

# MICHAEL S. SACKS

JOHN A. SWANSON ENDOWED CHAIR IN BIOENGINEERING  
DEPARTMENTS OF BIOENGINEERING, MECHANICAL ENGINEERING AND MATERIALS SCIENCE, AND CIVIL ENGINEERING  
SWANSON SCHOOL OF ENGINEERING  
THE MCGOWAN INSTITUTE, SCHOOL OF MEDICINE  
UNIVERSITY OF PITTSBURGH

PROFESSOR OF BIOMEDICAL ENGINEERING, CARNEGIE MELLON UNIVERSITY

100 Technology Drive, Room 234, Pittsburgh, PA 15219  
Tel 412-235-5146/Fax 412-235-5161, email: [msacks@pitt.edu](mailto:msacks@pitt.edu)

## EDUCATION

- 1992 **Ph.D., Biomedical Engineering (Biomechanics)**  
University of Texas Southwestern Medical Center at Dallas (UTSWMCD)  
Dissertation: "Active Wall Tension and Passive Constitutive Relation of the Right Ventricular Free Wall"
- 1983 **M.S., Engineering Mechanics**  
Michigan State University (MSU), East Lansing, MI.  
Thesis: "Stability of Response of Canine Tendon to Repeated Elongation"
- 1981 **B.S., Engineering Mechanics, MSU**

## PROFESSIONAL EXPERIENCE

4/09-Present	John A. Swanson Endowed Chair, Department of Bioengineering, University of Pittsburgh
9/04-3/2009	W.K. Whiteford Professor, Department of Bioengineering, University of Pittsburgh
1/09-Present	Professor (Secondary), Department of Civil Engineering, University of Pittsburgh
11/08-Present	Professor (Adjunct), Department of Biomedical Engineering, Carnegie-Mellon University
7/02-Present	Director, Engineered Tissue Mechanics and Mechanobiology Laboratory, The McGowan Institute
7/02-Present	Core Faculty, The McGowan Institute, University of Pittsburgh
9/01-8/04	Associate Professor, Department of Bioengineering, University of Pittsburgh
6/98-8/01	Assistant Professor, Department of Bioengineering, University of Pittsburgh
9/95-6/98	Adjunct Professor, Department of Bioengineering, University of Pennsylvania
8/93-5/98	Assistant Professor, Department of Biomedical Engineering, University of Miami

## HONORS

- 2009 John A. Swanson Endowed Chair in Bioengineer, Swanson School of Engineering, University of Pittsburgh.
- 2009 The Van C. Mow Medal, Bioengineering Division, ASME.
- 2008 Richard Skalak Distinguished Lectureship, Department of Biomedical Engineering, Columbia University, NY.
- 2008 Chancellor's Distinguished Research Award, University of Pittsburgh.
- 2008 Sigma-Kappa-Tau Lectureship, Department of Biomedical Engineering, CCNY
- 2008 Elected Fellow of the American Society of Mechanical Engineers
- 2007- Editor, Journal of Biomechanical Engineering.
- 2007 Provost's Doctoral Mentor Award Nominee, University of Pittsburgh
- 2006 Selected as one of the Scientific American 50 (with William R. Wagner).
- 2005 Elected Fellow of the Biomedical Engineering Society (Inaugural Class)
- 2005 Elected to the Canada Research Chairs College of Reviewers.
- 2005 Board of Visitors Faculty Award, Swanson School of Engineering, University of Pittsburgh
- 2004-2009 William Kepler Whiteford Professor, Swanson School of Engineering, University of Pittsburgh
- 2004 Elected Fellow of the American Institute for Medical and Biological Engineering
- 2001-2006 Associate Editor, Journal of Biomechanical Engineering
- 2001-2005 Established Investigator, American Heart Association, National Affiliate
- 2001-2003 CNG Faculty Fellow, School of Engineering, University of Pittsburgh
- 1994-97 Whitaker Young Investigator Award
- 1994-97 Initial Investigator, American Heart Association, Florida Affiliate
- 1994 University of Miami, Summer support award in Natural Sciences and Engineering
- 1992-93 NIH Postdoctoral Fellow
- 1990 Elected to Tau Beta Pi, the National Engineering Honor Society
- 1989 Albert Potvin Outstanding Biomedical Engineering Student Award (UTSWMCD)
- 1987-92 NIH Predoctoral Fellow

**6/92-7/93: Research faculty/NIH Post-doctoral Fellow, Biomedical Engineering, UTSWMC**

Expanded the use of SALS to tissue engineered dermal replacements and bovine pericardium. Taught an undergraduate introductory course in Biomedical Engineering, a graduate course on Biomedical Engineering Laboratory Principles, and Graduate Seminar.

**9/87-5/92: NIH Pre-doctoral Fellow, Biomedical Engineering, UTSWMC.**

1. Developed a thin-walled membrane shell model for the right ventricular free wall (RVFW). Characterized the complex *in-vivo* geometry of the RVFW using MR imaging. Used a FEM formulation to solve the force-equilibrium equations for a thin-walled membrane shell of arbitrary shape. By incorporating the *in-vivo* RVFW geometry, this model enabled non-invasive determination of regional wall tensions.
2. Determined a constitutive relation of passive RVFW myocardium. This work involves multi-axial mechanical tests using a custom built biaxial mechanical testing device. A constitutive relation, based on the assumption of transverse isotropy, was used to model the mechanical properties of passive RVFW myocardium.
3. Investigated the regional deformation of the RVFW using bi-plane cinefluorography. Local principle stretches were determined in three regions of the RVFW, allowing quantification of the regional deformation.
4. Studied the anisotropy of the diaphragmatic central tendon through mechanical testing and a novel small angle light scattering technique to characterize its collagen fiber architecture. Utilized this information to correlate the tendon's structure with its material properties and function in pulmonary ventilation.

**9/83-8/87: Biomaterials Engineer, USDA-Eastern Regional Research Center, Philadelphia, PA**

1. Determined the contribution of ground matrix components to the dynamic mechanical properties of skin. Enzymolysis was used to determine their mechanical contributions. Analysis included modeling the data to the WLF equation from polymer viscoelastic theory.
2. Developed an automated laser based small angle light scattering (SALS) device to quantify collagen fiber orientation. Applied this technique to the quantification of a genetic collagen fiber structure disorder in hide.
3. Determined the role of connective tissue in the viscoelastic properties of post-rigor muscle. Utilized an enzymatic approach to determine the roles of the collagenous and non-collagenous components in the viscoelastic properties, as well as muscle fiber orientation effects. Experimental work involved development of a PC-based data acquisition and control system.

**9/81-8/83: Graduate Research Assistant, Department of Biomechanics, MSU**

Investigated the long-term behavior of cyclic creep and extension of tendons and spinal ligaments, utilizing computer controlled mechanical testing equipment. Characterized their viscoelastic behavior, and determined when changes in response over time ceased. Applied this information to determine differences in physiological function between the various tendons and ligaments. Dissected, prepared samples, and programmed, as well as directed five undergraduate students in laboratory operations.

**9/81-6/82: Graduate Teaching Assistant, Mechanics Department, MSU**

Taught an undergraduate laboratory course on the strength of materials.

**6/79-8/81: Undergraduate Research Assistant, Dept. of Biomechanics, MSU**

Examined the mechanical properties of connective tissues in several projects: the effects of canine dysplasia, the aging of human tendons and ligaments, and the general properties of human and primate tendons and ligaments. Prepared and tested samples, performed histological and data analysis, as well as summarized results.

**6/80-8/80: Student project director, NSF Student Originated Study**

Directed student project on the mechanical properties of sheet and meshed skin grafts. Duties included surgery, mechanical testing, and analysis.

**Industrial collaborations:** Boston Scientific, Concordia Fibers, Inc., Edwards Lifesciences, TEPHA, 3F Therapeutics, Medtronic, Cook Myosite, Corevalve, St. Jude Medical. Also have served as Expert Witness for several legal firms.

**NATIONAL PROFESSIONAL ACTIVITIES**

1. Editor, Journal of Biomechanical Engineering.
2. Editorial board for the Cardiovascular Pathology, 2007-2010.
3. Member of the Executive Committee, Bioengineering Division, ASME 2006-present.
4. Editorial board for the Journal of Biomechanics, appointed 2005-2008.
5. Associate Technical Editor for Journal of Biomechanical Engineering, 2001-2006.
6. Editorial board for Acta Biomaterialia. Appointed 2005
7. Chair, Cell and Tissue Engineering Committee, Bioengineering Division, ASME. 2004-2006

*Journal Reviewer for:*

Acta Biomaterialia  
 Annals of Biomedical Engineering  
 Annals of Thoracic Surgery  
 Biomaterials  
 Biomechanics and Modeling and Mechnobiology  
 Cardiovascular Pathology  
 Expert Opinion On Biological Therapy  
 Journal of Biomedical Materials Research  
 Journal of Biomechanical Engineering  
 Journal of Biomechanics  
 Journal of Biomaterials Science, Polymer Edition  
 Medical Engineering and Medical Physics  
 Tissue Engineering

*Grant review and study sections:*

1. NIH/NIBIB "Enabling Technologies for Tissue Engineering and Regenerative Medicine" ZEB1 OSR-D (M1) S, March 20, 2009.
2. NSF Nano and Biomechanics Review panel January 26, 2009.
3. NIH CSR ZEB1 OSR-D J1 NIBIB Review Panel for "Enabling Technologies for Tissue Engineering and Regenerative Medicine," November 13, 2008.
4. NIH CSR ZRG1 BST-Z(40) Special emphasis panel to review and hold a reverse site visit for the Tufts/Columbia Tissue Engineering Resource Center, October, 2008.
5. National American Heart Association Reviewer for Cell Transport, Physiology, and Metabolism, April 16, 2008.
6. NIH CSR ZRG1 BST-Z(40) Special emphasis panel to review and site visit the Tufts/Columbia Tissue Engineering Resource Center, March 19-21, 2008.
7. Reviewer for the Israel Science Foundation, 2008.
8. NSF Bioengineering Grant Review Panel, May 17-18, 2007.
9. External reviewer for DOD extramural project entitled "Cardiovascular and soft tissue battlefield injury diagnostic and treatment sensors and MEMS technology development," University of South Florida, J. Strom, PI, February 21, 2007.
10. NIH CSR Bioengineering, Technology and Surgical Sciences Study Section (BTSS), San Francisco, CA, October, 5-6, 2006.
11. NIH/NCRR X02 Roadmap Precis IAR review (ZRR1 BT-8-01) Virtual Review Group, August 16, 2006.
12. NIH/NIGMS Minority Biomedical Research Support (MBRS), June, 2006.
13. Canadian Reseach Chairs College of Reviewers, starting November 2005.
14. NIH/NIGMS Minority Biomedical Research Support (MBRS), Bethesda, MD, October 18, 2005.
15. NIH/NIBIB Special Emphasis Panel ZEB1 OSR – B(01): Training Review, Bethesda, MD, June 29-30, 2005.
16. NSF CMS Nano and Bio Mechanics Grant Review Panel, May 31, 2005.
17. NIH CSR Special Emphasis Panel ZRG1 SB 50S: PAR-03-032 Bioengineering Partnerships, January 16, 2004.
18. NIH CSR Special Emphasis Panel ZRG1 SB 50R: PAR-03-032 Bioengineering Partnerships, June 1, 2003.
19. NIH/NIBIB Reviewer for special emphasis panel for BISTIC, Bethesda, MD, March 10, 2003.

20. NIH/NHLBI Reviewer for special emphasis panel for RFA HL-02—017, “Innovative concepts and approaches to developing functional tissues and organs for heart, vascular, lung, and blood applications,” Bethesda, MD, July 10-11, 2002.
21. Canadian Institute of Health Research (ongoing).
22. NIH Surgery and Bioengineering BRP review panel, November 29, 2001.
23. Canadian Foundation for Innovation, Toronto, CA, Sept. 27-28, 2001.
24. NSF ERC site visit member for the U. Washington Engineered Biomaterials (UWEB), June 5-7, 2001.
25. PTEI Seed Grant Review committee, May 29, 2001.
26. NSF Bioengineering CAREER Grant Review Panel, January 11, 2001.
27. NSF Bioengineering Grant Review Panel, June 5, 2000.
28. NIH Tissue Engineering Study Section (SSS-M), November 19, 1999.
29. NIH Surgery and Bioengineering Study Section, Temporary Member, November 9, 1999.
30. NSF Bioengineering Grant Review Panel, October 28, 1998.
31. PTEI Seed Grant Program Reviewer, May, 1999
32. Research Committee, American Heart Association, FL Affiliate, July 1, 1997-June 1, 1998.
33. Research Peer Review Committee, American Heart Association, FL Affiliate, July 1, 1995 – June 30, 1997.

*Reviewer for the following journals:* Acta Biomaterialia, American Journal of Physiology, Heart and Circulation, Annals of Biomedical Engineering, Cardiovascular Pathology, Biomechanics Modeling and Mechanobiology, Biomaterials, Biorheology, IEEE Transactions on Biomedical Engineering, Journal of Biomechanics, Journal of Biomechanical Engineering, Journal of Biomedical Materials Research, Journal of the Mechanical Behavior of Biomedical Materials, Journal of Mechanics of Materials and Structures, Journal of Heart Valve Disease, Journal of Orthopedic Research, Tissue Engineering

*Organized/ chaired the following sessions:*

1. Organizer and Chair for session entitled “Heart Valve Function and Simulation” at the 2008 Annual Fall Meeting of the Biomedical Engineering Society, October 4, 2008.
2. Organizer and Co-Chair for session entitled “Growth and Remodeling I” at the 10<sup>th</sup> ASME Summer Bioengineering Conference, June 28, 2008.
3. Organizer and Co-Chair for session entitled “Growth and Remodeling II” at the 10<sup>th</sup> ASME Summer Bioengineering Conference, June 29, 2008.
4. Session organizer and reviewer for the 8<sup>th</sup> World Congress of Biomaterials, Amsterdam, NL, May 28-June 1, 2008.
5. Co-Chair for session entitled “Heart Valve Biology and Tissue Engineering” at the Royal Society 2008 Meeting, London, England, May 4 - 7, 2008
6. Co-Chair for session entitled “Urological Tissue Engineering and Biomaterials” at the Society for Biomaterials 2007 Annual Meeting, Chicago, IL, April 18 -21, 2007.
7. Co-Chair for session entitled "Multiscale Models of Aortic Valve Mechanics and Mechano-Biology" at the Annual Fall Meeting of the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL.
8. Chair for session entitled “Special Topics – Bioengineering of Urinary and Reproductive Systems” at the Annual Fall Meeting of the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL.
9. Co-Chair for session entitled "Aortic Valve Interstitial Cell Mechanobiology: Response to Cyclic Tension and TGF- $\beta$ 1" at the Annual Fall Meeting of the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL.
10. Co-Chair for session entitled "Effects of Decellularization on Mechanical and Structural Properties of Porcine Aortic Valve Leaflet" at the Annual Fall Meeting of the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL.
11. Co-Chair for the session entitled “Biomechanics of Organs: Urinary Tract” at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany.

