

**Advance
Technical Program**

**First World Congress on
Biomimetics and Artificial Muscles**

December 9-11, 2002
Albuquerque Convention Center
Albuquerque, New Mexico, USA

Honorary Congress Chair:

*Professor Pierre-Gilles de Gennes (Nobel Laureate)
Ecole Supérieur de Physique et de Chimie Industrielles
(ESPCI), Paris, France*

General Congress Chair:

*Professor Mohsen Shahinpoor
Artificial Muscle Research Institute (AMRI), Albuquerque,
New Mexico, USA (<http://www.unm.edu/~amri/>)*

**General Congress Co-Chair and Chair of Second
World Congress on BAM to be hosted by NASA
Langley Research Center, Spring 2004:**

*Dr. Upendra N. Singh (U.N.Singh@LaRC.NASA.GOV)
Chief Technologist, NASA Langley Research Center
Hampton, VA 23681-2199 USA*

National Organizing Committee

Dr. Mohsen Shahinpoor, New Mexico, USA
Mr. Massoud Ahghar, New Mexico, USA
Dr. Natalie Clark, Virginia, USA
Ms. Jamileh Farahmand, New Mexico, USA
Dr. Kwang J. Kim, Nevada, USA
Dr. Kumar Krishen, Virginia, USA

Dr. Benjamin R. Mattes, New Mexico, USA
Dr. Sorin G. Popa, New Mexico, USA
Dr. Laurel O. Sillerud, New Mexico, USA
Dr. Upendra Singh, Virginia, USA
Ms. Mary Zsigmond, Congress Secretary, New Mexico, USA

International Organizing Committee

Prof. Narayan Aluru, Illinois, USA
Dr. Kinji Asaka, Kansai, Japan
Prof. Hiroshi Asanuma, Chiba, Japan
Prof. Xiaoyi Bao, Ottawa, Canada
Dr. F.B. Bateman, Pennsylvania, USA
Prof. Ray H. Baughman, Texas, USA
Prof. Kaushik Bhattacharya, California, USA
Prof. Helmut R. Brand, Bayreuth, Germany
Dr. Robert G. Bryant, Virginia, USA
Dr. Z.Y. Cheng, Alabama, USA
Prof. Piero Chiarelli, Pisa, Italy
Prof. L.C. Chien, Ohio, USA
Dr. Patricia Cladis, New Jersey, USA
Prof. Richard O. Claus, Virginia, USA
Dr. Douglas Daum, Minnesota, USA
Dr. F.J. Davis, United Kingdom
Prof. Danilo De Rossi, Pisa, Italy
Dr. Toshi T. Doi, Yokohama-shi, Japan
Prof. Carolyn Dry, Illinois, USA
Prof. Toribio Fernandez Otero, Cartagena, Spain
Prof. Heino Finkleman, Freiburg, Germany
Prof. Takeo Furukawa, Tokyo, Japan
Dr. G. Jeronimidis, United Kingdom
Dr. Pierre-Francois Gobin, Lyon, France
Prof. J. Gonzalez, Cartagena, Spain
Prof. Faramarz Gordaninejad, Nevada, USA
Prof. Ardesir Guran, Ottawa, Canada
Dr. Jeffery A. Hinkley, Virginia, USA
Prof. Toshihiro Hirai, Ueda-shi, Japan
Dr. Tatsuzo Ishida, Yokohama-shi, Japan
Prof. Patrick Keller, Paris, France
Prof. Kwang J. Kim, Nevada, USA
Dr. Roy Kornbluh, California, USA
Dr. Friedrich Kremer, Leipzig, Germany
Dr. Kumar Krishen, Virginia, USA
Dr. Yoshihiro Kuroki, Yokohama-shi, Japan
Prof. Donald J. Leo, Virginia, USA
Prof. Jiangyu Li, California, USA
Prof. Ron Lumia, New Mexico, USA
Prof. John D. Madden, Massachusetts, USA
Prof. Arthur F.T. Mak, Hong Kong
Dr. Philippe Martinoty, Strasbourg CEDEX, France

Prof. Monique Mauzac, Toulouse, France
Prof. Kenneth Meijer, Maastricht, Netherlands
Prof. J.-Uwe Meyer, St. Ingbert, Germany
Prof. Mart Min, Tallinn, Estonia
Dr. G.R. Mitchell, United Kingdom
Dr. Minoru Mohko, Japan
Dr. Mehran Mojarad, Washington, DC, USA
Prof. Ferdinando (Sandro) Mussa-Ivaldi, IL, USA
Prof. Sia Nemat-Nasser, California, USA
Prof. Mihail D. Nicu, Bucharest, Romania
Dr. Keisuke Oguro, Kansai, Japan
Dr. Nils Holmstrom, Stockholm, Sweden
D. Olson, Pennsylvania, USA
Prof. Yoshihito Osada, Sapporo, Japan
Dr. S.I. Patel, United Kingdom
Prof. Krishna C. Persaud, Manchester, UK
Dr. Serban Peteu, Kentucky, USA
Prof. Bruno Picasso, Cagliari, Italy
Dr. Harald Pleiner, Mainz, Germany
Prof. Gerald H. Pollack, Washington, USA
Prof. Roger G. Quinn, Ohio, USA
Dr. B.R. Ratna, Washington, DC, USA
Prof. Arsalan Razani, New Mexico, USA
Dr. Alan S. Rudolph, Virginia, USA
Prof. K. Sadrnezhad, Tehran, Iran
Dr. Rodney Salo, Minnesota, USA
Dr. C. Santulli, Reading, UK
Prof. Jerry I. Scheinbeim, New Jersey, USA
Dr. Ji Su, Virginia, USA
Prof. Makoto Suzuki, Sendai, Japan
Prof. Satoshi Tadokoro, Kobe, Japan
Prof. Minoru Taya, Washington, USA
Dr. Eugene M. Terentjev, Cambridge, England
Dr. Laurence Thomsen III, Virginia, USA
Prof. Hy D. Tran, New Mexico, USA
Prof. Gordon Wallace, Wollongong, Australia
Prof. Mark Warner, Cambridge, England
Dr. F. Xia, Pennsylvania, USA
Prof. Takeshi Yamauchi, Nagaoka, Japan
Prof. Rudolf Zentel, Mainz, Germany
Prof. Qiming M. Zhang, Pennsylvania, USA
Prof. Miklos Zrinyi, Budapest, Hungary

GENERAL INFORMATION

Albuquerque is a city full of fun attractions and activities, from Historic Old Town founded in 1706 to the Albuquerque Aquarium and the Rio Grande Zoological Park if you are a nature lover. There are also casinos, cultural centers, family fun centers, and recreation areas, available for visitors to enjoy. We hope you will find the time to experience them all. The city is a great blend of American culture from the past to the present. It is said to be the most culturally diverse city in the United States. We are sure you will have a great time here. **For more information about Albuquerque you can visit the following website:** "<http://www.itsatrip.org>"

Registration Hours:

Sunday, December 8, 2002.....6:00 pm – 9:00 pm
Hyatt Regency Albuquerque in the Atrium, 330 Tijeras NW, Albuquerque, NM
Monday, December 9, 2002.....7:00 am – 9:00 am
Albuquerque Convention Center Garden Foyer, 401 2nd Street NW, Albuquerque, NM
Tuesday, December 10, 2002.....7:00 am – 9:00 am
Albuquerque Convention Center Garden Foyer, 401 2nd Street NW, Albuquerque, NM

Events:

Monday, December 9, 2002
Welcoming Reception6:00 pm – 8:00 pm
Tuesday, December 10, 2002
Banquet and Entertainment6:30 pm – 9:00 pm
Special Congress Entertainment Event:
Hector Pimentel & Leyenda Music Group "www.hectorpimentel.com"
New Mexico's Own, World Class Master of the Spanish Classical Guitar, Hector Pimentel,
"Mr. Guitar" & His Nuveo Flamenco En Ensemble, Leyenda.

