) Variable Thermal Conductivity Structures for Spacecraft Thermal Control Using Ceramic-Metal Cellular Contact-Aided Compliant Mechanisms
10:40	<b>Gregory Huff</b> Texas A&M	Multiscale Modeling and Characterization of Electromagnetically Tunable Colloidal-Based Materials
11:05	<b>Gregory Huff</b> Texas A&M <b>Zoubeida Ounaies</b> Penn State U <b>Michael Bevan</b> Johns Hopkins U	Multifunctional Material Systems for Reconfigurable Antennas in Superconfigurable Structures
11:30	<b>Aaron Esser-Kahn</b> UC Irvine	(YIP'12) Microvascular Structures for Mass and Energy Transport
<b>12:00</b>	<b>Lunch</b>	<b>Break</b>

<b>Luncheon Talk - Moderator: Martin Dunn (NSF)</b>		
<b>12:20</b>	<i>To be nominated</i>	<b>Briefing on Basic Research Initiative '12:</b> "Autonomic Material Systems Utilizing Biomolecular Transduction" (PI's: <b>To be appointed</b> ; Co-PM's: Les Lee, Hugh Delong)
<b>Session Chair: Bruce LaMattina (Rutgers U)</b>		
<b>13:30</b>	<b>David Kisailus</b> UC Riverside <b>Pablo Zavattieri</b> Purdue U	Damage-tolerant Biological Composites Derived from the Teeth of a Giant Chiton
13:55	<b>Nancy Sottos</b> U Illinois	Nanostructured Materials for Self-Healing Polymers and Composites
14:20	<b>Scott White</b> <b>Jeffrey Moore</b> <b>Nancy Sottos</b> U Illinois	(DCT'10) Regeneration and Remodeling of Composite Materials
14:45	<b>Nicolaus Correll</b> U Colorado	Self-Assembly and Self-Repair of Structures with Stability and Resource Constraints
15:10	<b>Les Lee</b> AFOSR	<b>Closing Remarks</b>
<b>15:15</b>	<b>Adjournment</b>	<b>Adjournment</b>

### **MEETING SITE & LODGING**

#### **Hilton Arlington Hotel**

950 N. Stafford Street, Arlington, Virginia 22203;  
Phone: 703-528-6000;

### **HOTEL RESERVATION**

Call 1-800-HILTONS or

Go to [http://www.hilton.com/en/hi/groups/personalized/D/DCAVAHF-MMM-20120729/index.jhtml?WT.mc\\_id=POG](http://www.hilton.com/en/hi/groups/personalized/D/DCAVAHF-MMM-20120729/index.jhtml?WT.mc_id=POG)

Provide the group code "MMM" referencing the room block designated

### **MEETING REGISTRATION**

<http://www.surveygizmo.com/s3/930603/Mechanics-of-Multifunctional-Materials-Microsystems>  
(To be finalized)

**The 2012 Annual Grantees'/Contractors' Meeting for  
AFOSR Program on "Mechanics of Multifunctional  
Materials & Microsystems"**

**30 July – 3 August 2012**

**Hilton Arlington Hotel, 950 N. Stafford Street**

**PI's & Co-PI's** (\*MURI; \*\*CoE; ~To be reviewed independently):

James Adair (Pennsylvania State Univ.)  
Jose Andrade\*\* (California Inst. of Technology)  
Anna Balazs (Univ. of Pittsburgh)  
Ray Baughman (Univ. of Texas at Dallas)  
Michael Bevan (Johns Hopkins Univ.)  
Kaushik Bhattacharya\*\* (California Inst. of Technology)  
Sven Bilén (Pennsylvania State Univ.)  
Alex Bogdanovich (N. Carolina State Univ.)  
John Borg (Marquette Univ.)  
Philip Bradford (N. Carolina State Univ.)  
Hugh Bruck (Univ. of Maryland)  
Greg Carman \* \*\* (Univ. of California, Los Angeles)  
Fu-Kuo Chang\* (Stanford Univ.)  
Ioannis Chasiotis (Univ. of Illinois)  
Yong Chen\* (Univ. of California, Los Angeles)  
Wonbong Choi (Florida Int'l Univ.)  
Tsu-Wei Chou (Univ. of Delaware)  
Ray Cipra (Purdue Univ.)  
Nicolaus Correll (Univ. of Colorado)  
Chiara Daraio\*\* (California Inst. of Technology)  
Aaron Dollar (Yale Univ.)  
Ricardo Dolmetsch\* (Stanford Univ.)  
Martin Dunn (Univ. of Colorado)  
Aaron Esser-Kahn (Univ. of California, Irvine)  
Mary Frecker (Pennsylvania State Univ.)  
Hae-Chang Gea (Rutgers Univ.) ~  
Somnath Ghosh\* (Johns Hopkins Univ.)  
Nakhiah Goulbourne (Univ. of Michigan)  
H. Thomas Hahn (Univ. of California, Los Angeles) ~  
John Hart (Univ. of Michigan)  
Noel Holbrook (Harvard Univ.)  
Gregory Huff (Texas A&M Univ.)  
Daniel Inman (Univ. of Michigan)  
Shiv Joshi (NextGen)  
John Kieffer (Univ. of Michigan)  
David Kisailus (Univ. of California, Riverside)  
Nicholas Kotov (Univ. of Michigan)  
Patrick Kwon (Michigan State Univ.)  
George Lesieutre (Pennsylvania State Univ.)  
Philip Levis\* (Stanford Univ.)  
Liping Liu (Rutgers Univ.)  
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Nancy Sottos (*Univ. of Illinois*)  
Sarah Stewart (*Harvard Univ.*)  
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Abraham Stroock (*Cornell Univ.*)  
C. T. Sun (*Purdue Univ.*)  
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