12. Co-Chair for the session entitled “Unresolved Problems in Heart Valve Repair and Replacement” at the 10<sup>th</sup> Annual Hilton Head Workshop: Advances in Innovative Technologies and Tissue Engineering for the Treatment of Heart Valve Disease, Hilton Head, SC, March 1 – 5, 2006.
13. Chair for the session entitled “Viscoelastic Response I” at the 2005 Fall Meeting of the Materials Research Society, November 28 – December 2, 2005, Boston, MA.
14. Organizer and Chair for the two sessions entitled “Cardiovascular Engineering: Heart Valves I & II” at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD.
15. Organizer and Chair for the session entitled “Mechanics of Growth and Remodeling in Native and Engineered Tissues I” at the 2005 ASME Summer Bioengineering Conference, Vail, CO, June 22–26, 2005.
16. Organizer and Chair for the session entitled “Heart Valve Mechanics” at the 2005 ASME Summer Bioengineering Conference, Vail, CO, June 22–26, 2005.
17. Co-Chair for the session entitled “Mechanics of Growth and Remodeling in Native and Engineered Tissues II” at the 2005 ASME Summer Bioengineering Conference, Vail, CO, June 22–26, 2005.
18. Chair for the session entitled “Cardiovascular Biomaterials I: Structure and Mechanics of Engineering Tissues” at the 2005 annual Society for Biomaterials meeting in Memphis, TN, April 27-30, 2005.
19. Chair for the session entitled “Urological Tissue Engineering Symposium” at the 2005 annual Society for Biomaterials meeting in Memphis, TN, April 27-30, 2005.
20. Organizer of four heart valve sessions for the 2004 annual BMES meeting in Philadelphia, PA.
21. Organizer and member of the scientific committee for “Advances in Tissue Engineering and Biology of Heart Valves,” Florence, Italy, September 15-18, 2004.
22. Organizer and Chair of the Heart Valve Biomechanics Session at the 2004 European Society for Biomechanics, s’Hertogenbosch, Netherlands, July 4-7, 2004.
23. Organizer and chair of the Heart Valve Sessions at the 2003 Fall BMES meeting, Nashville, TN.
24. Organizer and Chair for the session entitled “Tissue Engineering” at the IMECE meeting in New Orleans, LA, November 21-23, 2002.
25. Organizer and Chair for the session entitled “Constitutive modeling and computational implementation” at the IMECE meeting in New Orleans, LA, November 21-23, 2002.
26. Organizer and Chair for the two sessions on heart valves at the IEEE-BMES meeting, October 23-27, 2002, Houston, TX.
27. Organizer and Chair for the heart valve sessions at the Fall BMES meeting, October 4-7, 2001, Durham, NC.
28. Invited Chair for the session on *Calcification* at the First Biennial meeting of the Society for Heart Valve Disease, June 12-18, 2001, London, UK.
29. Organizer and Chair for Society for Biomaterials Workshop entitled “Biomechanical evaluation of native and engineered tissues,” April, 25-29, 2001, St. Paul, MN.
30. Chair on cardiovascular biomaterials for the Workshop entitled “Reference Data for Biomaterials,” Sponsored by and held at NIST, July 27, 2000.
31. Chair on Heart Valve session entitled “Heart Valve Mechanics” at the World Congress on Medical Physics and Biomedical Engineering, July 23-28, 2000, Chicago.
32. Organizer and Chair of session entitled “Chemical, Thermal, and Mechanical modification to Collagen” for the ASME IMECE, 1999, Nashville, TN.
33. Co-Chair, Cardiovascular track, first BMES-EMBS joint meeting, Atlanta, GA, October, 1999.
34. Organized a technical session on cardiac valve materials for the 1998 BMES meeting in Cleveland, OH.
35. Chaired “Mechanics of Biologically Derived Materials” for the ASME IMECE, 1997 in Dallas, TX.
36. NHLBI’s special emphasis panel on substitute heart valves, April 27, 1996, Washington, D.C.

*Additional society service and committees:*

1. Active Review Committee member, Engineering & Urology Society 2007 Annual Meeting, Anaheim, CA.
2. Technical Committee member, European Society for Biomechanics 2004 Annual Meeting in s’Hertogenbosch, Netherlands, July 4-7, 2004.
3. Technical Program Representative, IMECE 2003 for the ASME Bioengineering Division.
4. ASME Cell and Tissue engineering Technical Committee Co-Chair, July 1, 2001 – June 30, 2004.
5. ASTM F04-42-12 Technical Committee Chair on Mechanical Testing Standards for Tissue Engineered Materials.

6. ASME Biomaterials Technical Committee Chair, 1998-2000
7. Editorial Board and Program Committee, ASAIO, 1997-1998

*Local service and honors:*

2009                   Invited Faculty Responder, presentation of Faculty Awards, Honors Convocation, University of Pittsburgh.

**MEMBERSHIPS**

American Institute for Medical and Biological Engineering (AIMBE)  
American Society of Biomechanics.  
American Society of Mechanical Engineers.  
Biomedical Engineering Society  
International Society for Applied Cardiovascular Biology (ISACB)  
Materials Research Society  
Society for Biomaterials  
Society for Heart Valve Disease  
Tissue Engineering and Regenerative Medicine International Society (TERMIS)

## RESEARCH FOCUS

My overall research focus is characterization and modeling of the structure-function-biomechanics of native and engineered soft tissues, and linking these studies to the underlying cellular mechanobiology. In particular, my laboratory has focused on the mechanical behavior and function of the native aortic and mitral heart valves, including the development of the first constitutive (stress-strain) models for these tissues using a structural approach. To acquire the necessary critical experimental data, my laboratory has developed several novel methods to quantify tissue structure and mechanical testing techniques. By integrating the resulting experimental data obtained from both techniques, we have developed structural constitutive (stress-strain) models that directly integrate information on tissue composition and structure. These models avoid ambiguities in material characterization, offering insight into the function, structure, and mechanics of tissue components. Recent work includes simulation studies of cell/tissue/organ mechanical interactions in native and engineered heart valves. I am particularly interested in determining the local stress environment for heart valve interstitial cells. This work aims to utilize an integrated experimental/multi-scale finite element approach to determine how hemodynamic loading on the valve translates to altered stress states on the valve interstitial cell function and, in-turn, changes in local extra-cellular structure/composition and valve function.

We have also begun studies on the influence of mechanical forces on bone marrow stem cell (BMSC) abilities to form extracellular matrix and produce endothelial-like cell monolayers on biodegradable scaffolds. These studies have been reported in a recent publication on utilizing a novel bioreactor that is able to subject BMSC seeded scaffolds to controlled flexure, tension, and flow regimes either alone or on various combinations.

My laboratory is also active in the biomechanics of engineered tissues, and in particular understanding the in-vitro and in-vivo remodeling processes from a functional biomechanical perspective. Our long-term research goal is to develop a rigorous quantitative understanding of the morphological and functional events that occur during both in-vitro development and in-vivo remodeling, and to use this knowledge to improve replacement heart valves for the pediatric population. Specifically, a question fundamental to the successful development of a clinically feasible tissue engineered pulmonary valve (TEPV) is how well does the TEPV functionally match the native pulmonary valve tissue, and what mechanical, structural, and biological factors guide the remodeling process and final outcome. Once these factors are sufficiently well understood, it should then be possible in subsequent studies to optimize cell sourcing, fabrication techniques, and in-vitro conditioning procedures to produce a functioning TEPV designed for long-term in-vivo function. The goal of the current research program is to thus quantify and simulate tissue remodeling events that occur post-implantation, and to understand what primary factors influence the remodeling rate and final tissue state.

*Specific applications include:*

1. Multi-scale finite element simulations of valvular structures that incorporate structural constitutive models for soft tissue that enable simulation of valve interstitial cell deformations and correlations with interstitial cell biosynthesis.
2. Investigation of the unique compositional and architectural features of valvular extracellular matrix and how these are altered in valve disease.
3. Quantification and modeling of cellular deformations within electrospun engineered scaffolds for use as both engineered tissues and tissue analogs for understanding cellular function within a 3D tissue-like environment.
4. Constitutive models and design of tissue engineered biomaterials and scaffolds.
5. Development of quasi-static and viscoelastic constitutive models for active and passive mechanical properties of the urinary bladder. These models are correlated to changes in tissue composition and structure in both the normal and post-spinal cord injured rat bladder.

## SUMMARY OF TEACHING AND MENTORING

### *Post-doctoral- current:*

**Sharan Ramaswamy, Ph.D.** Research Assistant Professor, Department of Bioengineering.

- Research area: Bioreactor studies of tissue engineered heart valve in-vitro tissue development.
- Awarded a travel grant to Termis-NA 2008

**Mohammed El-Kurdi, Ph.D.** Research Associate, Department of Bioengineering

- Research area: Heart valve engineering.

### *Completed Post-doctoral and Fellows:*

**Aron Parekh, Ph.D.** Training period: 6/2004-2/2008.

- Research area: Mechanobiological responses of bladder wall smooth muscle cells to stretch, and in particular the role of TGF- $\beta$ .
- Current position: Research Fellow, Department of Cancer Biology, Vanderbilt University Medical Center.
- 2006-2008: NIH Post-doctoral Fellow (Currently supported by NIH T32 by Department of Urology).
- 2004-2006: PTEI Post-doctoral fellow, Department of Otolaryngology, Children's Hospital, Pittsburgh, Pa. Co-Advisor with Dr. Patricia Hebda, Department of Otolaryngology, Children's Hospital, Pittsburgh, Pa

**Julie Myers-Irvin, Ph.D.** Training period: 6/2006-6/2007.

- PTEI Post-doctoral fellow, Dr. Steven Badylak, Primary Advisor.
- Current position: Office of Research, Health Sciences, UPMC.

**Jun Liao, Ph.D.** Training period: 11/2003 – 12/2006.

- Research area: Quantification of the micromechanical properties and 3D structure of collagenous tissues.
- Awarded a 2 year \$100,000 Beginning Grant-in-Aid from the AHA, PA-Delaware Affiliate to study the effects of decellurization on native aortic valve extra-cellular matrix.
- Current position: Assistant Professor, Department of Agricultural and Biological Engineering, Mississippi State University, MS.

**Jiro Nagatomi, Ph.D.** Training period: 4/2003 – 7/2005.

- Research area: Urinary bladder biomechanics.
- Awarded a 2 year \$150,000 grant from the Spinal Cord Research Foundation to study the effects of spinal cord injury on the urinary bladder wall.
- Current position: Assistant Professor, Department of Biomedical Engineering, Clemson University, SC.

**Ali Mirnajafi, Ph.D.** Training period: 10/2001 – 10/2004.

- Research area: Fatigue properties of bioprosthetic heart valve biomaterials.
- Current position: Senior Research Engineer, Edwards Lifescience, Irvine, CA.

**Chung Cheng "Eric" Wang, M.D.** Training period: 6/2003 – 6/2005.

- Surgical Fellow, Department of Urology, University of Pittsburgh.
- Research area: Diabetes induced alterations in the biomechanical properties of the urinary bladder wall.

**Sarah M. Wells, Ph.D.** (NSERC fellow) Training period: 6/2000 – 7/2001

- Research area: Fatigue properties of collagenous bioprosthetic heart valve biomaterials.
- Current position: Assistant professor, Department of Physics (Materials) and Biomedical Engineering, Dalhousie University, Nova Scotia.

**Arun K.S. Iyengar, Ph.D.** Training period: 6/1998-5/2000

- Awarded a 2 year \$100,000 Beginning Grant-in-Aid from the AHA, PA-Delaware Affiliate to study the bioprosthetic dynamic heart valve motion.
- Current position: CFD scientist, Siemens-Westinghouse, Pittsburgh, PA.

**Zhihong "Jason" Zhou, MD.** Training period: 6/1998-5/2000.

- Post-doctoral fellow, Department of Otolaryngology, Children's Hospital, Pittsburgh, Pa
- Co-Advisor with Dr. Patricia Hebda, Department of Otolaryngology, Children's Hospital, Pittsburgh, Pa.

*Current Doctoral candidates:*

1. **Erinn Joyce** (Spring 2009 anticipated graduation date).
  - Awarded a Pre-Doctoral Fellowship from the University of Pittsburgh's Provost's Development Fund.
2. **John Stella** (Fall 2009 anticipated graduation date).
  1. Selected and presented top 10 abstract at the 4<sup>th</sup> annual society for heart valve disease, New York, June 2007.
  2. "Cardiovascular Bioengineering" NHBLI T32 Predoctoral Training Grant Trainee
3. **Silvia Wognum** (Fullbright Fellow, Spring 2010 graduation date).
  - Fullbright Fellow (from the Netherlands).
4. **Antonio D'Amore** (PhD student from the Department of Mechanical Engineering, University of Palermo).
  - Jointly advised by William Wagner.
5. **Diana Gaitan** (January 2010 anticipated graduation date).
  - Fullbright Fellow (from Columbia).
  - Jointly advised by David Vorp.
6. **Chad Eckert** (January 2010 anticipated graduation date).
  - "Biomechanics in Regenerative Medicine" NIBIB T32 Predoctoral Training Grant Trainee.
  - As part of the NSF's initiative to encourage cultural diversity in research, the EAPSI program was created to provide US students the opportunity to study abroad. As one of 15 selected students, Chad will be performing research under Dr. Peter Hunter at the University of Auckland, New Zealand, this summer
7. **Bahar Fata** (June 2010 anticipated graduation date).
8. **Brandon Mikulis** (Fall 2011 anticipated graduation date).
  - "Cardiovascular Bioengineering" NHBLI T32 Predoctoral Training Grant Trainee
9. **Chris Carruthers** (June 2011 anticipated graduation date).
  - Awarded an NSF Predoctoral Fellowship on "Mechano-Dependent Biosynthetic Response of PV Interstitial Cells" to start September 2009.
  - "Biomechanics in Regenerative Medicine" NIBIB T32 Predoctoral Training Grant Trainee.

*Completed Doctorates:*

- 1) **David E. Schmidt** (4/2009) CMU Department of Civil and Environmental Engineering.
  - Dissertation title: "Multi-Scale Biomechanical Modeling of Heart Valve Tissues."
  - Current position: Research Associate, Engineered Tissue Mechanics Laboratory, Department of Bioengineering, University of Pittsburgh.
- 2) **Rebecca Long Heise** (6/2008).
  - Dissertation title: "Strain-induced remodeling of urinary bladder smooth muscle"
  - Awarded one of five travel awards to the 2008 annual fall BMES meeting, Los Angeles, CA.
  - Selected for the Second Annual NIH National Graduate Student Research Festival, October 2007.
  - CATER T32 trainee.
  - ORAU fellowship, Nobel Laureates in Lindau, Germany, July, 2005.
  - Current position: Post doctoral fellow, National Institute for Environmental Health Sciences.
- 2) **David Merryman** (6/2007).
  - Dissertation title: "Mechanobiology of the aortic valve interstitial cell"
  - Awarded an AHA Pennsylvania-Delaware Predoctoral Fellowship entitled "Effects of local stress on aortic valve interstitial cell phenotype and resulting synthetic function."
  - "TA of the year", Department of Bioengineering, Spring 2007.
  - Current position: Assistant Professor, Biomedical Engineering, University of Alabama at Birmingham.

**3) George Englemayr (11/2005).**

- Dissertation title: “Optimizing engineered heart valve tissue extracellular matrix”
- AHA Pennsylvania-Delaware Predoctoral Fellowship Awardee.
- NRSA Post-doctoral awardee.
- Receptient of an ISACB Young Investigator Award for the 2006 ISACB meeting in La Jolla, CA.
- Post-doctoral fellow, Drs. Lisa Freed and Robert Langer, MIT, Boston, MA, 1/2008 - 6/2009.
- Current Position: Assitant of Professor Bioengineeirng, The Pennyslvania State University.

**4) Hsiao-Ying Shadow Huang (1/2004)**

- Dissertation title: “Micromechanical simulations of heart valve tissues”
- 2006-present: Post-Doctoral Fellow, Laboratory for Computation and Simulation of Microstructures, Department of Material Science and Engineering, MIT.
- 2005-2006: Adjunct Professor, Dept. of Mechanical Engineering, University of Pittsburgh.
- 2004-2005: Adjunct Professor, Dept. of Biological & Agricultural Engineering, University of Georgia.

**5) Wei Sun (10/2003)**

- Dissertation title: “Biomechanical simulations of heart valve biomaterials”
- Fall 2007-present: Assistant Professor, Department of Mechanical Engineering, University of Connecticut.
- 2005-2007: Senior Engineer, Edwards Lifesciences, Irvine, CA.
- 2003-2005: Post-doctoral Fellow, Department of Biomedical Engineering, Georgia Institute of Technology.

**6) Claire Gloeckner (4/2003)**

- Dissertation title: “Tissue biomechanics of the urinary bladder wall”
- Current position: Biomechanics Engineer, Exponent, Inc., Philadelphia, PA.

**7) David Smith (5/2001)**

- Dissertation title: “A generalized thin-walled membrane shell approach for in-vivo stress analysis of anatomic structures.”
- Current position: Senior Research Engineer, Ethicon Endoscopic Division, Johnson and Johnson, Cinncinati, OH.

**8) Kristen L. Billiar (6/1998)**

- Dissertation title: “A structurally guided constitutive model for aortic valve bioprostheses: Effects of glutaraldehyde treatment and mechanical fatigue”
- 2008-present: Associate Professor, Department of Biomedical Engineering, WPI.
- 2002-2008: Assistant Professor, Department of Biomedical Engineering, WPI.
- 1998-2002: Senior Research Engineer at Organogenesis, Inc., Canton, MA

*Completed Master’s students*

1. **Brett Zubiante** (June 2007) Professional MS.
1. **Todd Courtney** (December 2006), Professional MS.
2. **Ajay Abad** (January 2006) Professional MS. Research project on quantifying heart valve leaflet deformations.
3. **Kashayar Toosi** (January 2006), Thesis title: “The effects of long-term spinal cord injury on the urinary bladde wall tissue mechancs.”
4. **Jon Grashow** (April 2005), Thesis title: “Evaluation of the biaxial mechanical properties of the mitral valve anterior leaflet under physiological loading conditions.”
5. **Thanh Lam** (December 2004). Thesis title: “Mechanical Properties of Native Porcine Aortic and Pulmonary Heart Valve Leaflets.” Outstanding TA/TF for academic year 2002-2003.
6. **Daniel Hildebrand** (December 2003) Thesis title: “Design and evaluation of a novel pulsatile bioreactor for biologically active heart valves.”
7. **Brent Sugimoto** (April 2003) Thesis title: “Effects of leaflet stiffness on the dynamic motion of the aortic heart valve.”
8. **Tiffany Sellaro** (April 2003) Thesis title: “Effects of collagen orientation on the medium-term fatigue response of heart valve biomaterials.”
9. **Greg Fulchiero** (Professional track with project, 2002). Project title: “Alterations in collagen fiber crimp morphology with cyclic loading in zero and low pressure fixed porcine bioprosthetic heart valves.”
10. **Claire Gloeckner** (May 1998) Thesis title: “Mechanical and structural analyses of an acellular collagenous biomaterial: Intestinal submucosa.”