Registration Fees

Registration after July 2002 and Registration at the Congress Site: \$495.
Student Registration Fee: \$99.

Full Conference Registration Includes:

Admittance to the conference, coffee breaks, welcome reception, banquet, and proceedings of the First World Congress on Biomimetics and Artificial Muscles; see the enclosed registration form, or visit the website at "<http://www.world-congress.net>" to register online.

Audio-Visual Equipment:

The following will be provided as standard room equipment in each conference room: overhead projector, LCD projector, podium microphone and laser pointer.

Monday , December 9, 2002

Time/Room	<i>Acoma</i>	<i>Cochiti</i>	<i>Picuris</i>	<i>Navajo</i>	<i>Isleta</i>	<i>Laguna</i>
M1 8:00 - 9:00	Plenary Presentation: Biomimetics and Biotechnology Research at Sandia National Laboratories Dr. Julia M. Phillips, Director, Physical and Chemical Sciences Center, Sandia National Laboratories, Ballroom A - West Complex					
9:00 - 9:30	Morning Break					
M2 9:30 - 12:00	Bio-Electric and Bio-Magnetic Phenomena Bioimpedance Research I	Advanced Technologies For the Commercial Development of Biomimetics, Bio-Robotics, Bio-MEMS in Novel Medical & Industrial Applications	Advanced Technologies For the Commercial Development of Artificial or Synthetic Muscles in Novel Medical & Industrial	Advanced R&D In Biomimetics And Artificial Muscles Special Topics in BAM	Shape Memory Alloys, Shape Memory Polymers, Magnetic Shape Memory Alloys	Electroactive Polymers, Biopolymers, Polymer Gels, and Magnetic Polymer Gels
12:00 - 1:30	Lunch Break					
M3 1:30 - 3:00	Bio-Electric and Bio-Magnetic Phenomena Bioimpedance Research II	Conjugated Copolymers and Carbon Nanotubes	Biomimetic Vision Technologies I	Liquid Crystal Elastomers I	Electro and Magnetostrictive Materials	Electroactive Polymers, Biopolymers, Polymer Gels, and Muscles I Molecular Motors
3:00 - 3:30	Afternoon Break					
M4 3:30 - 5:00		Electroactive Polymers (EAP's) as Multifunctional Materials I	Biomimetic Vision Technologies II	Liquid Crystal Elastomers I (Con't)	Electro and Magnetostrictive Materials (Con't)	Electroactive Polymers, Biopolymers, Polymer Gels, & Muscles II Biomimetic & Sensing Actuation I

Tuesday , December 10, 2002

Time/Room	<i>Acoma</i>	<i>Cochiti</i>	<i>Picuris</i>	<i>Navajo</i>	<i>Isleta</i>	<i>Laguna</i>
T1 8:00 - 9:00	Professor Gerald H. Pollack, Department of Bioengineering, University of Washington Title: Cells, Gels and Engines of Life: A Fresh Paradigm for Cell Function Ballroom A - West Complex					
9:00 - 9:30	Morning Break					
T2 9:30 - 12:00	Bio-Electric and Bio-Magnetic Phenomena Research III Advances in Biomimetic Research	Electroactive Polymers (EAP's) as Multifunctional Materials II	Ferroelectric and Relaxor Materials I	Liquid Crystal Elastomers II	Electronically Conducting Polymers I	Electroactive Polymers, Biopolymers, Polymer Gels, & Muscles III Biomimetic & Sensing Actuation II
12:00 - 1:30	Lunch Break					
T3 1:30 - 3:00	Metal Hydride/ Pneumatic/ McKibben Artificial Muscles	Electroactive Polymers (EAP's) as Multifunctional Materials III	Ferroelectric and Relaxor Materials II	Liquid Crystal Elastomers III	Electronically Conducting Polymers II	Electroactive Polymers, Biopolymers, Polymer Gels, & Muscles IV Intelligent Sensing & Structures I
3:00 - 3:30	Afternoon Break					
T4 3:30 - 5:00	Electrochemically Active Artificial Muscles	Electroactive Polymers (EAP's) as Multifunctional Materials IV	Piezoceramic and Piezopolymeric Materials I	Liquid Crystal Elastomers IV	Electronically Conducting Polymers II (Con't)	

Wednesday , December 11, 2002

Time/Room	<i>Acoma</i>	<i>Cochiti</i>	<i>Picuris</i>	<i>Navajo</i>	<i>Isleta</i>	<i>Laguna</i>
W1 8:00 - 9:00	Dr. L. MacDonald, Memry Corporation, Bethel, Connecticut, USA Title: Shape Memory Alloy Technology: The Four Decades of Growth in Industrial and Medical Applications Ballroom A - West Complex					
9:00 - 9:30	Morning Break					
W2 9:30 - 12:00	Biologically Inspired Robotic Systems and Devices	Electroactive Polymers (EAP's) as Multifunctional Materials V	Piezoceramic and Piezopolymeric Materials II			

Symposium: Bio-Electric and Bio-Magnetic Phenomena I
Session: Bioimpedance Research I

Symp. Chair: Professor Mart Min, Tallinn Technical University, Estonia
Co-Chair: Dr. Sorin G. Popa, MAGNIM, Inc. Albuquerque, New Mexico, USA
Session: M2/Acoma 9:30 am-12:00 pm
Session Chair: Professor Mart Min, Tallinn Technical University, Estonia
Co-Chair: Dr. Nils Holmstrom, St. Jude Medical Sweden

- 9:30-10:00 *Considerations on Bio-Electric and Bio-Magnetic Phenomena*
M. D. Nicu – Keynote, S.G. Popa, L.C. Robu
- 10:00-10:30 *Electrical Bioimpedance Measurement: The Means and Methods for Applying in Cardiac Monitoring and Pacing,*
M. Min
- 10:30-11:00 *The Use of Bioimpedance Sensors for Obtaining Respiration Parameters,*
D. Daum
- 11:00-11:30 *Measuring Cardiac Volumes by Impedance - Potential Solutions for Implantable Devices,*
R. Salo
- 11:30-12:00 *Clinical Experiences Using Bioimpedance Implanted Pacemaker Electrodes to Monitor Heart Failure,* **N. Holmstrom, K. Jarverud, K. Noren**

Symposium: Bio-Electric and Bio-Magnetic Phenomena II
Session: Advances in Biomimetic Research

Chair: Professor Mart Min, Tallinn Technical University, Estonia
Co-Chair: Dr. Sorin G. Popa, MAGNIM, Inc. Albuquerque, New Mexico, USA
Session: T2/Acoma 9:30 am - 12:00 pm
Session Chair: Professor Ferdinando (Sandro) Mussa-Ivaldi, Northwestern University Medical School, Evanston, IL, USA
Co-Chair: Dr. Sorin G. Popa, MAGNIM, Inc. Albuquerque, New Mexico, USA

- 9:30-10:00 *The Interplay of Computational, Neurobiological and Technological Issues in Brain-Machine Interfaces,* **S. Mussa-Ivaldi**
- 10:00-10:30 *Bioinspired Microdevices: Neurotronic Implants,* **J.-Uwe Meyer**
- 10:30-11:00 *Some Thermodynamic Optimization Criteria for Biological Systems with Applications to Artificial Muscles,* **A. Razani**
- 11:00-11:30 *Modeling of the Behavior of Ca Ions as Messengers*
M. D. Nicu, S. G. Popa, C. M. Dabu
- 11:30-12:00 *Smart Fiber Optic Magnetometer Array for MEG,*
L. O. Sillerud, S. G. Popa, M. Shahinpoor