11. **Rony Abovitz** (May 1998) Thesis title: "Analysis of a proposed endosseous dental implant design: The effect of internal implant geometry on internal and external stress distributions."
12. **David Smith** (December 1996) Thesis title: "The effects of in-vitro accelerated testing on the porcine bioprosthetic heart valve."
13. **Eric Heister** (May 1996) Thesis title: "Bovine pericardium as a bioprosthetic material: localization of optimal tissue selection sites."
14. **Susan Otano** (August 1995) Thesis title: "The collagen fiber architecture and mechanical behavior of human cranial dura mater allografts."

*U. Pittsburgh Doctoral Committees (Current):*

Carrie A. Voycheck (BioE, Richard Debski, Advisor)  
 Joseph Candiello (BioE, Sanjeev Shroff, Advisor)  
 Jian Zhou (BioE, Lance Davidson, Advisor)  
 Nick Amoroso (BioE, William R. Wagner, Advisor).

*U. Pittsburgh Doctoral Committees (Completed):*

Dan Onwona Debrah (BioE, Sanjeev Shroff, Advisor)  
 Constantine Cois (BioE, George Stetten, Advisor)  
 Thomas Gillbert (BioE, Stephen Badylak, Advisor)  
 John Stankus (BioE, William R. Wagner, Advisor)  
 Jonathan Vande Geest (BioE, David Vorp, Advisor)  
 Mark Disilvestro (BioE, Francis Suh, Advisor)  
 Qiliang Zhu (BioE, Francis Suh, Advisor)  
 David Wang (BioE, David Vorp, Advisor)  
 Raffaella DeVita (ME, Will Slaughter, Advisor)  
 Anthony Petrella (ME, Mark Miller, Advisor)  
 Anita Jesionowski (ChemE, Alan Russel, Advisor)

*U. Pittsburgh Masters Committees (Completed):*

Raffaella DeVita (MS, ME, Will Slaughter, Advisor)  
 Rachmadian Wulanda (Ph.D., ME, Anne Robertson, Advisor)  
 Theodore Clineff (BioE, Richard Debski, Advisor)  
 Dennis Song (BioE, David Vorp, Advisor)

*Other university Ph.D. and M.S. committees:*

Kartik Balachandran, Ph.D., Department of Biomedical Engineering, Georgia Tech (in progress).  
 Caitlin Pierlot, M.S., Dalhousie University (in progress).  
 Andrew D. Moeller, M.S., Dalhousie University, (8/2007).  
 Niels J.B. Driesson, Ph.D., Technische Universiteit Eindhoven, The Netherlands, (9/2006).  
 Jennifer Ritchie, M.S. Department of Biomedical Engineering, Georgia Institute of Technology (8/2004).  
 Eric Talman, Ph.D., University of Western Ontario, CA, Derek Boughner, Advisor, (12/2000).  
 Steven Waldman, Ph.D., Dalhousie University, CA, J. Michael Lee, Advisor (1/2000).

*Current undergraduate students, including Intramural interns:*

Michael McCall, Bioengineering REU, ongoing  
 Julia Ivanova, Bioengineering REU, ongoing  
 Steven Boronyak, Bioengineering, ongoing.

*Undergraduate students/PTEI summer mentorships:*

Jessica Wagner, BBSI summer 2008  
 Maggie Saracco, PTEI summer 2008  
 Emmanuel Owusu, PTEI summer 2008  
 Jocelyn Brown, Bioengineering REU summer 2008  
 Dana Bruck (BioE/REU student 2007)  
 Rahul Kumar (BBSI summer intern 2007)  
 Alex Cigan (2007 PTEI summer intern from Tulane University)  
 Paul Bieneke (BS BioE, 2007)

Michael Nilo (BS BioE, 2007)  
Chi Zheng (BBSI summer intern 2006)  
Heather Gray, (BS BioE, 2005)  
Jeremy Raimer, (BS BioE, 2005)  
Leigh McGuire, (BS BioE, 2005)  
Brett Zubiante (BS ME, CMU 2004)  
Brooke Odle, Minority Engineering Mentoring Program, 2004.  
Nitin Agarwal (2004) PTEI Summer Intern  
Dan Hildebrand (BS BioE, 2003)  
Jonathan Grashow (BS BioE, 2003)  
Jill Ulrich (BS BioE, 2001) Pitt Fung award recipient  
Beth Kaminski (2000) PTEI Summer Intern  
Michael Dizenzo (1999)

*Classroom Teaching:*

*U. Pittsburgh:*

BIOE 3002 – Advanced topics in Biosolid Mechanics (developed/taught). To be offered Fall 2008  
BIOE 3000 – Advanced Tissue Mechanics (developed/taught)  
BIOE 2072 – Functional Tissue Engineering (developed/ offered fall 2003,2007)  
BIOE 2064 – Biomechanics of cells, tissues, and organs (developed/ongoing)  
BIOE 1064 – Biomechanics IV – Tissues and organs (developed/taught)  
BIOE 1631 – Biomechanics II – (developed/direct)  
BIOE 1150 - Lab section on cardiovascular biomechanics (developed/taught)  
BIOE 2070 - Continuum Mechanics (offered spring 2000 only, ME dept. now offers equivalent)  
BIOE 1160, 1161 - BioE Senior Project (developed/taught)  
BIOE 1163 - Presented lectures on cardiovascular mechanics

*U. Miami:*

BME 575 - Graduate tissue biomechanics  
BME 375 - Undergraduate tissue biomechanics  
BME 335 - Undergraduate Biomaterials  
Supervised senior projects, undergraduate academic advising, and high school research interns.

*Training Grant participation:*

Principal mentor (5% time), “Urologic training program for physicians and scientists”, 4/1/2001 – 3/31/2008, NIH/NIGMS, Michael B. Chancellor, PI.  
Principal mentor (5% time), “Cellular approaches to Tissue Engineering and Regeneration”, 7/1/2003 – 6/30/2008 NIH/NIGMS, Alan Russell, PI.

*Educationally related outreach:*

1/29/2009: Spoke with three groups of Mt. Lebanon High School Students during the “Brown Bag Lunch Lecture Series” to discuss career opportunities in Biomedical Engineering.

## CURRENT FUNDING

### *Principle Investigator Grants and Contracts:*

1. "GAGs: Function and Fixation in Bioprosthetic Heart Valves", NIH/NHLBI R01 HL070969, 7/1/08 – 6/30/12. Total cost \$1.6M. Note this is a multi-PI grant, with Co-PI Dr. Naren Vyavahare, Clemson University.
2. "Mechanisms of In-Vivo Remodeling in Tissue Engineered Heart Valves," NIH/NHLBI R01 HL089750-01, 7/1/07 – 6/30/11. Total cost \$3.3M.
3. *Biomechanical Optimization of Tissue Engineered Heart Valves,*" R01 HL68816, 2/1/07 – 12/31/11, Total cost \$1.9M.
4. "Biomechanics in Regenerative Medicine," NIH/NIBIB EB003392-01 T32 Predoctoral Training Grant, 4/1/2005-3/31/2010. Total cost: \$1.4M.

### *Current Co-investigator Grants and Contracts:*

1. "Biocompatible Heterograft Biomaterials," Robert J. Levy, University of Pennsylvania, PI, NIH/NHLBI P01-HL074731, 8/1/04 – 7/31/09. Total cost: \$1,500,000, Sacks sub-contract: \$324,563.
2. "Biomechanical Evaluation of Abdominal Aortic Aneurysms," David A. Vorp, University of Pittsburgh, PI, NIH/NHLBI R01 HL079313, 6/1/05 – 5/31/10. Total Cost: \$1,250,000, Sacks sub-contract: \$85,000.

## PAST FUNDING

### *Principle Investigator Grants and Contracts.*

1. "Mitral Saddle Shape Preservation Improves Valvuloplasty," Joseph H. Gorman, University of Pennsylvania, PI, NIH R01 HL073021, 4/1/04 – 3/31/08. Sacks sub-contract: \$249,001.
2. "Cardiopulmonary Organ Engineering," William R. Wagner, University of Pittsburgh, PI. NIH BRP R01 HL69368, 7/1/2003 – 6/30/08. Total cost: \$5,300,000. Role: Director of Biomechanics Core, \$470,000.
3. "Fluid Structure Simulation for Prosthetic Heart Valves," K.B. Chandran, University of Iowa, PI, NIH/NHLBI R01-HL071814, 7/1/03 – 7/31/07. Sacks sub-contract: \$408,827.
4. "Functional Tissue Engineering for Stress Incontinence," Michael B. Chancellor, University of Pittsburgh, PI. NIH R01-AR049398 01, 5/1/03 – 4/30/07. Total cost: \$1,351,000, Sacks sub-contract: \$350,000.
5. "Effects of Decellularization and Recellularization on Biomechanics of Porcine Aortic Valve," Jun Liao, University of Pittsburgh, PI. American Heart Association Beginning Grant-in-Aid Award #0565346U, 7/1/05 – 6/30/07. Total cost: \$100,000. Role: Collaborating Investigator.
6. "Biomechanical Optimization of TE Heart Valves," R01 HL068816, NIH/NHLBI, 3/1/02 - 2/28/06. Total cost: \$1,017,553.
7. "Enhanced Durability of Bioprosthetic Heart Valves," R01 HL63026, NIH/NHLBI, 1/1/01 - 12/31/04. Total cost: \$744,000.
8. "Mechanisms of Fatigue Damage in Bioprosthetic Heart Valves," Established Investigator Award from the National American Heart Association, 1/1/01 – 12/31/04. Total cost: \$300,000.
9. "Commercialization of SALS for Tissue Informatics," Pittsburgh Tissue Engineering Initiative: Development fund seed grant. 7/1/2000 – 6/30/2003. Total cost: \$50,000.
10. "Fatigue Damage Behavior of Chemically Treated Bioprosthetic Heart Valve Tissues," NSF BED-9978858 (GOALI program), 10/1/99 – 9/30/02. Total cost: \$347,000.
11. "Calcification-independent Collagen Damage in Explanted Clinical Bioprosthetic Heart Valves," American Heart Association, PA-DE affiliate, 7/1/99 - 6/30/01. Total cost: \$89,500.
12. "Structure-strength Relations in Porcine Bioprosthetic Heart Valves," St. Jude Medical, Inc. 1/1/99-12/31/02. Total cost: \$180,000.
13. "Extension of SALS to Quantify 3D Fiber Architecture in Cardiac Valvular Tissues," A.W. Ford Foundation, 7/1/98-6/31/99. Total cost: \$20,188.
14. "A Novel In-Vitro Tissue Culture SALS-Based Fiber Architecture Apparatus," A.W. Ford Foundation, 7/1/97-6/31/98. Total cost: \$20,000.
15. "A Non-Invasive Method to Compute In-Vivo Abdominal Aortic Aneurysm Wall Tensions," American Heart Association, Florida Affiliate, 7/97-6/00. Total cost: \$100,000.
16. "Effects of Fixation Pressure on the Durability of Bioprosthetic Heart Valves," St. Jude Medical, Inc., 6/1/97-12/31/97. Total cost: \$25,000.

17. *"The Durability of Porcine Bioprosthetic Heart Valves: A Micro-mechanical Study,"* Initial Investigatorship, American Heart Association, Florida Affiliate, 7/94-6/97. Total cost: \$270,000.
18. *"Bovine Pericardium: A Bioprosthetic Material,"* Whitaker Foundation, 8/1/94 - 10/31/97. Total cost: \$170,000.
19. *"A SALS Device for Dermal Tissue Microstructural Analysis,"* Smith and Nephew, Inc., 1997. Total cost: \$30,000.
20. *"In-vivo 3D Reconstruction of Porcine Bioprosthetic Heart Valves,"* St. Jude Medical, Inc., 1/96-1/97. Total cost: \$32,000.
21. *"Laser Light Scattering of Porcine Intestinal Submucosa,"* A.W. Ford Foundation, 7/1/96 - 6/30/97. Total cost: \$20,000.
22. *"Study of Human Explanted Bioprosthetic Heart Valves,"* A.W. Ford Foundation, 7/1/95 - 6/30/96. Total cost: \$20,000.
23. *"A SALS Device for Connective Tissue Analysis,"* A.W. Ford Foundation, 7/1/94 - 6/30/95. Total cost: \$20,000.
24. *"Dental Implant Project,"* funded by Uri Elias, D.D.S., 1/15/94-12/31/94. Total cost: \$13,000.
25. *"Summer General Research Support Award,"* University of Miami, 8/15/94 - 5/14/95. Total cost: \$5,000.

*Co-investigator Grants and Contracts.*

1. *"Mechanics of the Mitral Valve,"* Ajit Yoganathan, Georgia Institute of Technology, PI, NIH R01 HL520009-04A1, 7/1/01 – 6/30/05. Total cost: \$1,679,465; Sacks sub-contract: \$370,866.
2. *"Biomechanical Evaluation of Abdominal Aortic Aneurysms,"* David A. Vorp, University of Pittsburgh, PI, NIH R01 HL60670-02, 12/1/00 – 11/30/05. Total cost: \$1,697,305; Sacks sub-contract: \$112,000.
3. *Development of Novel PHA Based Biodegradable Scaffolds.* NIST-ATP, 10/02 – 9/05, PI: David Martin, TEPHA, Inc., Cambridge, MA. Role: Advise biomechanical evaluations of scaffold biomaterials.
4. *"Tissue Engineered Heart Valve Prostheses,"* NIST-ATP award to St. Jude Medical, Inc. Subcontract to study tissue engineered prosthetic heart valve biomaterials, 1/1/2000 - 1/1/2003. Sacks sub-contract: \$300,000.
5. *"Development of a Novel, Software-Based Tool for the Improved Diagnoses of Abdominal Aortic Aneurysms,"* David A. Vorp, University of Pittsburgh, PI, Pittsburgh Foundation Program for Medical Research, 7/1/00 – 6/30/03. Total cost: \$150,000, Sacks sub-contract: \$5,500.
6. *"Interaction between Leaflet Motion and Hemodynamics of Bioprosthetic Heart Valves: An In-Vitro Study,"* Arun Iyengar, PI, American Heart Association Pennsylvania Affiliate, PEN Beginning Grant-in-Aid, 7/1/98 – 6/31/00. Sacks sub-contract: \$70,000.

## PATENTS

1. Steven M. Boronyak, George C. Engelmayr, Jr., Sharan Ramaswamy, Michael S. Sacks, David E. Schmidt, Mohammed S. El-Kurdi, "Flow-Stretch-Flexure Bioreactor," filed on December 4, 2008 with Serial no. 61/119,927.
2. W. Wagner, J. Stankus, **M.S. Sacks**, T. Courtney, J. Guan, K. Fujimoto, A. Nieponice, L. Soletti, D. Vorp, "Biodegradable elastomeric scaffolds containing microintegrated cells," filed August 10, 2007.
3. M.B. Chancellor, J. Huard, C. Capelli, S. Chung, **M.S. Sacks**, provisional patent: "Rapid preparation of stem cell matrices for use in tissue and organ treatment and repair," filed Feb. 23, 2001 and issued.

## DEPARTMENTAL/INSTITUTE SERVICE

*School of Engineering:* Member, Appointments, Promotion, and Tenure committee (2004-2007).

*Department of Bioengineering*

Biomechanics Concentration/Track chair (ongoing)

Graduate Admissions Committee Chair (2002 – present)

Graduate Committee member (2002 – present)

Faculty search committee (Ongoing)

Faculty search committee chair (2000-2002)

Bioengineering computation/modeling core leader for Whitaker Development Award (2001)

Faculty coordinator for startup of the Keck/Whitaker DMM/RP lab (1998-1999)

*McGowan Institute for Regenerative Medicine:* Core faculty for Biomechanics, Member, Executive committee

**INVITED LECTURES AND WORKSHOPS**

1. "Integrating the Biomechanics of Native and Engineered Heart Valve Tissues," Department of Cell Biology and Anatomy, School of Medicine, University of South Carolina, Columbia, South Carolina. November 21, 2008.
2. "Biomechanics of Native and Engineered Heart Valve Tissues," Mechanics of Cardiovascular Organs and tissues session, American Society of Mechanical Engineers, Boston, MA. November 5, 2008.
3. "Biomechanics of Native and Engineered Heart Valve Tissues," Department of Mechanical Engineering, Southern Methodist University, Dallas, TX. October 24, 2008.
4. Cardiology Grand Rounds, "Biomechanics of Native and Engineered Heart Valve Tissues," Sponsored by the Cardiovascular Institute and the University of Pittsburgh Medical Center. September 16, 2008.
5. Richard Skalak Lecture at the Department of Biomedical Engineering, Columbia University, NY, entitled "Biomechanics of Native and Engineered Heart Valve Tissues," September 12, 2008.
6. "Biomechanics of Native and Engineered Heart Valve Tissues," Keynote address, 16<sup>th</sup> International Conference on Mechanics in Medicine and Biology, Pittsburgh, PA, July 23-25, 2008.
7. "Extracellular matrix-contractile response coupling of the aortic heart valve interstitial cell" invited keynote lecture presented at the 3<sup>rd</sup> Biennial Heart Valve Biology and Tissue Engineering Meeting, The Royal Society, London, UK, May 4-7, 2008.
8. Sigma-Kappa-Tau Lecture at the Department of Biomedical Engineering, CCNY entitled "Biomechanics of Native and Engineered Heart Valve Tissues," April 9, 2008.
9. "Biomechanics of native and engineered heart valve tissues," Keynote address, Symposium on valve mechanics, 25<sup>th</sup> Annual Houston Society for Engineering in Medicine and Biology, Houston, TX, Feb. 8, 2008
10. "Biomechanical design of heart valve tissues," Boston Scientific Corporation, Applied Research Division, Maple Grove, MN, January 18, 2008.
11. "Biomechanics of native and engineered heart valve tissues," Distinguished Lecturer Series, Institute for Medicine and Engineering, University of Pennsylvania, October 16, 2007.
12. "Biomechanics of native and engineered heart valve tissues," Distinguished Lecturer Series, BioMatrix Engineering and Regenerative Medicine Center, University of Alabama at Birmingham, October 9, 2007.
13. "Biomechanics of native and engineered heart valve tissues," Distinguished Academic Speaker for the Research Day 2007, School of Biomedical Engineering, Dalhousie University, Halifax, Nova Scotia, May 11, 2007.
14. "Differences in tissue remodeling potential of the aortic and pulmonary heart valve interstitial cells," Invited Lecture for the Session entitled "Bioengineering in Development and Disease" at the 2007 FASEB annual meeting, April 30, 2007. Sponsored by the American Association of Anatomists.
15. "Biomechanics of native and engineered heart valve tissues," Departments of Biomedical Engineering, Mechanical and Industrial Engineering, University of Iowa, February 22, 2007.
16. "Biomechanics of native and engineered heart valve tissues," Distinguished Lecturer Series, Department of Biomedical Engineering, University of Texas at Austin, February 8, 2007.
17. "Biomechanics of engineered heart valve tissues," Distinguished Lecturer Series, Department of Biomedical Engineering, Cornell University, February 5, 2007.
18. "Biomechanics of native and engineered heart valve tissues," Keynote Address, Workshop Two: Cardiac Mechanics and Remodeling, Mathematical Biosciences Institute at the Ohio State University, October 2-6, 2006, The Ohio State University, Columbus, OH. Available at <http://mbi.osu.edu/2006/ws2abstracts.html#sacks>
19. "Mechanics of engineered heart tissue," Keynote Address, American Society of Biomechanics, September 6 -9, 2006, Blacksburg, VA.
20. "Biomechanics of engineered heart valve tissues," Presented at the 28th IEEE EMBS Annual International Conference, August 30-September 3, 2006, New York City, NY.
21. "Structural constitutive models for engineered tissue scaffolds," Presented at the 43<sup>rd</sup> Annual Technical Meeting Society of Engineering Science, August 13 - 16, 2006, Pennsylvania State University, University Park, PA.

22. "The role of mechanical stimulation in ECM development in in-vitro engineered valvular tissue development," Leibniz Symposium on Transplantation and Regeneration of Thoracic Organs, Hannover, GY, May 19 – 20, 2006.
23. "Heart valve tissue engineering," Session 5, Tissue Engineering Applications, Part I, National University of Singapore Tissue Engineering Program & ICBME 2005 Pre-Conference Workshop on Regenerative Medicine and Tissue Engineering, Singapore, December 5-6, 2005.
24. "Biomechanics of native and engineered heart valve tissues," Symposium S9: Current Trends in Native and Prosthetic Valve Dynamic Simulation, 12th International Conference on Biomedical Engineering, Singapore, December 7 -10, 2005.
25. "Analysis and design of novel electrospun PEUU scaffolds for soft tissue engineering," Materials Research Society 2005 Annual Fall Meeting, Boston, MA, November 28 – December 2, 2005. *Note that this talk was voted "top five" presentations for the entire MRS meeting.*
26. "Biomechanics of native and engineered heart valve tissues," Department of Bioengineering, The Pennsylvania State University, State College, PA, November 11, 2005.
27. "Biomechanics of native and engineered heart valve tissues," Institute of Biomaterials and Biomedical Engineering," Distinguished Speakers in Bioengineering, University of Toronto, Toronto, Ontario, October 25, 2005 .
28. "Changes in the biomechanical function of the neurogenic bladder after spinal cord injury," 51th Annual Meeting of the American Paraplegia Society, Las Vegas, NV. September 7, 2005.
29. "Biomechanics of Native and Engineered Heart Valve Tissues Mechanical Engineering," Michigan State University East Lansing, MI. October 18, 2005.
30. "Changes in the structure-strength relations of the bladder wall after spinal cord injury," Invited presentation for the National Bladder Foundation's 2005 International Bladder Symposium, Linthicum, MD, April 15-16, 2005.
31. "Biomechanics of heart valves," Invited presentation for the Medtronic "Forum" presentation series, Medtronic Heart Valve Division, Irvine, CA, February 18, 2005.
32. "Biomechanical analyses of heart valves," Invited presentation for Vascular Biology and Transplant, Yale University, February 14, 2005.
33. Invited participant for NIDDK/NIH Workshop entitled "Research progress report and strategic plan for pediatric urology," College, Park, MD, February 2 - 4, 2005
34. "Biomechanics of engineered heart valve tissues," Invited presentation at the Department of Biomedical Engineering, Yale University, October 27, 2004.
35. "Biomechanics of engineered heart valve tissues," Invited presentation at LOEX, University of Laval, Quebec, Canada, October 22, 2004.
36. "Heart valve biomechanics and mechanobiology," Invited presentation at the BMES annual fall meeting, part of the session entitled "Heart valve disease and treatment: Clinical and Engineering perspectives," Organized by Peter F. Davies, Philadelphia, PA, October 16, 2004.
37. "Biomechanics of the native and engineered pulmonary valve," Invited presentation at the Department of Biomedical Engineering, Purdue University, October 4, 2004.
38. "A structural model for the native pulmonary valve", Presented at "Advances in Tissue Engineering and Biology of Heart Valves," Florence, Italy, September 15-18, 2004.
39. "Electrospun poly(ester-urethane) urea scaffolds for tissue engineered heart valve leaflets," Invited presentation at the UWEB 8<sup>th</sup> Summer Symposium, University of Washington, Seattle, WA, August 25 – 27, 2004. Published in Book of Abstracts, page 28.
40. "Biomechanics of native and engineered heart valve tissues," Department of Biomedical Engineering, Clemson University, July 16, 2004.
41. "Viscoelastic behavior of heart valve tissues under biaxial stretch," 2004 European Society for Biomechanics, s'Hertogenbosch, Netherlands, July 7, 2004.
42. "A structural constitutive model for the native pulmonary valve," International Union for Theoretical and Applied Mechanics Symposium on Soft Tissue Mechanics, Graz, Austria, June 27, 2004.

43. "Towards tissue engineered heart valves," Cardiothoracic Surgery Grand Rounds, University of Pittsburgh School of Medicine, June 16, 2004.
44. "Biomechanics of native and engineered heart valve tissues," Department of Biomedical Engineering, Boston University, March 22, 2004.
45. "Biomechanics of native and engineered heart valve tissues," Department of Biomedical Engineering, Texas A&M University, December 12, 2003.
46. Workshop entitled "Biology for Engineers" coordinated by Prof. Jane Grande-Allen of Rice University and Prof. Michael Sacks of the University of Pittsburgh, part of the 3-day symposium on "Biological and Biologically Inspired Materials and Systems," First fall meeting of the Society for Experimental Mechanics, October 1, 2003, Springfield, MA
47. "FE implementation of Fung elastic model for planar anisotropic biological materials", Keynote talk at the 7<sup>th</sup> US National Congress on Computational Mechanics, Albuquerque, New Mexico, July 30, 2003.
48. "How mechanical stresses are transmitted to the cellular level" Invited talk for the Gordon Research Conference on Biomaterials and Biocompatibility, Holderness School, Plymouth, NH, July, 2003.
49. "Effects of fixation pressure on the durability of porcine bioprosthetic heart valves", Society of Thoracic Surgeons 39<sup>th</sup> Annual Meeting, San Diego, CA, February 1, 2003.
50. "Biomechanical considerations in Tissue Engineered Heart Valves" Presented at the Tissue Engineering meeting held at Cold Spring Harbor Laboratory, November 21-24, 2002.
51. "Constitutive models for heart valves tissues," Biocomplexity meeting, Norte Dame, IN, November 7-10, 2002.
52. "Recent advances in constitutive models for heart valve tissues," International Society for Heart Research, Madison, WI, July 24-27, 2002.
53. "Biomechanical design and analysis of engineered tissues," Engineering Tissue Growth, March 19, 2002, Pittsburgh, PA.
54. "Heart valve biomechanics and extracellular matrix," International Society for Applied Cardiovascular Biology (ISACB) at the 8<sup>th</sup> Biennial Meeting, Feb. 27-March 2, 2002, St. Gallen, Switzerland.
55. "Constitutive models for soft tissues," Department of Mechanical Engineering, CMU, Pittsburgh, PA, February 15, 2002.
56. "Biomechanics of native and engineered heart valve biomaterials" University of Washington (UWEB), Seattle, WA, Feb. 7, 2002.
57. "Integration of quantitative morphological data into structural constitutive models," University of Massachusetts Medical School, Worcester, MA, December 17, 2001.
58. "Planar testing methods: Overview and applications," Invited by Dr. Robert Tranquillo for the IPRIME annual meeting, University of Minnesota, May 15, 2001.
59. "Biomechanics of Soft Biomaterials," Organized and chaired workshop at the 2001 Society for Biomaterials, St. Paul, MN, April 24, 2001.
60. "Biomechanical and structural properties of native and biologically-derived soft tissues," Invited keynote speaker at the Engineering Tissue Growth International Conference and Exposition, Pittsburgh, PA, March 26-29, 2001.
61. "Biomechanical considerations in developing autogenous heart valve substitutes," Invited lecture at the 73<sup>rd</sup> National American Heart Association Scientific Sessions, New Orleans, LA, November 13, 2000.
62. "Structure-strength relations in heart valve bioprosthetic tissues," Invited by Dr. Ajit Yoganathan, Georgia Institute of Technology, November 2, 1999.
63. "Micro-mechanics of the bioprosthetic aortic valve cusp: effects of chemical fixation and fatigue," ASB annual meeting in Pittsburgh, PA, October, 1999.
64. "Cardiovascular tissue mechanics" at the SFB workshop entitled "Cardiovascular Implantology: Biological, Biomaterial, and Device Issues," Sponsored by the Society for Biomaterials, April 28-May 2, 1999, Providence, Rhode Island.
65. "Structural constitutive models for planar collagenous tissues," Invited by Dr. Stephen Cowin, Department of Mechanical Engineering, CUNY, February, 1999.
66. "Constitutive models for bioprosthetic heart valves," Invited Dr. Derek Boughner, John P. Robarts Research Institute, University of Western Ontario, December, 1998.

**JOURNAL PAPERS***Submitted:*

1. V. L. Sales, B. A. Mettler, E. Aikawa, G. C. Engelmayr, Jr., A. Exarhopoulos, M. A. Moses, J. Bischoff, D. P. Martin, F. J. Schoen, **M. S. Sacks**, J. E. Mayer, Jr., "Endothelial Progenitor Cells as a Sole Source for Ex vivo Seeding of Tissue-engineered Heart Valves," Federation of American Societies for Experimental Biology Journal.
2. D.E. Schmidt, W.D. Merryman, and **M.S. Sacks**, "Extracellular matrix-contractile response coupling of the aortic heart valve interstitial cell," Annals of Biomedical Engineering.
3. S. Vigmostad, H.S. Udaykumar, J. Liu, **M.S. Sacks**, K.B. Chandran, "Fluid-structure Interaction Simulations of Bioprosthetic Heart Valve Dynamics Using a Sharp Interface Method," Annals of Biomedical Engineering.
4. C.E. Eckert, B. Zubiate, M. Vergnat, J. H. Gorman III, R.C. Gorman, and **M.S. Sacks**, "In-vivo dynamic deformation of the mitral valve annulus," Annals of Biomedical Engineering.

*In-revision:*

1. R.A. Long, A. Parekh, M.B. Chancellor, and **M.S. Sacks**, "The effects of in-vitro mechanical stretch on urinary bladder wall extracellular matrix remodeling," Biomechanics and modeling in mechanobiology.
2. **M.S. Sacks**, W.D. Merryman, and D.E. Schmidt, "On the biomechanics of heart valve function," Journal of Biomechanics, invited review.
3. E.M. Joyce, J.J. Moore, **M.S. Sacks**, "Term human fetal membranes have minimal biomechanical structural reserve," Reproductive Sciences.
5. A. Mirnajafi, B. Zubiate, and **M.S. Sacks**, "Effects of cyclic flexural fatigue on porcine bioprosthetic heart valve heterograft biomaterials," Journal of Biomedical Materials Research.
6. R. Long Heise, J. Ivanova, A. Paraekh, and **M.S. Sacks**, "Generating elastin-rich SIS-based smooth muscle constructs utilizing exogenous growth factors and cyclic stimulation," Tissue Engineering.

*Published:*

1. J. Stella, W.R. Wagner, **M.S. Sacks**, "Scale dependent fiber kinematics of elastomeric electrospun scaffolds for soft tissue engineering," Journal of Biomedical Materials Research, in-press.
2. **M.S. Sacks**, Frederick J. Schoen, and John E. Mayer, "Bioengineering challenges for heart valve tissue engineering," Annual Reviews of Biomedical Engineering, to appear in vol. 11, 2009.
3. A. Parekh, R.A. Long, M.B. Chancellor, and **M.S. Sacks**, "Assessing the effects of TGF $\beta$ 1 on bladder smooth muscle cell phenotype. I – Modulation of in-vitro contractility," Journal of Urology, to be published September 2009.
4. A. Parekh, R.A. Long, M.B. Chancellor, and **M.S. Sacks**, "Assessing the effects of TGF $\beta$ 1 on bladder smooth muscle cell phenotype. II – Modulation of collagen organization," Journal of Urology, to be published September 2009.
5. E.M. Joyce, J.J. Moore, **M.S. Sacks**, "Biomechanics of the fetal membrane prior to mechanical failure: Review and Implications," European Journal of Obstetrics and Gynecology and Reproductive Biology, in-press.
6. E. M. Joyce, J. Liao, F.J. Schoen, J.E. Mayer, and **M.S. Sacks**, "Functional Collagenous Architecture of the Pulmonary Heart Valve Cusp," Annals of Thoracic Surgery, in-press.
7. C.C. Wang, J. Nagatomi, K.K. Toosi, N. Yoshimura, J. H. Hsieh, M.B. Chancellor, and **M.S. Sacks**, "Diabetes Induced Alternations in the Biomechanical Properties of the Urinary Bladder Wall," Urology, in-press.
8. W.D. Merryman, P.D. Bieniek, F. Guilak, **M.S. Sacks**, "Viscoelastic properties of the aortic heart valve interstitial cell," Journal of Biomechanical Engineering, in press.
9. A. Parekh, V.C. Sandulache, T. Singh, S. Cetin, **M.S. Sacks**, J.E. Dohar, P.A. Hebda, "Prostaglandin E2 Differentially regulates contraction and structural reorganization of anchored collagen gels by human adult and fetal dermal fibroblast," Wound Repair and Regeneration, Vol. 17, pp. 88-98, 2009.
10. T. Gilbert, S. Wognum, E.M. Joyce, D.O. Freytas, **M.S. Sacks**, S.F. Badylak, "Collagen fiber architecture and biaxial mechanical behavior of porcine urinary bladder derived extracellular matrix," Biomaterials, in-press.
11. T. Nguyen, R. Liang, S.L.Y. Woo, S. Burton, C. Wu, A. Almarza, **M.S. Sacks**, S. Abramowitch, "Effects of cell-seeding and cyclic stretch on the fiber remodeling in an extracellular matrix derived bioscaffold," Tissue Engineering, in-press.