Symposium: Bio-Electric and Bio-Magnetic Phenomena II
Session: BioImpedance Research II

Symp Chair: Professor Mart Min, Tallinn Technical University Estonia
Co-Chair: Dr. Sorin G. Popa, MAGNIM, Inc. Albuquerque, New Mexico, USA
Session: M3/Acoma 1:30 pm -3:30 pm
Session Chair: Dr. Nils Holmstrom, St. Jude Medical, Sweden
Co-Chair: Professor Mart Min, Tallinn Technical University, Estonia

- 1:30-2:00 *An Experimental Setup for Validation of the Four-Chamber Cardiac Model Using Bioimpedance Measurement,* **A. Kink, M. Min, T. Parve, I. Ratsep, G. Taal**
- 2:00-2:30 *Using of Bioimpedance for Estimation of Cardiac Energy Balance*
T. Parve, A. Kink, M. Min
- 2:30-3:00 *Experience with the PRECEPT Impedance Controlled Pacemaker,*
R. Salo
- 3:00-3:30 *Basic Model for Muscle Control in Primitive Neural Sets with Reflection,* **S. Sugiyama**

Symposium: Metal Hydride/Pneumatic/Mckibben Artificial Muscles

Symp. Chair: Professor Roger D. Quinn, Case Western Reserve University, Cleveland, OH, USA
Co-Chair: Professor Mohsen Shahinpoor, AMRI, University of New Mexico, Albuquerque, NM,
Session: T3/Acoma 1:30 pm - 3:00 pm
Session Chair: Professor Kwang J. Kim, University of Nevada-Reno Reno, NV, USA
Co-Chair: Professor Arslan Razani, University of New Mexico, USA

1:30-2:00 *Metal Hydride Artificial Muscle Systems*

M. Shahinpoor

2:00-2:30 *Experimental & Theoretical Investigation of a Metal Hydride Artificial Muscle*, **K. Kim,**

J. Detweiler, G. Lloyd, M. Shahinpoor, A. Razani

2:30-3:00 *McKibben Artificial Muscles for Biologically Inspired Robots*, **R. Quinn**

Symposium: Electrochemically Active Artificial Muscles

Symp. Chair: Professor Mohsen Shahinpoor, Artificial Muscle Research Institute (AMRI), Albuquerque, NM, USA
Co-Chair: Professor Kwang J. Kim, University of Nevada-Reno, Reno, Nevada, USA
Session: T4/Acoma 3:30 pm – 5:00 pm
Session Chair: Professor Mohsen Shahinpoor, Artificial Muscle Research Institute (AMRI), Albuquerque, NM, USA
Co-Chair: Professor Kwang J. Kim, University of Nevada-Reno, Reno, Nevada, USA

3:30-4:00 *Polyacrylonitrile Nanofibers as Artificial Nano-Muscles*, **K. J. Kim, J. Caligiuri, K. Choi, M. Shahinpoor, I. D. Norris, B. R. Mattes**

4:00-4:30 *Modeling of Electrochemical Deformation in Polyacrylonitrile (PAN) Artificial Muscles*, **M. Shahinpoor, M. Ahghar**

4:30-5:00 *Electrical Activation of Contractile Polyacrylonitrile (PAN)-Conductor Composite Fiber Bundles As Artificial Muscles*, **K. J. Kim, M. Shahinpoor**

Symposium: Biologically Inspired Robotic Systems & Devices

Symp. Chair: Professor Mohsen Shahinpoor, Artificial Muscle Research Institute (AMRI), Albuquerque, NM, USA
Co-Chair: Professor Kwang J. Kim, University of Nevada-Reno, Reno, Nevada, USA
Session: W2/Acoma 9:30 am - 11:30 am
Session Chair: Professor Wayne Walter, Rochester Institute of Engineering, Rochester, NY, USA
Co-Chair: Massoud Ahghar, ERI, Albuquerque, NM USA

9:30-10:00 *Computer Simulated Transient Analysis of Polyimide V-Groove Actuator with Serpentine Heater*, **R. Khire, W. Walter**

10:00-10:30 *Conceptual Aspect of Bio-Nano Battery* **S. Choi, J. Harb, R. Davis, G. Watt**

10:30-11:00 *Ion Channel Based Biosensors: Computational Studies*, **S. Joseph, N.R. Aluru**

11:00-11:30 *Hierarchical Actuators*, **D. Huston**

Symposium: Advanced Technologies for the Commercial Development of Biomimetics, Bio-Robotics, Bio-MEMS in Novel Medical and Industrial Applications

Symp. Chair: Professor Dermot Diamond
Dublin City University, Dublin, Ireland
Co-Chair: Dr. Yu Wang
Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA
Session: M2/Cochiti 9:30 am - 12:00 pm
Session Chair: Professor Dermot Diamond
Dublin City University, Dublin, Ireland
Co-Chair: Dr. Yu Wang, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

9:30-10:00 *Creating Facial Expressions Using Polymeric Muscles*, **D. De Rossi - Keynote**

G. Pioggia, F. Carpi, A. Ahluwalia

10:00-10:30 *Autonomous Sensing Devices - Putting the 'S' into Smart Materials*, **D. Diamond**

10:30-11:00 *Applications of Ionic Polymer Conductor Composites (IPCC's) to Nanotechnology and Nanorobots*, **M. Shahinpoor**

11:00-11:30 *Nacre-Like Materials for Use in Tough Environments*, **C.F. Kennedy, T.P. Mollart J. E. Field, K. L. Lewis**

11:30-12:00 *Permittivity Responsive Biosensor for Cell Growth Evaluation in Polymer-Based Microporous Scaffold*, **P. Bagnaninchi, M. Tabrizian**

Symposium: Conjugated Co-Polymers & Carbon Nanotubes

Chair: Professor Ray H. Baughman, University of Texas at Dallas, Dallas, Texas, USA
Co-Chair: Professor Christello Catuogno, Biomedical Engineering Dept. Montreal (QC) Canada
Session: M3/Cochiti 1:30 pm - 3:00 pm
Session Chair: Professor Ray H. Baughman, University of Texas at Dallas, Dallas, Texas, USA
Co-Chair: Professor Christello Catuogno, Biomedical Engineering Dept. Montreal (QC) Canada

1:30-2:00 *Carbon Nanotube Actuators: From the Fundamental Physics to Device Performance and Targeted Applications*, **R. Baughman – Keynote, A. A. Zakahidov, J. P. Ferraris, A. B. Dalton, E. Munoz, S. Collins, G. M. Spinks, G. G. Wallace, J. N. Barisci, M. Kertesz, Yu. N. Gartstein**

2:00-2:30 *Carbon Nanotube Artificial Muscles: Investigation of Mechanism and Applications* **L.S. Fifield, G. M. Spinks, L.R. Dalton**

2:30-3:00 *Polyelectrolyte Multilayer Self-Assembled Nanoparticles for the Delivery of Transforming Growth Factor Beta*, **C. Catuogno, M. Tabrizian**

Symposium: Electroactive Polymers (EAP's) as
Multifunctional Materials I

Chair: Professor Kwang J. Kim, University of
Nevada-Reno, Reno, Nevada, USA
Co-Chair: Professor Sia Nemat-Nasser,
University of California, San Diego, CA USA
Session: M4/Cochiti 3:30 pm - 5:00 pm
Session Chair: Professor Donald J. Leo, Virginia Polytechnic
Institute and State University, Blacksburg, VA, USA
Co-Chair: Dr. John G. Michopoulos, Naval Research Lab, Wash. D.C.

3:30-4:00 *Calcium-Induced Contractile Behaviour of
Interpenetrating Network Poly(sodium acrylate)
of Poly(vinyl alcohol) in Physiological Media,*
S. Rajagopalan, L. Yahia, J. Fernandes

4:00-4:30 *Towards A Multiphysics Formulation of Electroactive Large
Deflection Plates Made From Ionic Polymeric
Artificial Muscles,* **J.G. Michopoulos, M. Shahinpoor**

4:30-5:00 *Continuous Electrodynamic Estimation of Impedance
Associated with Multi-Dimensional Ionic Polymeric Artificial
Muscles,* **J. G. Michopoulos, M. Shahinpoor**

Symposium: Electroactive Polymers (EAP's) as
Multifunctional Materials III

Symp. Chair: Professor Kwang J. Kim, University of
Nevada-Reno, Reno, Nevada, USA
Co-Chair: Professor Sia Nemat-Nasser,
University of California, San Diego, CA USA
T3/Cochiti 1:30 pm - 3:00 pm
Session Chair: Professor Donald J. Leo, Virginia Polytechnic
Institute and State University, Blacksburg, VA, USA
Co-Chair: Professor Kaushik Bhattacharya, California Institute
of Technology, Pasadena, CA, USA

1:30-2:00 *Electromechanical Modeling of Ionic Polymer
Materials,* **D. Leo**

2:00-2:30 *Development of Active Composites as High
Temperature Artificial Muscles,* **H. Asanuma**

2:30-3:00 *Space Applications for Ionic Polymer- Metal Composit
Sensors, Actuators, and Artificial Muscles,* **K. Krishei**

Symposium: Electroactive Polymers (EAP's) as
Multifunctional Materials IV

Symposium: Electroactive Polymers (EAP's) as Multifunctional Materials II

Chair: Professor Kwang J. Kim, University of
Nevada-Reno, Reno, Nevada, USA
Co-Chair: Professor Sia Nemat-Nasser,
University of California, San Diego, CA USA
Session: T2/Cochiti 9:30 am - 12:00 pm
Session Chair: Professor Sia Nemat-Nasser,
University of California, San Diego, CA USA
Co-Chair: Dr. Joycelyn Harrison, NASA Langley Research
Center, Hampton, VA, USA

9:30-10:00 *Nano-Mechanics of Ionic Polymer-Metal
Composites as Soft Actuators and Sensors*
S. Nemat-Nasser - Keynote

10:00-10:30 *From Electroactive Polymers to Artificial
Muscles,* **J. Su, J. Harrison**

10:30-11:00 *Ionic Polymer-Metal Composite Artificial
Muscles: Manufacturing Techniques,* **K. Kim**

11:00-11:30 *An Investigation into the Relationship Between
Current and Strain Rate in Ionic Polymer
Sensors,* **K. Newbury, K. Farinholt,
M. Bennet, D. Leo**

11:30-12:00 *Biomimetic Locomotion Using Ionic Polymeric
Composite Artificial Muscles,* **M. Mojarad**

Chair: Professor Kwang J. Kim, University of
Nevada-Reno, Reno, Nevada, USA
Co-Chair: Professor Sia Nemat-Nasser,
University of California, San Diego, CA USA
Session: T4/Cochiti 3:30 pm - 5:00 pm
Session Chair: Professor Donald J. Leo, Virginia Polytechnic
Institute and State University, Blacksburg, VA, USA
Co-Chair: Professor Hiroshi Asanuma, Chiba Universtiy, Japan

3:30-4:00 *Isotonic and Isometric Tension Measurement
of a Solid Polymer Electrolyte Membrane-
Gold,* **T. Ihara, T Masuda, T Nakamura,
Y. Ikada, K. Asaka, N. Fujiwara, K. Oguro**

4:00-4:30 *Electrical Response of Polymer Electrolyte
Membrane Artificial Muscles,* **K. Asaka**

4:30-5:00 *Robotic Application of IPMC,* **S. Tadokoro**

Symposium: Electroactive Polymers (EAP's) as
Multifunctional Materials V

Chair: Professor Kwang J. Kim, University of
Nevada-Reno, Reno, Nevada, USA
Co-Chair: Professor Sia Nemat-Nasser,
University of California, San Diego, CA USA
Session: W2/Cochiti 9:30 am - 12:00 pm
Session Chair: Professor Jiangyu Li, California Institute of
Technology, Pasadena, CA, USA
Co-Chair: Professor Ron Lumia, University of New Mexico
Albuquerque, NM, USA

9:30-10:00 *Bandwidth Characterization of Ionic Polymer-
Metal Composite Actuators*, **C. Kothera, D. Leo**
10:00-10:30 *The Mechanism of IPMC: Swelling or
Electrostatic*, **J. Li**
10:30-11:00 *Artificial Muscle Microgrippers*, **R. Lumia, M. Shahinpoor**
11:00-11:30 *An Electric Circuit Model for Ionic Polymer
Metal Composites*, **J. Paquette, K. Kim**
11:30-12:00 *Artificial Muscles Based on Polymer
Electrolyte Membranes*, **K. Oguro - Keynote**

Symposium: Biomimetic Vision Technologies
Session: Biomimetic Vision Technologies I

Symp. Chair: Dr. Natalie Clark
NASA Langley Research Center, Hampton, VA
Co-Chair: Dr. Upendra Singh, NASA Langley Research Center,
Hampton, VA, USA
Session: M3/Picuris 1:30 pm - 3:00 pm
Session Chair: Dr. Natalie Clark, NASA Langley Research Center,
Hampton, VA, USA
Co-Chair: Patrick A. Shoemaker
Tanner Research Inc., Pasadena, CA

1:30-2:00 *Intelligent Biomimetic Vision Systems*, **N. Clark**
2:00-2:30 *Adaptive Motion Detectors Inspired by
Insect Vision*, **A. Straw, D. O'Carroll, P. A. Shoemaker**
2:30-3:00 *Photonic Biosensing Using Smart Optical
Fiber Structures*, **I. Ilev, R. Waynant**

Symposium: Advanced Technologies for the Commercial
Development of Artificial or Synthetic Muscles
In Novel Medical & Industrial Applications

Symp. Chair: Dr. Benjamin Mattes, Santa Fe Science and
Technology, Inc., Santa Fe, NM, USA
Co-Chair: Yoshihiro Kuroki, Digital Creatures Laboratory
Sony Corporation, Hodogayaku, Yokohama-shi
JAPAN
Session: M2/Picuris 9:30 am - 12:00 pm
Session Chair: Dr. Benjamin Mattes, Santa Fe Science and
Technology, Inc., Santa Fe, NM, USA
Co-Chair: Professor Pierre-Francois Gobin, Institut National des
Science Appliquees de Lyon (INSA), Lyon, France

9:30-10:00 *A Small Biped Entertainment Robot and
Expectation to Material Research*, **Y. Kuroki,
T. Ishida, T. Doi**
10:00-10:30 *Distributed Temperature and Strain Sensing
for Civil Structural Applications*, **X. Bao**
10:30-11:00 *Brief Overview and Trends About the Use of
Inorganic Materials as Artificial Muscles*
P.F. Gobin, L. Goujon, M. Morin, M. Salvia
11:00-11:30 *Long Term Health Monitoring of a Nuclear
Reactor Structure with a Distributed Brillouin
Sensor*, **X. Zeng, X. Bao, G. Ferrier, Q. Yu, G. Wu**
11:30-12:00 *Load Test of the Rollinsford Bridge Using the
Distributed Brillouin Sensor*, **X. Zeng, Q. Yu, G. Ferrier,
X. Bao**

Symposium: Biomimetic Vision Technologies
Session: Biomimetic Vision Technologies II

Symp. Chair: Dr. Natalie Clark
NASA Langley Research Center, Hampton, VA
Co-Chair: Dr. Upendra Singh, NASA Langley Research Center,
Hampton, VA, USA
Session: M4/Picuris 3:30 pm - 5:00 pm
Session Chair: Dr. Natalie Clark, NASA Langley Research Center,
Hampton, VA, USA
Co-Chair: Patrick A. Shoemaker
Tanner Research Inc., Pasadena, CA