12. K.K. Toosi, J. Nagatomi, M.B. Chancellor, and **M.S. Sacks**, "The effects of long-term spinal cord injury on the mechanical properties of the rat urinary bladder", Annals of Biomedical Engineering, in-press.
13. J.P. Vande Geest, David E. Schmidt, **M.S. Sacks**, D.A. Vorp, "The effects of anisotropy on the stress analyses of patient-specific abdominal aortic aneurysms," Annals of Biomedical Engineering, 2008 Jun;36(6):921-32.
14. J. Stella, J. Liao, Y. Hong, W.D. Merryman, W.R. Wagner, and **M.S. Sacks**, "Tissue-cellular deformation coupling in cell micro-integrated elastomeric scaffolds," Biomaterials, 2008, Aug;29(22):3228-36.
15. G.C. Engelmayr, L. Solletti, S.C. Vigmostad, S.G. Budilarto, W.J. Federspiel, K.B. Chandran, D.A. Vorp, and **M.S. Sacks**, "A novel flex-stretch-flow bioreactor for the study of heart valve mechanobiology," Annals of Biomedical Engineering, 2008 May;36(5):700-12.
16. J. Liao, E. Joyce, and **M.S. Sacks**, "Effects of decellurization on the mechanical and structural properties of the porcine aortic valve leaflet," Biomaterials, 2008 May;36(5):700-12.
17. H. Kim, J. Lu, **M.S. Sacks**, K.B. Chandran, "Dynamic Simulation of Bioprosthetic Heart Valves using a Stress Resultant Shell Model," Annals of Biomedical Engineering, Vol. 36. No. 2, pp. 262-75, 2008.
18. J.H. Jimenez, S.W. Liou, M. Padala, Z. He, **M. Sacks**, R.C. Gorman, J.H. Gorman, III, and A.P. Yoganathan, "A saddle-shaped annulus reduces systolic strain on the central region of the mitral valve anterior leaflet," The Journal of Thoracic and Cardiovascular Surgery, 2007 Dec 134(6):1562-68.
19. G.C. Engelmayr and **M.S. Sacks**, "Prediction of extracellular matrix stiffness in engineered heart valve tissues based on nonwoven scaffolds," Biomechanics and Modeling in Mechanobiology, 2007 Aug 23. [Epub ahead of print].
20. M.A. Gray, E.C. Wang, **M.S. Sacks**, N. Yoshimura, M.B. Chancellor, and J. Nagatomi, "Time-Dependent Alterations of Select Genes in Streptozotocin-Induced Diabetic Rat Bladder," Urology 2008, Jun;71(6):1214-9.
21. J.A. Stella, J. Liao, and **M.S. Sacks**, "Time dependent biaxial mechanical behavior of the aortic valve leaflet," J. Biomechanics, Vol. 40(14), pp. 3169-3177, 2007.
22. **M.S. Sacks**, R.C. Gorman, H. Hamamoto, J.H. Gorman, R.J. Levy "In-vivo biomechanical assessment of triglycidylamine crosslinked pericardium using a novel mitral valvuloplasty model," Biomaterials, Vol. 28(35), pp. 5390-5398, 2007.
23. J. Nagatomi, K.K. Toosi, M.B. Chancellor, and **M.S. Sacks**, "Contribution of the Extracellular Matrix to the Viscoelastic Behavior of the Urinary Bladder Wall," Biomechanics in Modelling and Mechanobiology, Vol. 13(9), pp. 2281-2289, 2007.
24. W.D. Merryman, J. Liao, A. Parekh, J.E. Candiello, H. Lin, and **M.S. Sacks**, "Differences in tissue remodeling potential of the aortic and pulmonary heart valve interstitial cells," Tissue Engineering, Vol. 13(9), pp. 2281-2289, 2007.
25. H.Y. Huang, J. Liao, and **M.S. Sacks**, "In-situ deformation of the aortic heart valve interstitial cell nucleus under diastolic loading," Journal of Biomechanical Engineering, Vol. 129(6), pp. 880-889, 2007.
26. W.D. Merryman, H.D. Lukoff, R.A. Long, G.C. Engelmayr, R.A. Hopkins, and **M.S. Sacks**, "Synergistic effects of cyclic tensin and TGF- $\beta$ 1 on the aortic valve myofibroblast," Cardiovascular Pathology, Vol. 16,(5), pp. 268-276, 2007.
27. K.L. Fujimoto, K. Tobita, W.D. Merryman, J. Guan, N. Momoi, D.B. Stolz, **M.S. Sacks**, B.B. Keller, W.R. Wagner, "An elastic, biodegradable cardiac patch induces contractile smooth muscle and improves cardiac remodeling and function in sub-acute myocardial infarction," Journal of the American College of Cardiology, vol. 49(23), pp. 2292-2300, 2007.
28. John A. Stella and **M.S. Sacks**, "On the biaxial mechanical properties of the layers of the aortic valve leaflet," Journal of Biomechanical Engineering, Journal of Biomechanics, Vol. 40(14), pp. 3169-3177, 2007.
29. **M.S. Sacks** and A.P. Yoganathan, "Heart valve function: A biomechanical perspective," Philosophical Transactions of the Royal Society B: Biological Sciences on "Engineering of the Heart," Vol. 362 (1484), pp. 1369-1392, 2007.
30. V.S. Nirmalanandhan, M. Rao, **M.S. Sacks**, B. Haridas, and D.L. Butler, "Effect of length of the engineered tendon contract on its structure-function relationship in culture," Journal of Biomechanics, Vol 40(11), pp. 2523-2529, 2007.
31. T. L. Sellaro, D. Hildebrand, Q. Lu, N. Vyavahare, M. Scott, and **M. S. Sacks**, "Effects of collagen fiber orientation on the response of biologically-derived soft tissue biomaterials to cyclic loading," Journal of Biomedical Materials Research A, Vol. 80(1), pp. 194-205, 2007.
32. J. Liao, L. Yang, J. Grashow, and **M.S. Sacks**, "The relation between collagen fibril kinematics and mechanical properties in the mitral valve anterior leaflet," Journal of Biomechanical Engineering, Vol. 129, pp. 78-87, 2007.

33. H. Kim, K.B. Chandran, **M.S. Sacks**, J. Lu, "An experimentally derived stress resultant shell model for heart valve dynamic simulations," Annals of Biomedical Engineering, Vol. 35(1), pp. 30-44, 2007.
34. **M. S. Sacks**, A. Mirnajafi, W. Sun, and P. Schmidt, "Bioprosthetic heart valve heterograft biomaterials: Structure, mechanical behavior, and computational simulation," Expert Review of Medical Devices, Vol. 3(6), pp. 817-834, 2006.
35. J.S. Grashow, **M.S. Sacks**, Jun Liao, A.P. Yoganathan, "Planar biaxial creep and stress relaxation of the mitral valve anterior leaflet," Annals of Biomedical Engineering, Vol. 34(10), pp. 1509-18, 2006.
36. T.W. Gilbert., **M. S. Sacks**, J. S. Grashow, S.L.Y. Woo, S. F. Badylak, and M.B. Chancellor, "Fiber kinematics of small intestinal submucosa under biaxial and uniaxial stretch," Journal of Biomechanical Engineering, Vol. 128(6), pp. 890-898, 2006.
37. H. Kim, J. Lu, **M.S. Sacks**, and K.B. Chandran, "Dynamic simulation pericardial bioprosthetic heart valve function," Journal of Biomechanical Engineering, Vol. 128(5), pp. 717-24, 2006.
38. **M.S. Sacks**, Y. Enomoto, J.R. Graybill, W. D. Merryman, A. Zeeshan, A.P. Yoganathan, R.J. Levy, R.C. Gorman, J.H. Gorman, "In-vivo dynamic deformation of the mitral valve leaflet," Annals of Thoracic Surgery, Vol. 82(4), pp. 1369-77, 2006.
39. G.C. Engelmayr, V. Sales, J. E. Mayer, Jr., and **M.S. Sacks**, "Cyclic flexure and laminar flow synergistically accelerate stem cell-mediated engineered heart valve tissue formation," Biomaterials, Vol. 27, pp. 6083 – 6095, 2006.
40. S.J. Stachelek, I. Alferiev, H. Choi, C.W. Chan, B. Zubiate, **M.S. Sacks**, R. Composto, I.W. Chen, and R.J. Levy, "Prevention of oxidative degradation of polyurethane by covalent attachment of di-tert-butylphenol residues," Journal of Biomedical Materials Research A., Vol. 78A(4), pp. 653-661, 2006.
41. J. P. Vande Geest, **M. S. Sacks**, D. A. Vorp, "A planar biaxial constitutive relation for the luminal layer of intra-luminal thrombus in abdominal aortic aneurysms," Journal of Biomechanics, Vol. 39, pp. 2347-2354, 2006.
42. V. Sales, G.C. Engelmayr, B.A. Mettler, J.A. Johnson, **M.S. Sacks**, J.E. Mayer, "TGFbeta1 modulates extracellular matrix production, proliferation, and apoptosis of endothelial progenitor cells in tissue engineering scaffolds," Circulation, Jul 4;114(1 Suppl):1193-9, 2006.
43. G.C. Engelmayr and **M.S. Sacks**, "Flexural mechanics of non-woven tissue engineering scaffolds," Journal of Biomechanical Engineering, vol. 128(4), pp. 610-622, 2006.
44. G.C. Engelmayr, G. Papworth, S. C. Watkins, J. E. Mayer, Jr., and **M.S. Sacks**, "Guidance of engineered tissue collagen orientation by large-scale scaffold microstructures," Journal of Biomechanics, vol. 39(10), pp. 1819-31, 2006.
45. J.P. Vande Geest, **M.S. Sacks**, and D.A. Vorp, "The effects of aneurysm on the biaxial biomechanical behavior of human abdominal aorta," Journal of Biomechanical Engineering vol. 39(7), pp. 1324-34, 2006.
46. T. Courtney, **M.S. Sacks**, J. Stankus, J. Guan, and W.R. Wagner, "Design and analysis of tissue engineered scaffolds that mimic soft tissue mechanical anisotropy," Biomaterials, Vol. 27, pp. 3631-3638, 2006.
47. J. Ritchie, J. Jimenez, Z. He, **M.S. Sacks**, and A.P. Yoganathan, "The material properties of the native porcine mitral valve chordae tendineae: An in vitro investigation," Journal of Biomechanics vol. 39, pp. 1129-1135, 2006.
48. S.J. Stachelek, I. Alferiev, J.M. Connolly, **M. S. Sacks**, R.P. Hebbel, R. Bianco, R.J. Levy, "Cholesterol-modified polyurethane valve cusps show endothelial adhesion in-vitro and in-vivo," Annals of Thoracic Surgery, vol. 81, pp. 47-55, 2006.
49. W.D. Merryman, G.C. Engelmayr, J. Liao, and **M.S. Sacks**, "Defining biomechanical endpoints for tissue engineered heart valve leaflets from native leaflet properties", Progress in Pediatric Cardiology, Vol. 21, pp. 153-60, 2006.
50. W. D. Merryman, I. Youn, H.D. Lukoff, P.M. Krueger, F. Guilak, R.A. Hopkins, and **M.S. Sacks**, "Correlation between heart valve interstitial cell stiffness and transvalvular pressure: Implications for collagen biosynthesis," American Journal of Physiology, Heart Circ Physiol., Vol 290, H224-231, 2006.
51. W. D. Merryman, H.Y. Huang, F. J. Schoen, and **M. S. Sacks**, "The effects of cellular contraction on aortic valve leaflet stiffness," Journal of Biomechanics, vol. 39 (1), pp. 88-96, 2006.
52. R. Long, J. Nagatomi, M.B. Chancellor, and **M.S. Sacks**, "The role of MMP-I up-regulation in the increased compliance in muscle-derived stem cell-seeded small intestinal submucosa," Biomaterials, vol. 27(11), pp.2398-2404, 2006.
53. J.S. Grashow, A.P. Yoganathan, **M.S. Sacks**, "Biaxial stress-stretch behavior of the mitral valve anterior leaflet at physiologic strain rates," Annals of Biomedical Engineering, Feb 1, pp.1-11, 2006.

54. J.J. Lovekamp, D.T. Simionescu, J.J. Mercuri, B. Zubiato, **M.S. Sacks**, N.R. Vyavahare, "Stability and function of glycosaminoglycans in porcine bioprosthetic heart valves," Biomaterials, vol. 27 (8), 1507-1518, 2006.
55. A. Mirnajafi, J. M. Raymer, L.R. McClure, and **M. S. Sacks**, "Flexural rigidity of the aortic valve leaflet in the commissural region," Journal of Biomechanics, vol. 39 (16), pp. 2966-2973, 2006.
56. W. Sun, M.J. Scott, and **M.S. Sacks**, "Finite element implementation of a generalized Fung-elastic constitutive model for planar soft tissues," Biomechanics and Modeling in Mechanobiology, vol. 4, pp. 190-199, 2005.
57. W. Sun, A. Abad, and **M.S. Sacks**, "Simulated bioprosthetic heart valve deformation under quasi-static loading," Journal of Biomechanical Engineering, vol. 127 (6), pp.905-914, 2005.
58. W. Sun, M.J. Scott, and **M.S. Sacks**, "Effects of boundary conditions on the planar biaxial mechanical properties of soft tissues," Journal of Biomechanical Engineering, vol. 127(4), pp. 709-15, 2005.
59. F.W.H. Sutherland, T.E. Perry, Y. Yu, M.C. Sherwood, E. Rabkin, Y. Masuda, G.A. Garcia, D. L. McLellan, G.C. Engelmayer, **M.S. Sacks**, F.J. Schoen, and J.E. Mayer, "From stem cells to viable autologous semilunar heart valve," Circulation, vol. 111(21), pp. 2783-2791, 2005.
60. T.W. Cannon, D.D. Sweeney, D.A. Conway, I. Kamo, N. Yoshimura, **M.S. Sacks**, and M.B. Chancellor, "A tissue-engineered suburethral sling in an animal model," BJU International, vol. 96, pp. 664-669, 2005.
61. J. Nagatomi, J. Grashow, K. Toosi, and M.S. Sacks, "Quantification of bladder smooth muscle orientation in normal and spinal cord injured rats," Annals of Biomedical Engineering, vol. 33 (8), pp. 1078-1089, 2005.
62. Z. He, J. Ritchie, J.S. Grashow, **M.S. Sacks**, and A.P. Yoganathan, "In-vitro dynamic strain behavior of the mitral valve posterior leaflet," Journal of Biomechanical Engineering, vol. 127(3), pp. 504-511, 2005.
63. J. Nagatomi, F. DeMiguel, K. Torimoto, M.B. Chancellor, R.H. Getzenberg, **M.S. Sacks**, "Early molecular-level changes in rat bladder wall tissue following spinal cord injury," Biochemical and Biophysical Research Communications, vol. 334, pp. 1159-1164, 2005.
64. J. Guan, K.L. Fujimoto, **M.S. Sacks**, W.R. Wagner, "Preparation and characterization of highly porous, biodegradable polyurethane scaffolds for soft tissue applications," Biomaterials, vol. 26, pp. 3961-3971, 2005.
65. S.M. Wells, T.L. Sellaro, and **M.S. Sacks**, "Cyclic loading response of bioprosthetic heart valves: Effects of fixation stress-state on collagen fiber architecture," Biomaterials, vol. 26, pp. 2611-2619, 2005.
66. J.M. Connolly, I. Alferiev, J.N. Clark, N. Eidelman, **M.S. Sacks**, E. Palmatory, Z. Lu, A. Kronsteiner, S. DeFelice, J. Xu, R. Ohri, N. Narula, N. Vyavahare, and R. J. Levy, "Triglycidyl amine crosslinking of porcine aortic valve cusps or bovine pericardium results in improved biocompatibility, biomechanics, and calcification resistance: Chemical and Biological mechanisms." American Journal of Pathology, vol. 166(1), pp. 1-13, 2005.
67. A. Mirnajafi, J. Raymer, M.J. Scott, and **M.S. Sacks**, "The effects of collagen fiber orientation on the flexural properties of pericardial heterograft biomaterials," Biomaterials, vol. 26(7), pages 795-804, 2005.
68. S.H. Lu, **M.S. Sacks**, S.Y. Chung, D.C. Gloeckner, R. Pruchnic, J. Huard, W.C. de Groat, and M.B. Chancellor, "Biaxial mechanical properties of muscle-derived cell seeded small intestinal submucosa for bladder wall reconstruction," Biomaterials, vol. 26, pp. 443-449, 2005.
69. G.C. Engelmayer, Jr., E. Rabkin, F.W.H. Sutherland, F.J. Schoen, J.E. Mayer, Jr., and **M.S. Sacks**, "The independent role of cyclic flexure in the early in vitro development of engineered heart valve tissue," Biomaterials, vol. 26, no. 2, pp 175-187, 2005.
70. J.P. Vande Geest, **M.S. Sacks**, and D.A. Vorp, "Age dependency of the biaxial biomechanical behavior of human abdominal aorta," Journal of Biomechanical Engineering, vol. 126 (6), pp. 815-822, 2004.
71. J. Liao, L. Yang, J. Grashow, and **M.S. Sacks**, "Molecular orientation of collagen in intact planar connective tissues under biaxial stretch," Acta Biomaterialia, vol. 1, (1), 2004.
72. J. Nagatomi, D. Claire Gloeckner, M.B. Chancellor, W.C. deGroat, and **M.S. Sacks**, "Changes in the biaxial viscoelastic response of the urinary bladder following spinal cord injury," Annals of Biomedical Engineering, vol. 32 (10), pp. 1409-1419, 2004.
73. D.K. Hildebrand, Jon Wu, J.E. Mayer, Jr., and **M.S. Sacks**, "Design and hydrodynamic evaluation of a novel pulsatile bioreactor for biologically active heart valves," Annals of Biomedical Engineering, vol. 32(8), pp. 1039-1049, 2004.