3:30-4:00 *Audio Visual Speech Recognition*, **G. Erten**
4:00-4:30 *Magnetically Actuated Socket*, **G. Erten**
4:30-5:00 *Foveated Imaging*, **D.V. Wick, T. Martinez, J. T. Baker,
D.M. Payne, B. R. Stone, S. R. Restaino**

Symposium: Ferroelectric and Relaxor Materials I

Chair: Professor Qiming M. Zhang, Pennsylvania
State University, University Park, PA USA
Co-Chair: Professor Friedrich Kremer, University of Leipzig,
Leipzig, Germany
Session: T2/Picuris 9:30 am - 11:00 pm
Session Chair: Professor Friedrich Kremer, University of Leipzig,
Leipzig, Germany
Co-Chair: Professor Qiming M. Zhang, Pennsylvania
State University, University Park, PA USA

9:30-10:00 *Advanced Ferroelectric and Related Polymers for Artificial
Muscles*, **Q. Zhang**
10:00-10:30 *Electromechanical Effects in Ferroelectric
Liquid Crystalline Elastomers*, **F. Kremer**
10:30-11:00 *Relaxor Ferroelectric Polymers*, **Z.Cheng,
D. Olson, F. Xia, Q.M. Zhang**

Symposium: Ferroelectrics and Relaxor Muscles II

Chair: Professor Qiming M. Zhang, Pennsylvania State University, University Park, PA USA
Co-Chair: Professor Jerry I Scheinbeim, Rutgers University, New Jersey, USA
Session: T3/Picuris 1:30 pm - 3:00 pm
Session Chair: Professor Takeo Furukawa, Tokyo University of Science, Tokyo, Japan
Co-Chair: Professor Jerry I Scheinbeim, Rutgers University, New Jersey, USA

- 1:30-2:00 *Development of High Electromechanical Response Polymers*, **Q.M. Zhang, H. Li, Z.-Y. Cheng, F. Xia, M. Poh**
2:00-2:30 *On Polymer Piezoelectric Materials (PVDF, Composites, and Biomaterials)*, **T. Furukawa**
2:30-3:00 *High Dielectric Constant Elastomers and Ferroelectric Copolymer Blends as Artificial Muscles*, **J. Scheinbeim**

Symposium: Piezoceramic and Piezopolymeric Materials I

Chair: Dr. Robert G. Bryant, NASA Langley Research Center, Hampton, VA, USA
Co-Chair: Minoru Mohko, HONDA ENGINEERING, Research and Development, JAPAN
Session: T4/Picuris 3:30 pm – 5:00 pm
Session Chair: Dr. Robert G. Bryant, NASA Langley Research Center, Hampton, VA, USA
Co-Chair: Minoru Mohko, HONDA ENGINEERING, Research and Development, JAPAN

- 3:30-4:00 *The Effect of Radial Electric Fields on Piezoceramics, and the Applications of These Devices*, **R.G. Bryant, R.T. Effinger IV, I. Aranda Jr., B.M. Copeland, J. Harrison**
4:00-4:30 *Development of an Advanced Actuator by the Layered Unimorph PVDF*, **A. Usui, M. Mohko,**
4:30-5:00 *Sensor Measurements for Diagnostic Equipment*, **K. Mossi**

Symposium: Piezoceramic and Piezopolymeric Materials II

Chair: Dr. Robert G. Bryant, Advanced Materials Processing Branch, NLRC, Hampton, VA, USA
Co-Chair: Minoru Mohko, HONDA ENGINEERING, Research and Development, JAPAN
*Session: W2/Picuris 9:00 am - 12:00 pm
Session Chair: Joycelyn Harrison, NASA Langley Research Center, Hampton, VA, USA
Co-Chair: Ji Su, NASA Langley Research Center Hampton, VA, USA

- 9:00-9:30 *Electroactive Polymeric Blends for Self-Sensing Actuation*, **J. Su, T. Xu, J. Harrison**
9:30-10:00 *Synthesis and Characterization of Cyano-Containing Piezoelectric Polyimide Homopolymers and Copolymers*, **D.J. Klein, R. G. Bryant, Z. Ounaies**
10:00-10:30 *Miniaturizing High Voltage Amplifiers for Piezoelectric Actuators*, **P. Robinson, J. Bockman**
10:30-11:00 *Design, Manufacture & Evaluation of a Low Frequency, Anti-Resonant Piezoelectric Pump*, **R.M. Tieck, G.P Carman**
11:00-11:30 *Lightweight Piezo- Composite Curved Actuator for Adaptrincs Structure*, **K.J. Yoon, H.C. Park, K. H. Park, S.K. Lee**
11:30-12:00 *Material Nonlinear Characteristics of PZT Wafer Under Tension and It's Finite Element Analysis*, **Y.S. Kim, S.K. Lee, H.C. Park, K.J. Yoon**

* Note: Session starts at 9:00 am.

Symposium: Advanced R&D in Biomimetics and Artificial Muscles
Special Topics in BAM

Chair: Massoud Ahghar, Environmental Robots, Inc. Albuquerque, NM, USA
Co-Chair: David Soltanpour, *Medipump LLC, New York, NY*
Session: M2/Navajo 9:30 am – 12:30 pm
Session Chair: Massoud Ahghar, Environmental Robots, Inc. Albuquerque, NM, USA
Co-Chair: Mohsen Shahinpoor *AMRI, Albuquerque, NM, USA*
9:30-10:00 *Moving Beyond the "As-Received" State of Perfluorosulfonate Ionomers*, **R. B. Moore**
10:00-10:30 *Development of A Synthetic-Muscle Based Miniature Diaphragm Pump For Medical Applications* **D. Soltanpour, M. Shahinpoor**
10:30-11:00 *Development of An Artificial Muscle Based Smart Band To Correct Refractive Errors of The Human Eye* **D. Soltanpour P. Shahinpoor**
11:00-11:30 *Tailoring Actuators to Load Characteristics with Compliant Transmissions –Design Methods and Applications*, **S. Kota**
11:30-12:00 *Miniature, Portable, Automated Device As a Diagnostic Tool for Pathogens*, **E. Wilkins**
12:00-12:30 *Full-field Deformation & Strain Measurement in Biomechanics & Biomimetics*, **J. Tyson, T. Schmidt, K. Galanulis, M. Shahinpoor**

Symposium: Liquid Crystal Elastomers I

Chair: Professor Heino Finkelmann, Institut für Makromolekulare Chemie, Freiburg, Germany
Co-Chair: Professor Helmut R. Brand, University of Bayreuth
Session: M3/Navajo 1:30 pm - 3:00 pm
Session Chair: Dr. Laurence Thomsen III, NASA Langley Research Center, Hampton, VA, USA
Co-Chair: Professor Patrick Keller, Institut Curie Section de Recherche, France

1:30-2:00 *Nematic Side-On Liquid Crystalline Elastomers as Artificial Muscles*, **P. Keller - Keynote**

2:00-2:30 *Anomalous Damping and Acoustic Properties on Nematic Elastomers*, **E.M. Terentjev**

2:30-3:00 *Liquid Crystal Gels and Applications*, **L.C. Chien**

Symposium: Liquid Crystal Elastomers I (Con't)

Chair: Professor Heino Finkelmann, Institut für Makromolekulare Chemie, Freiburg, Germany
Co-Chair: Professor Helmut R. Brand, University of Bayreuth
Session: M4/Navajo 3:30 pm - 5:00 pm
Session Chair: Dr. Laurence Thomsen III, NASA Langley Research Center, Hampton, VA, USA
Co-Chair: Professor Patrick Keller, Institut Curie Section de Recherche, France