74. W. Sun, **M.S. Sacks**, G. Fulchiero, J. Lovekamp, N. Vyavahare, and M.J. Scott, "Response of heterograft heart valve biomaterials to moderate cyclic loading" Journal of Biomedical Materials Research, vol. 69A, pp. 658-669, 2004.
75. J.Guan, **M.S. Sacks**, E.J. Beckman, W.R. Wagner, "Biodegradable poly(ester-urethane)urea elastomers based on poly(ether ester) triblock copolymers and putrescine: Synthesis, characterization, and cytocompatibility," Biomaterials, vol. 25, no.1, 85-96, 2004.
76. Alferiev, S.J. Stachelek, Z. Lu, A. Fu, T.L. Sellaro, J.M. Connolly, R.W. Bianco, **M.S. Sacks**, and R.J. Levy, "Prevention of polyurethane valve cusp calcification with covalently attached biophosphonate diethylamino moieties," Journal of Biomedical Materials Research, vol. 66A(2), pp. 385-395, 2003.
77. Z. He, **M.S. Sacks**, L. Baijens, S. Wanant, P. Shah, and A.P. Yoganathan, "Effects of papillary muscle position on the in-vitro dynamic strain on the porcine mitral valve," Journal of Heart Valve Disease, vol. 12, pp. 488-494, 2003.
78. R.E. Debski, S.M. Moore, J.L. Mercer, **M.S. Sacks**, and P.J. McMahon, "The collagen fibers of the anteroinferior capsulolabrum have multi-axial orientation to resist shoulder dislocation," Journal of Shoulder and Elbow Surgery, vol. 12(3), pp. 247-52, 2003.
79. W. Sun, **M.S. Sacks**, T.L. Sellaro, W.S. Slaughter, and M. Scott, "Biaxial mechanical response of chemically treated bovine pericardium to high in-plane shear" Journal of Biomechanical Engineering, vol. 125, pp. 372-380, 2003.
80. S.H. Lu, T.W. Cannon, C. Chermanski, R. Pruchnic, G. Somogy, **M.S. Sacks**, W.C. de Groat, J. Huard, and M.B. Chancellor, "Muscle-derived stem cells seeded acellular scaffolds develop calcium dependent contractile activity that is modulated by nicotinic receptors," Urology, vol. 61, no. 6, pp. 1285-1291, 2003
81. G.C. Engelmayr, D.K. Hildebrand, F.W.H. Sutherland, J.E. Mayer, Jr., and **M.S. Sacks**, "A novel bioreactor for the dynamic flexural stimulation of tissue engineered heart valve biomaterials," Biomaterials, vol. 24, pp. 2523-2532, 2003.
82. T.E. Perry, S. Kaushal, F.W. Sutherland, K.J. Guleserian, J. Bischoff, **M.S. Sacks**, and J.E. Mayer, "Bone marrow: A cell source for tissue engineered valves," Annals of Thoracic Surgery, vol. 75(3), pp. 761-7, 2003.
83. **M.S. Sacks**, "Incorporation of experimentally-derived fiber orientation into a structural constitutive model for planar collagenous tissues" Journal of Biomechanical Engineering, vol. 125, pp. 280-287, 2003.
84. J.C. Criscione, **M.S. Sacks**, and W.C. Hunter, "Experimentally tractable, pseudo-elastic constitutive law for biomembranes: I. Theory," Journal of Biomechanical Engineering, vol. 125, pp. 94-99, 2003
85. J.C. Criscione, **M.S. Sacks**, and W.C. Hunter, "Experimentally tractable, pseudo-elastic constitutive law for biomembranes: II. Application," Journal of Biomechanical Engineering, vol. 125, pp. 100-105, 2003.
86. **M.S. Sacks** and Wei. Sun, "Multiaxial mechanical behavior of biological materials," Annual Reviews of Biomedical Engineering, Vol. 5, pp. 251-284, 2003.
87. **Sacks** and Wei. Sun, "Multiaxial mechanical behavior of biological materials," Annual Reviews of Biomedical Engineering, Vol. 5, pp. 251-284, 2003.
88. **M.S. Sacks**, Z. He, L. Baijens, S. Wanant, P. Shah, H. Sugimoto, and A.P. Yoganathan, "Surface strains in the anterior leaflet of the functioning mitral valve," Annals of Biomedical Engineering, vol. 30, pp. 1281-1290, 2002.
89. S.D. Waldman, **M.S. Sacks**, and J. M. Lee, "Boundary conditions during biaxial testing of planar connective tissues – Part II Fiber orientation," Journal of Materials Science Letters, vol. 21, pp. 1215-1221, 2002.
90. **M.S. Sacks** and F.J. Schoen, "Mechanical damage to collagen independent of calcification limits bioprosthetic heart valve durability," Journal of Biomedical Materials Research, vol. 62, pp. 359-371, 2002.
91. J.Guan, **M.S. Sacks**, E.J. Beckman, W.R. Wagner, "Synthesis, characterization, and cytocompatibility of elastomeric, biodegradable poly(ester-urethane)ureas based on poly(caprolactone) and putrescine," Journal of Biomedical Materials Research, vol. 61, pp. 493-503, 2002.
92. D. C. Gloeckner, **M.S. Sacks**, M.O. Fraser, G.S. Somogyi, W.C. de Groat, M.B. Chancellor, "Passive biaxial mechanical properties of the rat urinary bladder wall after spinal cord injury," Journal of Urology, vol. 167, pp. 2247-2252, 2002.
93. S.M. Wells and **M.S. Sacks**, "Effects of fixation pressure on the biaxial mechanical behavior of porcine bioprosthetic heart valves with long-term cyclic loading," Biomaterials, vol. 23, no. 11, pp. 2389-2399, 2002.
94. **M.S. Sacks**, "The biomechanical effects of fatigue on the porcine bioprosthetic heart valve," Journal of Long-term Effects of Medical Implants, Vol. 11 (3&4), pp. 231-247, 2001. (n.b. – This was an invited paper by Dr. Peter Zilla for the special issue on bioprosthetic heart valves).

95. A.K.S. Iyengar, H. Sugimoto, D.B. Smith, and **M.S. Sacks**, "Dynamic in-vitro quantification of bioprosthetic heart valve leaflet motion using structured light projection," Annals of Biomedical Engineering, vol. 29, pp. 963-973, 2001.
96. M.O. Fraser, J.P. Lavelle, J.P., **M.S. Sacks**, M.B. Chancellor, "The future of bladder control – intravesical drug delivery, a pinch of pepper and gene therapy," Rev. Urology, vol 3(2), 2001.
97. **M.S. Sacks**, "Biaxial mechanical evaluation of planar biological materials," Journal of Elasticity, vol. 61, pp. 199-246, 2000 (invited by Dr. Steven Cowin as part of a special issue on biomechanics).
98. M.C. Lewis, M. TerRiet, J.P. Lafferty, **M.S. Sacks**, V.S. Pallares, "How much work is required to puncture dura with Touhy needles?," British Journal of Anaesthesia, vol. 85 (2), pp. 238-41, 2000.
99. **M.S. Sacks**, "A structural constitutive model for chemically treated planar tissues under biaxial loading," Computational Mechanics, vol. 26 (3), pp. 243-249, 2000.
100. D.B. Smith, **M.S. Sacks**, D.A. Vorp, and M. Thornton, "Surface geometric analysis of anatomic structures using biquintic finite element interpolation," Annals of Biomedical Engineering, vol. 28(6), pp 598-611, 2000.
101. D. C. Gloeckner, **M.S. Sacks**, K.L. Billiar, N. Bachrach, "Mechanical evaluation and design of a multi-layered collagenous repair biomaterial," Journal of Biomedical Materials Research, vol. 52(2), pp.365-373, 2000.
102. K.L. Billiar and **M.S. Sacks**, "Biaxial mechanical properties of the fresh and glutaraldehyde treated porcine aortic valve: Part II - A structurally guided constitutive model," Journal of Biomechanical Engineering, vol. 122 (4), pp. 327-335, 2000.
103. K.L. Billiar and **M.S. Sacks**, "Biaxial mechanical properties of the fresh and glutaraldehyde treated porcine aortic valve: Part I - Experimental results," Journal of Biomechanical Engineering, vol. 122, pp. 23-30, 2000.
104. Z.B. Gao, S. Pandya, N. Hosein, **M.S. Sacks**, and Ned H.C. Hwang, "Bioprosthetic heart valve leaflet motion monitored by dual camera stereo photogrammetry," Journal of Biomechanics, vol. 33, pp. 199-207, 2000.
105. S.D. Waldman, **M.S. Sacks**, and J. M. Lee, "Imposed state of deformation determines local collagen fibre orientation but not apparent mechanical properties," Biomedical Sciences Instrumentation, vol. 35, pp. 51-56, 1999.
106. **M.S. Sacks**, "A method for planar biaxial testing that includes in-plane shear" Journal of Biomechanical Engineering, vol. 121, pp. 551-555, 1999.
107. A.V. Slucky, **M.S. Sacks**, V.S. Pallares, T.I. Malinin, F.J. Eismont, "The effects of epidural steroid on lumbar dura material properties," Journal of Spine Disorders, vol. 12 (4), pp. 331-340, 1999.
108. **M.S. Sacks**, D.A.Vorp, M.L. Raghavan, M. Federle, and M. Webster, "In-vivo 3D surface geometry of abdominal aortic aneurysms," Annals of Biomedical Engineering, vol. 27, pp. 469-479, 1999.
109. L.E. Bowes, M.C. Jimenez, E.D. Hiester, **M.S.Sacks**, J. Brahmatewari, P.M. Mertz, W.H. Eaglstein, "Collagen fiber orientation as detected by small angle light scattering in a wounds treated with transforming growth factor-beta2 and its neutralizing antibody," Wound Repair and Regeneration, vol. 7 (3), pp. 179-186, 1999.
110. N. Vyavahare, M. Ogle, F.J. Schoen, R. Zand, D.C. Gloeckner, **M.S. Sacks**, and R.J. Levy, "Collagen structural alterations and loss of glycosaminoglycans: mechanisms of cardiac valve deterioration," Journal of Biomedical Materials Research, vol. 46, pp. 44-50, 1999.
111. **M.S. Sacks** and D.C. Gloeckner, "Quantification of the fiber architecture and biaxial mechanical behavior of porcine intestinal submucosa," Journal of Biomedical Materials Research, vol. 46, pp. 1-10, 1999.
112. D.B. Smith, **M.S. Sacks**, P.M. Pattany, and R. Schroeder, "Fatigue induced changes in bioprosthetic heart valve 3D geometry and the relation to tissue damage," Journal of Heart Valve Disease, vol.8, pp. 25-33, 1999.
113. D.C. Gloeckner, K.L. Billiar, and **M.S. Sacks**, "Effects of mechanical fatigue on the bending properties of the porcine bioprosthetic heart valve," ASAIO Journal, Jan-Feb; 45(1):59-63, 1999.
114. **M.S. Sacks** and C.J. Chuong, "Orthotropic mechanical properties of chemically treated bovine pericardium," Annals of Biomedical Engineering, vol. 26(5), pp. 892-902, 1998.
115. **M.S. Sacks**, S.E. Otano-Lata, M.C. Jimenez, T.I. Malinin, "Local mechanical anisotropy in human cranial dura-mater allografts," Journal of Biomechanical Engineering, vol. 120(4), pp. 541-543, 1998.
116. **M.S. Sacks** and D.B. Smith, "Fiber architecture of the porcine bioprosthetic leaflet: effects of accelerated in-vitro testing," Biomaterials, vol. 19 (11/12), pp. 1027-1036, 1998.

117. M.C. Jimenez, **M.S. Sacks**, and T.I. Malinin, "Collagen fiber architecture of human cranial dura mater," Journal of Anatomy, vol. 192, pp. 99-106, 1998.
118. **M.S. Sacks**, D.B. Smith, and E.D. Hiester, "The aortic valve microstructure: effects of trans-valvular pressure," Journal of Biomedical Materials Research, vol. 41, pp. 131-141, 1998.
119. E.D. Hiester and **M.S. Sacks**, "Optimal selection sites in the bovine pericardial sac - Part I: Measurement of fiber architecture and tissue thickness," Journal of Biomedical Materials Research, vol. 39, pp. 207-214, 1998.
120. E.D. Hiester and **M.S. Sacks**, "Optimal selection sites in the bovine pericardial sac - Part II: Cartographic analysis," Journal of Biomedical Materials Research, vol. 39, pp. 215-221, 1998.
121. D.B. Smith, **M.S. Sacks**, F. Pattany, and R. Schroeder, "High-Resolution MRI to reconstruct bioprosthetic heart valve 3D geometry," Journal of Heart Valve Disease, vol. 6(4), 1997.
122. K.L. Billiar and **M.S. Sacks**, "A method to quantify the fiber kinematics of planar tissues under biaxial stretch," Journal of Biomechanics, vol. 30, No. 7, pp. 753-756, 1997.
123. **M.S. Sacks**, D.B. Smith, and E.D. Hiester, "A SALS device for planar connective tissue microstructural analysis," Annals of Biomedical Engineering, vol. 25, no. 4, pp. 678-689, 1997.
124. **M.S. Sacks**, C.J. Chuong, W.M. Petroll, M. Kwan, C. Halberstadt, "Collagen fiber architecture of a cultured dermal tissue," Journal of Biomechanical Engineering, vol. 119, pp. 124-127, 1997.
125. **M.S. Sacks**, C.J. Chuong, R. More, "Collagen fiber architecture of bovine pericardium," ASAIO Journal, vol. 40, no. 3, M632-M637, 1994.
126. P.L. Kronick and **M.S. Sacks**, "The roles of macromolecular components of the interfibrillary matrix in the dynamic mechanical behavior of calf skin," Journal of Biomechanical Engineering, vol. 106, pp. 140-145, 1994.
127. **M.S. Sacks** and C.J. Chuong "A constitutive relation for passive right ventricular free wall myocardium," Journal of Biomechanics, vol. 26, pp. 1341-1345, 1993.
128. **M.S. Sacks** and C.J. Chuong, "Biaxial mechanical properties of passive right ventricular free wall myocardium," Journal of Biomechanical Engineering, vol. 115, pp. 202-205, 1993.
129. **M.S. Sacks**, C.J. Chuong, G.H. Templeton, R. Peschok, "In-vivo 3D reconstruction and geometric characterization of the right ventricular free wall," Annals of Biomedical Engineering, vol. 21, pp. 263-275, 1993.
130. **M.S. Sacks** and C.J. Chuong, "Collagen fiber orientation of the diaphragmatic central tendon," Journal of Biomechanical Engineering, vol. 114, 1992.
131. C.J. Chuong, **M.S. Sacks**, R.L. Johnson, R.C. Reynolds, "On the anisotropy of the canine diaphragmatic central tendon," Journal of Biomechanics, vol. 24, no.7, pp. 563-576, 1991.
132. C.J. Chuong, **M.S. Sacks**, G.T. Templeton, F. Schweip, R.L. Johnson "Regional deformation of the right ventricle free wall," Journal of Applied Physiology, vol. 260, H1224-H1235, 1991.
133. P.L. Kronick, **M.S. Sacks**, M.P. Dahms, "Quantification of vertical fiber defect by small angle light scattering," Connective Tissue Research, vol. 26, pp. 1-12, 1991.
134. **M.S. Sacks**, "Focus on materials with scattered light," Research and Development, vol. 30, No. 9, 1988.
135. **M.S. Sacks**, P.L. Kronick, P.R. Buechler, "The contribution of intramuscular connective tissue to the viscoelastic properties of post-rigor muscle," Journal of Food Science, vol. 53, No., 1988.

**BOOKS**

Biomechanics of Native and Engineered Tissue Systems: A Functional Approach, Springer (under contract). Spring 2010 anticipated publication date. Authors: **M.S. Sacks** and Jiro Nagatomi.

**BOOK CHAPTERS**

1. **M. S. Sacks**, G.C. Engelmayr, D.K. Hildebrand, J.E. Mayer, Jr., "Chapter 11 - Biomechanical considerations for tissue engineered heart valve bioreactors," An invited chapter for Bioreactors for Tissue Engineering, Julian Chadhuri and Mohamed Al Rubeai, Eds., Springer, pp. 235-267, 2005.
2. **M.S. Sacks**, "Small angle light scattering methods for soft tissue connective tissue structural analysis," An invited chapter for the Encyclopedia for Biomaterials and Biomedical Engineering, G. Wnek and G. Bowlin, Eds, Marcel Dekker, 2004.
3. **M. S. Sacks** (Ed.), "2003 Advances in bioengineering", Proceedings of the IMECE 2003, vol. 1, ASME Press, ISBN 0-7918-4663-6, 2003.
4. **M.S. Sacks**, "Biomechanics of native and engineered heart valve tissues," Chapter 18 of Functional Tissue Engineering, pp. 243-257, Springer-Verlag, 2003.
5. Contributing author for "Overcoming bladder disease – A strategic plan for research," A report to the Bladder Research Progress Review Group, National Institute of Diabetes & Digestive & Kidney Diseases (NIDDK). Published by the NIH, August 2002.
6. "Functional biomaterials," N. Katsube, W. Soboyejo, and **M.S. Sacks** (Eds.), Trans-Tech Publications, Zurich, 2001. Published as part of the Key Engineering Materials series, vols. 198-199.
7. **M.S. Sacks**, "Biaxial mechanical evaluation of planar biological materials," in Cardiovascular Soft Tissue Mechanics, S.C. Cowin and J.D. Humphrey, Eds., pp. 199-246, Kluwer Academic Publishers, 2001.
8. W.S. Slaughter and **M.S. Sacks**, "Modeling fatigue damage in chemically treated soft tissues," Functional Biomaterials, pp. 255-260, Trans-Tech, Zurich, 2001.
9. **M.S. Sacks** and K.L. Billiar, "Biaxial mechanical properties of bioprosthetic heart valve cusps subjected to accelerated testing," Advances in Anti-Calcific and Anti-Degenerative Treatment of Heart Valve Bioprostheses, S. Gabbay and R.W.M. Frater, Eds., pp. 35-50, 1997.

**EXTENDED CONFERENCE PROCEEDINGS (greater than 2 pages)**

1. J.A. Stella, J. Liao, Y. Hong, W.D. Merryman, W.R. Wagner, and **M.S. Sacks**, "Tissue-to-cellular deformation coupling in cell-microintegrated elastomeric scaffolds," IUTAM proceedings of the Symposium on Cellular, Molecular and Tissue Mechanics, to be published by Springer in 2009.
2. T.E. Perry, S. Kaushal, B. Nasser, F.W.H. Sutherland, J. Wang, K.J. Guleserian, J. Bischoff, J.P. Vacanti, **M.S. Sacks**, and J.E. Mayer, "Peripheral blood as cell source for tissue engineering heart valves," Surgical Forum, pp. 99-101, vol. LII, 2001.
3. **M.S. Sacks**, "Multi-axial testing of planar biomaterials," Proceedings of the workshop entitled Biomechanics of Soft Biomaterials," Society for Biomaterials, St. Paul, MN, 2001.
4. **M.S. Sacks**, "Tissue level structural constitutive models," in "Mechanics in Biology," AMD vol. 242/BED vol. 46, pp. 113-124, 2000.
5. "Functional Biomaterials," Soboyejo, W.O., Katsube, N., **Sacks, M.S.**, Soboyejo, A.B.O., Orisamolu, I.R., Walter, M., Mumm, D., Popoola, O. (Eds.), MD-vol. 94, pp. 107-108, ASME, 2000.
6. **M.S. Sacks**, "Biomechanical and structural properties of native and biologically derived tissues," Proceedings of Tissue Engineering Research in the U.S., World Technology (WTEC) Division, International Technology Research Institute, pp. 59-78, 2000.
7. S.D. Waldman, **M.S. Sacks**, J.M. Lee, "Imposed state of deformation determines local collagen fiber orientation but not apparent mechanical properties," 36<sup>th</sup> Annual Rocky Mountain Bioengineering Symposium, Copper Mountain, Colorado, April 16-18, 1999.
8. **M.S. Sacks**, "A structural model for natural and chemically treated bovine pericardium," Modeling and Simulation Based Engineering, Vol. II, S.N. Atluri and P.E. O'Donoghue, Eds., Tech Science Press, pp. 1574-1579, 1998.
9. **M.S. Sacks**, "Biaxial mechanical behavior of bovine pericardium as a bioprosthetic material," 11<sup>th</sup> ASCE Conference on Engineering Mechanics, Vol. 1, pgs. 200-203, 1996.

10. **M.S. Sacks** and X. Lin, "Extension of SALS to transmural quantitative structural analysis of planar tissues," SPIE Transactions.

### PEER REVIEWED ABSTRACTS (ORAL AND POSTER PRESENTATIONS)

1. M. McCall, J. Stella, and **M. Sacks**, "Quantitative Finite Element Mesh Incorporating the Microanatomy of the Aortic Valve Leaflet," Presented at the 2008 Annual Fall Meeting of the Biomedical Engineering Society, October 2. Published on CD ROM.
2. B. Fata, **M. Sacks**, A. Cois, G. Stetten, D. Gottlieb, and J. Mayer, "3D *In Vivo* Geometric Characterization of the Right Ventricular Outflow Tract," Presented at the 2008 Annual Fall Meeting of the Biomedical Engineering Society, October 2. Published on CD ROM.
3. **M. Sacks**, J. Stella, and W. Wagner, "Scale Dependent Kinematics of Fibrous Elastomeric Scaffolds for Tissue Engineering," Presented at the 2008 Annual Fall Meeting of the Biomedical Engineering Society, October 3. Published on CD ROM.
4. D. Debrah, J. Debrah, **M. Sacks**, K. Conrad, and S. Shroff, "Determinants of Relaxin-Induced Changes in Passive Compliance of Small Renal Arteries," Presented at the 2008 Annual Fall Meeting of the Biomedical Engineering Society, October 4. Published on CD ROM.
5. J. Ivanova, R. Long, A. Parekh, and **M. Sacks**, "Mechanical Stimulation Induced Elastogenesis in Scaffolds Seeded with Bladder Smooth Muscle Cells," Presented at the 2008 Annual Fall Meeting of the Biomedical Engineering Society, October 4. Published on CD ROM.
6. **M. Sacks** and D. Schmidt, "A Multi-Layer Constitutive Model for Heart Valve Leaflets," Presented at the 2008 Annual Fall Meeting of the Biomedical Engineering Society, October 4. Published on CD ROM.
7. S. Vigmostad, H. Udaykumar, J. Lu, **M.S. Sacks**, and K. Chandran, "A Fluid-Structure Interaction Model for 3D Heart Valve Dynamics," Presented at the 10<sup>th</sup> ASME Summer Bioengineering Conference, June 29, 2008. Listed Page 58 of the proceedings. Published on CD ROM.
8. S. Wognum and **M.S. Sacks**, "Towards a Structurally Based Constitutive Model of Urinary Bladder Wall Tissue Remodeling After Spinal Cord Injury," Presented at the 10<sup>th</sup> ASME Summer Bioengineering Conference, June 28, 2008. Listed Page 51 of the proceedings. Published on CD ROM.
9. R. Long, Julia Ivanova, A. Parekh and **M.S. Sacks**, "Mechanical Stimulation Induced Elastogenesis in Collagenous Scaffolds Seeded with Bladder Smooth Muscle Cells," Presented at the 10<sup>th</sup> ASME Summer Bioengineering Conference, June 27, 2008. Listed Page 42 of the proceedings. Published on CD ROM.
10. S. Ramaswamy, D. Gottlieb, J. Meyer, and **M.S. Sacks**, "Engineered Heart Valve Tissue Formation at the Organ Level: Effects of Flow Dynamics on Tissue Development," Presented at the 10<sup>th</sup> ASME Summer Bioengineering Conference, June 27, 2008. Listed Page 32 of the proceedings. Published on CD ROM.
11. J. Liao, E. Joyce, H. Jones, M. Tahai, A. Borazjani, D. Merryman, and **M.S. Sacks**, "The Intrinsic Durability of Aortic Valve ECM in Absence of Cellular Maintenance," Presented at the 10<sup>th</sup> ASME Summer Bioengineering Conference, June 26, 2008. Listed Page 24 of the proceedings. Published on CD ROM.
12. **M.S. Sacks**, D. Schmidt, and D. Merryman, "Extracellular Matrix-Contractile Response Coupling," Presented at the 10<sup>th</sup> ASME Summer Bioengineering Conference, June 26, 2008. Listed Page 18 of the proceedings. Published on CD ROM.
13. M. Padala, **M.S. Sacks**, and A. Yoganathan, "Non-Planar Shape of the Mitral Annulus Reduces Systolic Strain on the Posterior Leaflet by Increasing Leaflet Curvature," Presented at the 10<sup>th</sup> ASME Summer Bioengineering Conference, June 26, 2008. Listed Page 19 of the proceedings. Published on CD ROM.
14. J.A. Stella, J. Liao, Y. Hong, W.D. Merryman, W. R. Wagner, and **M.S. Sacks**, "Tissue-Cellular Deformation Coupling in Cell Microintegrated Elastomeric Scaffolds," Presented at IUTAM Symposium on Cellular, Molecular and Tissue Mechanics, June 18, 2008. Published Page 10 of the proceedings.
15. **M.S. Sacks**, D. Schmidt, J. Mayer, W. Wagner, "Effects of scaffold anisotropy on engineered heart valve stress/strain distributions," Presented at the World Congress of Biomaterials, Amsterdam, May 29, 2008. Published on CD ROM.
16. S. Ramaswamy and **M.S. Sacks**, "Effects on specimen motion on flow induced shear stresses in engineered heart valve tissues," Presented at the World Congress of Biomaterials, Amsterdam, May 29, 2008. Published on CD ROM.

17. S. Ramaswamy and **M.S. Sacks**, "Guiding in-vitro engineered heart valve tissue formation in the pulmonary valve physiologic environment." Presented at the World Congress of Biomaterials, Amsterdam, May 29, 2008. Published on CD ROM.
18. **M.S. Sacks**, "A meso-structural constitutive model for electrospun scaffolds for cardiovascular tissue engineering," Presented at the World Congress of Biomaterials, Amsterdam, May 30, 2008. Published on CD ROM.
19. R. Long, J. Ivanova, M.B. Chancellor, and **M.S. Sacks**, "Exogenous growth factors enhance bladder wall smooth muscle cell ingrowth into Small Intestinal Submucosa," Presented at the World Congress of Biomaterials, Amsterdam, May 30, 2008. Published on CD ROM.
20. C. Eckert, J. Gorman, and **M.S. Sacks**, "3D in-vivo geometric characterization of the right ventricular outflow track," presented at the 3<sup>rd</sup> Biennial Heart Valve Biology and Tissue Engineering Meeting, The Royal Society, London, UK, May 4-7, 2008. Published Page 43 of the proceedings.
21. B. Fata, D. Gottlieb, A. Cois, G. Stetten, J.E. Mayer, and **M.S. Sacks**, "3D in-vivo geometric characterization of the right ventricular outflow track," presented at the 3<sup>rd</sup> Biennial Heart Valve Biology and Tissue Engineering Meeting, The Royal Society, London, UK, May 4-7, 2008. Published Page 52 of the proceedings.
22. C. Eckert, J. Gorman, and **M.S. Sacks**, "Dynamic in-vivo deformation of the mitral valve leaflet and annulus in synchrony," presented at the 3<sup>rd</sup> Biennial Heart Valve Biology and Tissue Engineering Meeting, The Royal Society, London, UK, May 4-7, 2008. Published Page 43 of the proceedings.
23. **M.S. Sacks**, "Collagen fiber recruitment structural constitutive models for valvular tissues," presented at the 3<sup>rd</sup> Biennial Heart Valve Biology and Tissue Engineering Meeting, The Royal Society, London, UK, May 4-7, 2008. Published Page 98 of the proceedings.
24. C. Carruthers and **M.S. Sacks**, "The role of physiological biaxial deformations on cellular mechanotransduction in the native pulmonary valve: Implications for heart valve tissue engineering," presented at the 3<sup>rd</sup> Biennial Heart Valve Biology and Tissue Engineering Meeting, The Royal Society, London, UK, May 4-7, 2008. Published Page 94 of the proceedings.
25. S. Ramaswamy, D. Gottlieb, J.E. Mayer, Jr., and **M.S. Sacks**, "Effects of organ-level mechanical pre-conditioning in the development of tissue engineering heart valves," presented at the 3<sup>rd</sup> Biennial Heart Valve Biology and Tissue Engineering Meeting, The Royal Society, London, UK, May 4-7, 2008. Published Page 118 of the proceedings.
26. J. Stella, W. Wagner, and **M.S. Sacks**, "Tissue-cellular deformation coupling in cell-microintegrated elastomeric scaffolds," presented at the 3<sup>rd</sup> Biennial Heart Valve Biology and Tissue Engineering Meeting, The Royal Society, London, UK, May 4-7, 2008. Published Page 119 of the proceedings.
27. S. Ramaswamy, D. Gottlieb, J.E. Mayer, Jr., and **M.S. Sacks**, "Physiological Conditioning of TEPVs seeded with ovine bone marrow mesenchymal stem cells," Presented at "Regenerative Medicine – Advancing to Next Generation Therapies," Hilton Head Island, SC, March 12-16, 2008. Published Page 58 of the proceedings.
28. **M.S. Sacks**, "Tissue-cellular deformation coupling in cell-microintegrated elastomeric scaffolds," presented at the Society for Biological Engineering First International Conference on Stem Cell Engineering, Coronado Island, CA, Jan. 20-23, 2008. Published on page 30 of the proceedings.
29. G. Engelmayr, **M.S. Sacks**, and J.E. Mayer, "Synergistic acceleration of stem cell mediated heart valve tissue formation by cyclic flexure and laminar flow," presented at the Society for Biological Engineering First International Conference on Stem Cell Engineering, Coronado Island, CA, Jan. 20-23, 2008. Published on page 47 of the proceedings.
30. D.E. Schmidt and **M.S. Sacks**, "A structural-based constitutive model for valvular tissues under generalized deformation," Presented at the 44<sup>th</sup> Annual Technical Meeting, Society for Engineering Science, College Station, TX, Oct. 21-24, 2007. Published on CDROM.
31. J. Stella, **M.S. Sacks**, W.R. Wagner, "Local non-affine deformations and fiber kinematics of elastomeric electrospun scaffolds," Presented at the 44<sup>th</sup> Annual Technical Meeting, Society for Engineering Science, College Station, TX, Oct. 21-24, 2007. Published on CDROM.
32. W.D. Merryman, F. Guilak, and **M.S. Sacks**, "Viscoelastic deformation of the aortic valve interstitial cell during diastole," presented at the BMES annual fall meeting, Los Angeles, CA, Sept. 26-29, 2007. Published on CDROM.
33. S.A. Metzler, S.C. Waller, **M.S. Sacks**, J. Liao, and J.N. Warnock, "Characterization Of Aortic Valve Endothelial Cell Strain Response To Global Tissue Stretch," presented at the BMES annual fall meeting, Los Angeles, CA, Sept. 26-29, 2007. Published on CDROM.