3:30-4:00 *Lifetime Studies of a Thermally Driven Liquid Crystalline Elastomer Bender (TLB)*, **D.L.Thomsen III G. Bush, P. Keller, R.G. Bryant**

4:00-4:30 *Tailored Shape Memory Polymers: Not all SMPs are Created Equal*, **C. Liu, I. A. Rousseau P.T. Mather,**

4:30-5:00 *Large Light-Induced Strains in Solids* **M. Warner**

Symposium: Liquid Crystal Elastomers II

Chair: Professor Heino Finkelmann, Institut für Makromolekulare Chemie, Freiburg, Germany
Co-Chair: Professor Helmut R. Brand, University of Bayreuth
Session: T2/Navajo 9:30 am - 12:00 pm
Session Chair: Dr. Patricia Cladis, Advanced Liquid Crystal Technologies, Inc., Summit, NJ, USA
Co-Chair: Dr. Philippe Martinoty, Laboratoire De Dynamique Des Fluides Complexes, Strasbourg, CEDEX France

9:30-10:00 *Electromechanical Effects in Liquid Crystalline Polymers and Elastomers*, **H. R. Brand - Keynote**

10:00-10:30 *Anisotropic Liquid Crystal Gels – Self- Assembled Nano-Composites with High Electromechanical Response*, **C. Huang, H. Li, Q. M. Zhang, A. Jakli**

10:30-11:00 *Rheological Properties of Liquid Crystal Elastomers*, **P. Martinoty**

11:00-11:30 *Macroscopic Dynamic Properties of Liquid Crystalline Elastomers*, **H. Pleiner**

11:30-12:00 *Liquid Crystalline Elastomers as Artificial Muscles*, **P. Cladis**

Symposium: Liquid Crystal Elastomers III

Chair: Professor Heino Finkelmann, Institut für Makromolekulare Chemie, Freiburg, Germany
Co-Chair: Professor Helmut R. Brand, University of Bayreuth
Session: T3/Navajo 1:30 pm - 3:00 pm
Session Chair: Professor Patrick Keller, Institut Curie Section de Recherche, France
Co-Chair: Dr. D. Laurence Thomsen III, NASA Langley Research Center, Hampton, VA, USA

1:30-2:00 *Liquid Crystal Elastomers as Mechanical Actuators and Artificial Muscles*, **H. Finkelmann - Keynote**

H. Brandt, S. Hohn, F. Weiss, H. Wermter

2:00-2:30 *Nematic Elastomers as Artificial Muscles*, **B. R. Ratna, J. V. Selinger, A. Srinivasan, J. Hong, J. Naciri**

2:30-3:00 *Interface Mechanisms, Kinetics, Thermodynamics and Transport Phenomena in Liquid Crystal Polymer-Polymer Mixtures, Investigated by Classical Methods and by Laser Holographics, in Real Time, Interferometry*, **M. Ralea. N. Eseanu**

Symposium: Liquid Crystal Elastomers IV

Chair: Professor Heino Finkelmann, Institut für Makromolekulare Chemie, Freiburg, Germany
Co-Chair: Professor Helmut R. Brand, University of Bayreuth
Session: T4/Navajo 3:30 pm - 4:30 pm
Session Chair: Dr. B.R. Ratna, US Naval Research Laboratory, Washington, D.C., USA
Co-Chair: P. Palffy-Muhoray, Kent State University, Kent, OH, USA

3:30-4:00 *Influence of Molecular Parameters on the Transition Temperatures and Viscoelastic Properties of Side-Chain Liquid Crystalline Elastomers*, **M. Mauzac**

4:00-4:30 *Swimming Towards the Dark: A Photophobic Light-Driven Elastomeric Swimmer*, **M. Camacho-Lopez, H. Finkelmann, M. Shelly P. Palffy-Muhoray**

Symposium: Shape Memory Alloys, Shape Memory Polymers,
Magnetic Shape Memory Alloys

Chair: Professor Takamichi Kamiyama, Tohoku
University, Tohoku, Japan
Co-Chair: Professor B. Picasso, Cagliari, Italy
*Session: M2/Isleta 9:30 am - 12:00 pm
Session Chair: Dr. L. MacDonald, Memry Corporation,
Bethel, CT, USA
Co-Chair: Takeshi Okuyama, Tohoku University, Aobaku,
Sendai Japan

9:30-10:00 *Modeling the Mechanics of Fish Propulsion*
B. Picasso

10:00-10:30 *Applications of SMAs with Two-Way Shape
Memory Effect to Artificial Anal Sphincters*
**Y. Luo, T. Takagi, T. Okuyama, S. Amae,
M. Wada, K. Nishi, T. Yambe, T. Kamiyama**

10:30-11:00 *Studies of Shape Memory Behavior Styrene-
Based Network Copolymers*, **S.P. Cullen,
T.R. Robert, T.H. Tong**

11:00-11:30 *Development of 3-Dimensional Shaped Micro-
Devices Based on Shape Memory Alloy Thin
Film for Medical Applications*, **V. Gupta,
A.D. Johnson, V. Martynov, L. B. Menchaca**

11:30-12:00 *Development of High Performance Thermo-Magneto-
Elastic Actuator/Sensor Materials by Rapid-Solidification
and Their Applications For Smart Systems*, **Y. Furuya
Y. Shinya, T. Yamahira, T. Okazaki, Y. Tanahashi, K. ITagaki**

Symposium: Electro and Magnetostrictive Materials

Chair: Roy Kornbluh, Stanford Research Institute
International, Menlo Park, CA, USA
Co-Chair: Professor Toshihiro Hirai, Shinshu University
Ueda-Shi, Japan
*Session: M3/Isleta 1:00 pm - 3:00 pm
Session Chair: Roy Kornbluh, Stanford Research Institute
Co-Chair: Massoud Ahghar
Environmental Robots, Inc., Albuquerque, NM USA

1:00-1:30 *Dielectric Elastomers as Artificial Muscle for
Actuators, Generators and Sensors*
R. Kornbluh, R. Pelrine, Q. Pei, S. Stanford

1:30-2:00 *Electrically Active Non-Ionic Artificial Muscle - From
Polymer Gel to Elastomer*, **T. Hirai**

2:00-2:30 *Development of Carbon Nanotubes Based
MR Materials*, **S.H. Choi**

2:30-3:00 *Design with Magnetically Modified Elastomers*
S. Kazi, R. W. Leger, H. D. Tran

Symposium: Electro and Magnetostrictive Materials (Con't)

Chair: Roy Kornbluh, Stanford Research Institute
International, Menlo Park, CA, USA
Co-Chair: Professor Toshihiro Hirai, Shinshu University
Ueda-Shi, Japan
Session: M4/Isleta 3:30 pm – 5:00 pm
Session Chair: K.S. Lee
Co-Chair: David Soltanpour
Medipump LLC, New York, NY

3:30-4:00 *Scalable Capacitive Array Actuators*, **S.M. Bobio,
S.W. Smith, J.M. Zara, S.M. Goodwin-Johanson**

4:00-4:30 *Antagonistically-Driven Liner Actuator by Using
Electroactive Dielectric Elastomer
Nanocomposites*, **K.S. Lee, I.K. Ahn, H.R. Choi
J.W. Jeon, H.M. Kim, Y.S. Tak, K.J. Kim, J.D. Nam**

4:30-5:00 *Potential Applications of Ferrofluids for Energy
Conversion Cycles*, **S. H. Choi**

Symposium: Electronically Conducting Polymers I

Chair: Dr. Benjamin Mattes, Santa Fe Science and
Technology, Inc., Santa Fe, NM, USA
Co-Chair: Professor Toribio Fernandez Otero, Universidad
Politecnica de Cartagena, Cartagena, Spain
Session: T2/Isleta 9:30 am - 11:30 pm
Session Chair: Dr. Benjamin Mattes, Santa Fe Science and
Technology, Inc., Santa Fe, NM, USA
Co-Chair: Professor Gordon Wallace, University of Wollongong
Wollongong, Australia

9:30-10:00 *Electronics Textiles Based on Homogenous
Polyaniline Fiber*, **B.R. Mattes**

10:00-10:30 *Molecularly Self-Assembled Actuators and
Devices*, **R.O. Claus, T. Zeng, K. Huie, J. Huie,
J.B. Mecham, F. Arregui, I. Matias**

10:30-11:00 *(B)Ionic Liquids: An Elixir for Inherently Conducting
Polymer Based Artificial Muscles*
G. G. Wallace, J. Ding, D. Zhou, G.M. Spinks

11:00-11:30 *Electrochemical Properties of Conducting
Polymers: Multifunctionality and Biomimesis*
T. F. Otero

*Note: Session starts at 1:00 pm instead of 1:30 pm

Symposium: Electronically Conducting Polymers II

Chair: Dr. Benjamin Mattes, Santa Fe Science and Technology, Inc., Santa Fe, NM, USA
Co-Chair: Professor Toribio Fernandez Otero, Universidad Politecnica de Cartagena, Cartagena, Spain
Session: T3/Isleta 1:30 pm - 3:00 pm
Session Chair: Professor J. Gonzalez, Universidad Politecnica de Cartagena, Cartagena, Spain
Co-Chair: Professor Krishna C. Persaud, UMIST, Manchester, UK

1:30-2:00 *Design and Testing of New Molecular Mechanisms of Actuation,*

J. D. Madden

2:00-2:30 *Intelligent Conducting Polymer Chemical Sensors,* **K.C. Persaud, R. Bissell**

2:30-3:00 *Electrochemomechanical Characterization of Polypyrrole Based Artificial Muscles,*
J. Gonzalez

Symposium: Electronically Conducting Polymers II (Con't)

Chair: Dr. Benjamin Mattes, Santa Fe Science and Technology, Inc., Santa Fe, NM, USA
Co-Chair: Professor Toribio Fernandez Otero, Universidad Politecnica de Cartagena, Cartagena, Spain
Session: T4/Isleta 3:30 pm – 5:00 pm
Session Chair: Professor J. Gonzalez, Universidad Politecnica de Cartagena, Cartagena, Spain
Co-Chair: Professor Krishna C. Persaud, UMIST, Manchester, UK

3:30-4:00 *Characterization of Novel Thiophene Based Molecular Actuator,* **P. Anquetil, J. Madden, H.H. Yu, T. Swager, I. Hunter**

4:00-4:30 *Development of Stable Electrochemical Linear Actuators Using Polyaniline Fibers and Room-Temperature Ionic Liquids,* **W. Lu, A.G. Fadeev, B.R. Mattes**

4:30-5:00 *A Large-Strained Linear Actuator for Use in Aqueous Environments,* **K. West**

Symposium: Intelligent Gels, Polymer Gels and Magnetic Polymer Gels

Chair: Professor Minoru Taya, University of Washington, Seattle, WA, USA
Co-Chair: Miklos Zrinyi, Technical University of Budapest, Budapest, Hungary
Session: M2/Laguna 9:30 am - 12:00 pm
Session Chair: Dr. Kinji Asaka, National Institute of Advanced Industrial Science and Technology, Kansai, Japan
Co-Chair: Dr. Kwang J. Kim, University of Nevada-Reno, Reno, NV, USA

9:30-10:00 *Muscular Contraction Mimiced by Magnetic Gels,* **M. Zrinyi**

10:00-10:30 *A Biomimetic Two-Dimensional Conveyor System Using Electroactive Polymer Gel*
T. Yamauchi, J.F.V. Vincent

10:30-11:00 *Design of Flemion Actuators,* **M.L. Guilly, M. Taya**

11:00-11:30 *The Electrochemomechanical Phenomena of a Chitosan-Based Smart Hydrogel, A Study on Both Experiment & Theory,* **A.F.T. Mak, S. Sun**

11:30-12:00 *Intelligent Gels – an Approach to Artificial Muscles,*
Y. Osada – Keynote, J. P. Gong

Symposium: Electroactive Polymer Gels, Biopolymers and Muscles I
Session: Molecular Motors

Chair: Professor Gerald H. Pollack, University of Washington, Seattle, WA, USA
Co-Chair: Professor Tadashi Ihara, Suzuka University Suzuka, Japan
Session: M3/Laguna 1:30 pm - 3:00 pm
Session Chair: Dr. Kenneth Meijer, University of Maastricht, Maastricht, The Netherlands
Co-Chair: Professor Tadashi Ihara, Suzuka University Suzuka, Japan

1:30-2:00 *Translation Step Size in Single Myofibrils and Single Filaments,* **X. Liu, O. Yakovenko, F. A. Blyakhman, G. H. Pollack - Keynote**

2:00-2:30 *Engineering with the Engines of Creation,*
C. Montemagno, Keynote

2:30-3:00 *From Motors to Muscles: Innovations in ChemoMechanical BioTechnology,*
A. S. Rudolph - Keynote

Symposium: Electroactive Polymers, Biopolymers, Polymer Gels
and Muscles II

Session: Biomimetic Sensing and Actuation I

Chair: Professor Gerald H. Pollack, University of
Washington, Seattle, WA, USA
Co-Chair: Professor Tadashi Ihara, Suzuka University
Suzuka, Japan
Session: M4/Laguna 3:30 pm - 5:00 pm
Session Chair: Dr. Kenneth Meijer, University of Maastricht,
Maastricht, The Netherlands
Co-Chair: Professor Tadashi Ihara, Suzuka University
Suzuka, Japan

3:30-4:00 *Protein Motor Mechanism: Role of Water,*
M. Suzuki
4:00-4:30 *Elastic Kinetics in Ionized Polymeric Hydrogels:*
High-Frequency Range, P. Chiarelli
4:30-5:00 *Tensile Properties of Hydrogels and Reptilian Skin,*
J.A. Hinkley, A. H. Savitzky, G. Rivera,
S. H. Gehrke

Electroactive Polymers, Biopolymers, Polymer
Gels and Muscles IV

Intelligent Sensing & Structures I

Chair: Professor Gerald H. Pollack, University of
Washington, Seattle, WA, USA
Co-Chair: Professor Tadashi Ihara, Suzuka University
Suzuka, Japan
Session: T3/Laguna 1:30 pm - 2:30 pm
Session Chair: Dr. Kenneth Meijer, University of Maastricht,
Maastricht, The Netherlands
Co-Chair: Professor Tadashi Ihara, Suzuka University
Suzuka, Japan

1:30-2:00 *Smart Materials Which Build & Repair*
Themselves, C. Dry
2:00-2:30 *Intelligent Dynamic Structures, A. Guran*

Electroactive Polymers, Biopolymers, Polymer Gels
and Muscles III

Biomimetic Sensing and Actuation II

Symp. Chair: Professor Gerald H. Pollack, University of
Washington, Seattle, WA, USA
Co-Chair: Professor Tadashi Ihara, Suzuka University
Suzuka, Japan
Session: T2/Laguna 9:30 am - 12:00 pm
Session Chair: Dr. Kenneth Meijer, University of Maastricht,
Maastricht, The Netherlands
Co-Chair: Professor Tadashi Ihara, Suzuka University
Suzuka, Japan

9:30-10:00 *Development of Smart Actuators Using*
N-Isopropylacrylamide Gels, C. Santulli,
G. Jeronimidis, S.I. Patel, F.J. Davis,
G.R. Mitchell
10:00-10:30 *Smart Polymer Systems for Biosensing and for Controlled*
Release, S. Peteu
10:30-11:00 *Form-Function Relationships in Biological*
Muscle, Inspiration for the Design of Artificial
Muscles, K. Meijer
11:00-11:30 *Photo-Switchable Self-Assembled Polymers*
Thin Films, O. Mermut, C.J. Barrett
11:30-12:00 *Multi-Scale Self-Assembly and Patterning*
Of Functional Hybrid Nanostructures,
C.J. Brinker, D. Doshi, H. Fan, Y. Yang

First World Congress on Biomimetics and Artificial Muscles
 December 9 – 11, 2002
 Albuquerque Convention Center
 Albuquerque, New Mexico, USA

Advance Technical Program Addendum

Monday , December 9, 2002	
Time/Room	<i>Santo Domingo</i>
M1 8:00 - 9:00	Plenary Presentation: Biomimetics and Biotechnology Research at Sandia National Laboratories Dr. Julia M. Phillips, Director, Physical and Chemical Sciences Center, Sandia National Laboratories, Ballroom A - West Complex
9:00 - 9:30	Morning Break
M2 9:30 - 12:00	Special Symposium on Active Materials Session: I
12:00 - 1:30	Lunch Break
M3 1:30 - 3:00	Special Symposium on Active Materials Session: II
3:00 - 3:30	Afternoon Break
M4 3:30 - 5:00	Special Symposium on Active Materials Session: II (con't)
Tuesday, December 10, 2002	
Time/Room	<i>Santo Domingo</i>
T1 8:00 - 9:00	Professor Gerald H. Pollack, Department of Bioengineering, University of Washington Title: Cells, Gels and Engines of Life: A Fresh Paradigm for Cell Function Ballroom A - West Complex
9:00 - 9:30	Morning Break
T2 9:30 - 12:00	Special Symposium on Active Materials Session: III
12:00 - 1:30	Lunch Break
T3 1:30 - 3:00	Special Symposium on Active Materials Session: IV
3:00 - 3:30	Afternoon Break

Symposium: Special Symposium on Active Materials

Session: I

Symp. Chair: Professor Jiangyu Li, University of Nebraska-Lincoln
Lincoln, Nebraska, USA
Co-Chair: Professor Robert W. Schwartz, Clemson University
Clemson, South Carolina, USA
Session: M2/Santo Domingo 9:30 am-12:00 pm
Session Chair: Dr. John G. Michopoulos, Naval Research Lab, Wash. D.C.
Co-Chair: Professor Jiangyu Li, University of Nebraska-Lincoln
Lincoln, Nebraska, USA

- 9:30-10:00 *Ferroic High Strain Actuators: Common Mechanisms In Diverse Material Systems*, **E. Cross**
10:00-10:30 *Applications of Active Materials to Microactuation*
K. Bhattacharya
10:30-11:00 *Performance Enhancement Mechanisms in Piezoceramic Mechanical Electromechanical Actuator*, **R.W. Schwartz, M. Narayanan**
11:00-11:30 *Piezoresponse of Constrained Polydomain Ferroelectric Films*, **A.L. Roytburd, V. Nagarajan, C.S. Ganpule, L. Chen, R. Ramesh**
11:30-12:00 *Thin Film Shape Memory Alloy Motor for a Compact Kinetic Energy Missile* **D. D. Shin, D. G. Lee, K. P. Mohanchandra, G. P. Carman**

Symposium: Special Symposium on Active Materials
Session: II

Symp. Chair: Professor Jiangyu Li, University of Nebraska-Lincoln
Lincoln, Nebraska, USA
Co-Chair: Professor Robert W. Schwartz, Clemson University
Clemson, South Carolina, USA
Session: M3/Santo Domingo 1:30 pm-3:00 pm
Session Chair: Professor Robert W. Schwartz, Clemson University
Clemson, South Carolina, USA
Co-Chair: TBD

- 1:30-2:00 *Ultrathin Piezoelectric Polymer Films for Biomechanical and Biochemical Functions* **S. Ducharme, A.V. Bune, V.M. Fridkin, S.P. Palto, A.V. Sorokin**
2:00-2:30 *Thermodynamics of Shape Memory Polymer Non-Composite*, **M. L. Dunn, P. McCluskey**
2:30-3:00 *Optimization of Ferroelectric Polymeric Composites*,
J. Li

Symposium: Special Symposium on Active Materials

Session: II (Con't)

Symp. Chair: Professor Jiangyu Li, University of Nebraska-Lincoln
Lincoln, Nebraska, USA
Co-Chair: Professor Robert W. Schwartz, Clemson University
Clemson, South Carolina, USA
Session: M4/Santo Domingo 3:30 pm-5:00 pm
Session Chair: Professor Robert W. Schwartz, Clemson University
Clemson, South Carolina, USA
Co-Chair: TBD

- 3:30-4:00 *Piezoelectric Polymer Sheets Electroded with Conductive Polymers to Provide Higher-Strain Actuators*
V.H. Schmidt, J. Hallenberg, N. Hallenberg, L. Lediae, A. Vinogradov, G.F. Tuthill
4:00-4:30 *Damping and Electro-Mechanical Energy Losses in the Piezoelectric Polymer PVDF*, **M. Vinogradov V.H. Schmidt, G.F. Tuthill, G.W. Bohannan**
4:30-5:00 *Modeling of Nonlinear Behavior of PZT Piezoceramics Based on Microstructures*, **C.T. Sun, A. Achuthan**

Symposium: Special Symposium on Active Materials
Session: III

Symp. Chair: Professor Jiangyu Li, University of Nebraska-Lincoln
Lincoln, Nebraska, USA
Co-Chair: Professor Robert W. Schwartz, Clemson University
Clemson, South Carolina, USA
Session: T2/Santo Domingo 9:30 am-11:30 am
Session Chair: Melanie W. Cole, US Army Research Lab
Co-Chair: Professor Jiangyu Li, University of Nebraska-Lincoln
Lincoln, Nebraska, USA

- 9:30-10:00 *Elastic, Anelastic, Piezoelectric Coefficients of Monocrystal Lithium Niobate*, **H. Ogi, H. Ledbetter, S. Kim**
10:00-10:30 *The Dependence of Dielectric Properties on Composition Variation for Voltage Tunable Device Applications*, **M.W. Cole, R.G. Geyer**
10:30-11:00 *Comparative Experimental Study of Nafion- and Flemion- Based Ionic Polymer Metal Composites (IPMC) In Various Cation Forms*, **S. Nemat-Nasser, Y. Wu**
11:00-11:30 *Design of Piezo-bimorph Actuators with Functionally Graded Microstructure*, **M. Taya**
11:30-12:00 *Evolution of Magnetic Domains Under Combine Stress and Field*, **Y.C. Shu**
-

Symposium: Special Symposium on Active Materials

Session: IV

Symp. Chair: Professor Jiangyu Li, University of Nebraska-Lincoln
Lincoln, Nebraska, USA

Co-Chair: Professor Robert W. Schwartz, Clemson University
Clemson, South Carolina, USA

*Session: T3/Santo Domingo 1:00 pm-3:00 pm

Session Chair: Melanie W. Cole, US Army Research Lab
Aberdeen Proving Ground, MD, USA

Co-Chair: Professor Jiangyu Li, University of Nebraska-Lincoln
Lincoln, Nebraska, USA

1:30-2:00 *Elastic Domain Architectures in Constrained*

Ferroelectric Films, J. Slutsker, A.L. Roytburd

2:00-2:30 *Thermodynamics of Charged Swelling Porous Media*

with an Electric Field, L.S. Bennethum

2:30-3:00 *Electroelastic Effect Induced by Electrode Embedded*

at the Interface of Two Piezoelectric Half-Planes

Y. Shindo