34. W.D. Merryman, H. Lukoff, R. Hopkins, and **M.S. Sacks**, "Stress Overload Of The In Situ Aortic Valve Interstitial Cell Under Circumferential Strain," presented at the BMES annual fall meeting, Los Angeles, CA, Sept. 26-29, 2007. Published on CDROM.
35. R.A. Long, A. Parekh, and **M.S. Sacks**, "Ex Vivo Strain Induced Bladder Wall Remodeling," presented at the BMES annual fall meeting, Los Angeles, CA, Sept. 26-29, 2007. Published on CDROM.
36. C. Williams, E.M. Joyce, J.B. Leach, **M.S. Sacks**, J. Liao, J.Y. Wang, "Structural Properties Of Extracellular Matrix In Decellularized Rabbit Carotid Arteries," presented at the BMES annual fall meeting, Los Angeles, CA, Sept. 26-29, 2007. Published on CDROM.
37. J. Stella, J. Liao, Y. Hong, W.D. Merryman, W.R. Wagner, **M.S. Sacks**, "Cellular Deformations In Micro-Integrated Electrospun Scaffolds For Heart Valve Tissue Engineering," presented at the BMES annual fall meeting, Los Angeles, CA, Sept. 26-29, 2007. Published on CDROM.
38. S. Ramaswamy and M.S. Sacks, "Influence Of Simulated Physiological Hemodynamics On Engineered Heart Valve Tissue Formation," presented at the BMES annual fall meeting, Los Angeles, CA, Sept. 26-29, 2007. Published on CDROM.
39. J. Liao, W. D. Merryman, Y. Hong, S. Watkins, W. Wagner, **M. S. Sacks**, and J. Stella, "Cellular deformations in microintegrated electrospun poly (ester urethane) urea scaffolds under biaxial stretch," Presented at the ASME 2007 Summer Bioengineering Conference, Keystone, CO, June 20 – 24, 2007.
40. D. Schmidt, **M. S. Sacks**, "A structural – based constitutive model for valvular tissues," Presented at the ASME 2007 Summer Bioengineering Conference, Keystone, CO, June 20 – 24, 2007.
41. J. Stella, **M. S. Sacks**, "The digital leaflet: Quantitative image analysis and 3-D digital reconstruction of the aortic valve leaflet," Presented at the ASME 2007 Summer Bioengineering Conference, Keystone, CO, June 20 – 24, 2007.
42. R. Long, A. Parekh, **M. S. Sacks**, "Strain induced bladder smooth muscle remodeling," Presented at the ASME 2007 Summer Bioengineering Conference, Keystone, CO, June 20 – 24, 2007.
43. T. Courtney, **M. S. Sacks**, W. Wagner, J. Liao, "Local non-affine deformations and fiber kinematics of elastomeric electrospun scaffolds," Presented at the ASME 2007 Summer Bioengineering Conference, Keystone, CO, June 20 – 24, 2007.
44. W. D. Merryman, **M. S. Sacks**, P. Bieniek, F. Guilak, "Aortic valve interstitial cell viscoelasticity," Presented at the ASME 2007 Summer Bioengineering Conference, Keystone, CO, June 20 – 24, 2007.
45. B. Zubiate, **M.S. Sacks**, "In vivo dynamic strains of the MV annulus," Presented at the ASME 2007 Summer Bioengineering Conference, Keystone, CO, June 20 – 24, 2007.
46. B. Zubiate, **M. S. Sacks**, R. Gorman, and J. Gorman "In-vivo dynamic strains of the mitral valve annulus," Society for Heart Valve Disease 4<sup>th</sup> Biennial Meeting, New York, NY, June 15-18, 2007. Abstract #P132, page 58 of the proceedings.
47. G.C. Engelmayr and **M. S. Sacks**, "A novel flex-stretch-flow bioreactor for the study of engineered heart valve tissue mechanobiology," Society for Heart Valve Disease 4<sup>th</sup> Biennial Meeting, New York, NY, June 15-18, 2007. Abstract #P98, page 47 of the proceedings.
48. C. Eckert, L. Ryan, J. Gorman, R. Gorman, and **M. S. Sacks**, "High resolution 3D geometric model of the ovine mitral valve," Society for Heart Valve Disease 4<sup>th</sup> Biennial Meeting, New York, NY, June 15-18, 2007. Abstract #P36, page 30 of the proceedings.
49. W. D. Merryman and **M. S. Sacks**, "Differences in tissue remodeling potential of aortic and pulmonary heart valve interstitial cells," Society for Heart Valve Disease 4<sup>th</sup> Biennial Meeting, New York, NY, June 15-18, 2007. Abstract #133, page 56 of the proceedings.
50. **M. S. Sacks**, W.R. Wagner, and John E. Mayer, Jr. "Cellular deformations of micro-integrated elastomeric electrospun scaffolds for heart valve tissue engineering," Society for Heart Valve Disease 4<sup>th</sup> Biennial Meeting, New York, NY, June 15-18, 2007. Abstract #46, page 26 of the proceedings.
51. J. Stella and **M. S. Sacks**, "The digital leaflet: Quantitative image analysis and 3D digital reconstruction of the aortic valve leaflet," Society for Heart Valve Disease 4<sup>th</sup> Biennial Meeting, New York, NY, June 15-18, 2007. Abstract #6, page 19 of the proceedings. Note that this abstract was selected as one of the 10 top abstracts out of a total of 133 abstracts presented at the meeting.
52. S. Wognum and M. S. Sacks, " A structural model of the unirinary bladder wall: Effects of connective tissue remodeling," Presented at the Engineering and Urology Society 22<sup>nd</sup> Annual Meeting, Anaheim, CA, May, 2007.

53. A. Parekh, R. A. Long, **M. S. Sacks**, "In vivo expression of TGF- $\beta$ 1 in spinal cord injury bladders and in vitro effects on bladder smooth muscle cell contraction and remodeling," Presented at the Engineering and Urology Society 22<sup>nd</sup> Annual Meeting, Anaheim, CA, May, 2007.
54. A. Parekh, T. Singh T, **M. S. Sacks**, J. E. Dohar, P. A. Hebda, "Collagen gel matrix reorganization by human adult and fetal dermal fibroblasts is differentially regulated by prostaglandin E2," Presented at the Wound Healing Society 17<sup>th</sup> Annual Meeting and Exhibition: Symposium on Advanced Wound Care, Tampa, FL, April 28 – May 1, 2007.
55. **M. S. Sacks** and W. D. Merryman, "Differences in tissue remodeling potential of the aortic and pulmonary heart valve interstitial cells," 2007 Annual Meeting, American Association of Anatomists, Federation of American Societies for Experimental Biology, Washington, DC, April 30, 2007. Published on CD, "Experimental Biology: Today's Research: Tomorrow's Health," Abstract # 187.1.
56. C.A. Cois, K. Rockot, J. Galeotti, R. Tamburo, D. Gottlieb, J.E. Mayer, Jr., A. Powell, **M. Sacks**, and G. Stetten, "Automated segmentation of the right heart using an optimized shells and spheres algorithm," Presented and published (Abstract SA-AM-PS4.10) in the Proceedings of the International Symposium on Biomedical Imaging, April 12-15, Washington, DC, 2007.
57. R. A. Long, A. Parekh, M. B. Chancellor, **M. S. Sacks**, "Bladder smooth muscle cell responses to contact guidance and biaxial mechanical stretch," Presented at the Society for Biomaterials 2007 Annual Meeting, Chicago, IL, April 18 -21, 2007. Published on CD "Transactions of the 32<sup>nd</sup> Annual Meeting. Vol. XXX, Abstract # 154.
58. T. Courtney, J. Stella, J. Liao, W. Wagner, **M. S. Sacks**, "Micromechanical deformations of electrospun elastomeric scaffolds for tissue engineering," Presented at the Society for Biomaterials 2007 Annual Meeting, Chicago, IL, April 18 - 21, 2007. Published on CD "Transactions of the 32<sup>nd</sup> Annual Meeting. Vol. XXX, Abstract # 347.
59. E. M. Joyce, J. Liao, W. D. Merryman, **M. S. Sacks**, "The intrinsic durability of the aortic valve extracellular matrix," Presented at the Society for Biomaterials 2007 Annual Meeting, Chicago, IL, April 18 -21, 2007. Published on CD "Transactions of the 32<sup>nd</sup> Annual Meeting. Vol. XXX, Abstract # 69.
60. S. M. Wells, **M. S. Sacks**, "Effects of glutaraldehyde fixation and cyclic loading on the thermoelastic properties of aortic heart valve leaflets," Presented at the Society for Biomaterials 2007 Annual Meeting, Chicago, IL, April 18 -21, 2007. Published on CD "Transactions of the 32<sup>nd</sup> Annual Meeting. Vol. XXX, Abstract # 104
61. **M. S. Sacks**, J. Liao, W. D. Merryman, Y. Hong, W. R. Wagner, "Cellular deformations in micro-integrated elastomeric electrospun scaffolds under biaxial stretch," Presented at the 11<sup>th</sup> Annual Hilton Head Workshop, Hilton Head, SC, March 7 – 11, 2007. Published in "Engineering Tissues: Replace ~ Repair ~ Regenerate," page 26.
62. **M. S. Sacks**, J. A. Stella, J. Liao, W. R. Wagner, "Micromechanical deformations of electrospun elastomeric scaffolds for tissue engineering," Presented at the 11<sup>th</sup> Annual Hilton Head Workshop, Hilton Head, SC, March 7 – 11, 2007. Published in "Engineering Tissues: Replace ~ Repair ~ Regenerate," page 40.
63. G. C. Engelmayr, Jr., V. L. Sales, D. Gottlieb, J. E. Mayer, Jr., **M. S. Sacks**, "Independent and coupled effects of ascorbic acid-2-phosphate and basic fibroblast growth factor on bone marrow mesenchymal stem cell-mediated engineered tissue formation," Presented at the 11<sup>th</sup> Annual Hilton Head Workshop, Hilton Head, SC, March 7 – 11, 2007. Published in "Engineering Tissues: Replace ~ Repair ~ Regenerate," page 61.
64. V. L. Sales, G. C. Engelmayr, D. Gottlieb, J. A. Johnson, Jr., J. Gao, Y. Wang, **M. S. Sacks**, J. E. Mayer, Jr, " Protein pre-coating of elastomeric tissue-engineering scaffolds: Extracellular matrix formation and phenotypic changes of circulation endothelial progenitor cells," American Heart Association Scientific Sessions, November 12 – 15, 2006, Chicago, IL.
65. **M.S. Sacks** and D. Schmidt, "Multiscale models of aortic valve mechanics and mechano-biology, " Presented at the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL. Published on CD, "Proceedings of the 2006 BMES Annual Fall Meeting: Unlimited Horizons," Abstract # 238
66. W. D. Merryman, H. D. Lukoff, R. A. Long, G. C. Engelmayr, R. A. Hopkins, **M. S. Sacks**, "Aortic valve interstitial cell mechanobiology: Response to cyclic tension and TGF- $\beta$ 1," Presented at the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL. Published on CD, "Proceedings of the 2006 BMES Annual Fall Meeting: Unlimited Horizons," Abstract # 316.
67. E. M. Joyce, J. Liao, **M. S. Sacks**, "Effects of decellularization on mechanical and structural properties of porcine aortic valve leaflet," Presented at the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL. Published on CD, "Proceedings of the 2006 BMES Annual Fall Meeting: Unlimited Horizons," Abstract # 873.

68. S. Wognum, **M. S. Sacks**, "Structural constitutive model of the urinary bladder wall with basal smooth muscle ton, " Presented at the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL. Published on CD, "Proceedings of the 2006 BMES Annual Fall Meeting: Unlimited Horizons," Abstract # 1379.
69. W. D. Merryman, J. Liao, A. Parekh, J. E. Candiello, H. Lin, **M. S. Sacks**, "Comparing the remodeling capabilities of aortic and pulmonary valve interstitial cells," Presented at the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL. Published on CD, "Proceedings of the 20006 BMES Annual Fall Meeting: Unlimited Horizons," Abstract # 1471.
70. T. Courtney, J. Liao, J. Stankus, J. Guan, W. R. Wagner, **M. S. Sacks**, " Constitutive models for cell-integrated elastomeric scaffolds for soft tissue engineering," Presented at the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL. Published on CD, "Proceedings of the 20006 BMES Annual Fall Meeting: Unlimited Horizons," Abstract # 1576.
71. C. Wang, J. Nagatomi, K. Toosi, N. Yoshimura, M. B. Chancellor, **M. S. Sacks**, " Diabetes induced alternations in the biomechanic properties of the urinary bladder wall," Presented at the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL. Published on CD, "Proceedings of the 2006 BMES Annual Fall Meeting: Unlimited Horizons," Abstract # 1097.
72. D. M. Gaitan, P. Bienek, B. Zubiata, **M. S. Sacks**, "Regional dynamic strains of the native aortic valve," Presented at the Biomedical Engineering Society 2006 Annual Fall Meeting, October 11 – 15, 2006, Chicago, IL. Published on CD, "Proceedings of the 2006 BMES Annual Fall Meeting: Unlimited Horizons," Abstract # 1187.
73. S. Wognum, **M. S. Sacks**, "Towards a structural model of the urinary bladder wall, "Presented at 43<sup>rd</sup> Annual Technical Meeting Society of Engineering Science, August 13 - 16, 2006, Pennsylvania State University, University Park, PA.
74. T. Courtney, J. Liao, J. Stankus, J. Guan, W. Wagner, **M. S. Sacks**, "Micromechanics of electrospun poly ester urethane urea scaffolds for soft tissue engineering," Presented at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany. Published on CD, "Abstracts of the 5<sup>th</sup> World Congress of Biomechanics," Abstract #7515 and Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S262.
76. D. M. Gaitán, M. S. Sacks, "Regional dynamic strains of the native aortic valve," Presented at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany. Published on CD, "Abstracts of the 5<sup>th</sup> World Congress of Biomechanics," Abstract 7509 and Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S307.
77. J. A. Stella, M. S. Sacks, "Biaxial mechanical behavior of the aortic valve under physiologic loading conditions," Presented at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany. Published on CD, "Abstracts of the 5<sup>th</sup> World Congress of Biomechanics," Abstract 7512 and Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S307.
78. J. Nagatomi, M. S. Sacks, "Contribution of the extracellular matrix to the viscoelastic behavior of the bladder: A new modeling approach for bladder wall tissue, " Presented at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany. Published on CD, "Abstracts of the 5<sup>th</sup> World Congress of Biomechanics," Abstract 4649 and Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S391.
79. T. W. Gilbert, D. O. Freytes, A. R. Willment, M. S. Sacks, S. F. Badylak, "Fiber architecture and biaxial mechanical behavior of porcine urinary bladder extracellular matrix," Presented at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany. Published on CD, "Abstracts of the 5<sup>th</sup> World Congress of Biomechanics," Abstract 5324 and Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S391.
80. H.-Y. S. Huang, M. S. Sacks, "Geometric changes in heart valve interstitial cell nuclei with transvalvular pressure, " Presented at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany. Published on CD, "Abstracts of the 5<sup>th</sup> World Congress of Biomechanics," Abstract 7524 and Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S640.
81. K.K. Toosi, J. Nagatomi, M. B. Chancellor, M. S. Sacks, "Long-term changes in material class of the urinary bladder wall following spinal cord injury," Presented at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany. Published on CD, "Abstracts of the 5<sup>th</sup> World Congress of Biomechanics," Abstract 7501 Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S390.
82. E. M. Joyce, J. Liao, **M. S. Sacks**, "Structural and biaxial mechanical properties of decellularized aortic valve leaflets," Presented at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany. Published on CD, "Abstracts of the 5<sup>th</sup> World Congress of Biomechanics," Abstract 7408 and Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S618.

83. S. Wognum, **M. S. Sacks**, "Toward a structural model of the urinary bladder wall," Presented at the 5<sup>th</sup> World Congress of Biomechanics, July 29 – August 4, 2006, Munich, Germany. Published on CD, "Abstracts of the 5<sup>th</sup> World Congress of Biomechanics," Abstract 7502 and Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S392.
84. H. Kim, J.Lu, **M. S. Sacks**, K. Chandran, " Dynamic simulation of bioprosthetic heart valves using a new finite element shell model based on experimental data, " Presented at the ASME 2006 Summer Bioengineering Conference, June 21 - 25, 2006, Amelia Island, FL. Published on CD, "Proceedings of the 2006 Summer Bioengineering Conference." Abstract #BIO2005-152057.
85. J. Liao, **M. S. Sacks**, "A structural constitutive model for mitral valve leaflets," Presented at the ASME 2006 Summer Bioengineering Conference, June 21 -25, 2006, Amelia Island, FL. Published on CD, "Proceedings of the 2006 Summer Bioengineering Conference." Abstract #BIO2005-157739.
86. T. Courtney, **M. S. Sacks**, J. Liao, J. Stankus , J.Guan , W. Wagner. "Incorporation of fiber tortuosity effects in a constitutive model for electrospun scaffolds," Presented at the ASME 2006 Summer Bioengineering Conference, June 21 -25, 2006, Amelia Island, FL. Published on CD, "Proceedings of the 2006 Summer Bioengineering Conference." Abstract #BIO2005-157686.
87. S. Wognum, **M. S. Sacks** , "Towards a structural model of the urinary bladder wall, " Presented at the ASME 2006 Summer Bioengineering Conference, June 21 -25, 2006, Amelia Island, FL. Published on CD, "Proceedings of the 2006 Summer Bioengineering Conference." Abstract #BIO2005-157685.
88. R. A. Long, **M. S. Sacks**, "The effects of contact guidance and mechanical stretch on bladder smooth muscle cell alignment," Presented at the ASME 2006 Summer Bioengineering Conference, June 21 -25, 2006, Amelia Island, FL. vPublished on CD, "Proceedings of the 2006 Summer Bioengineering Conference." Abstract #BIO2005-157652
89. W. D. Merryman, J. Liao, A. Parekh, **M. S. Sacks**, 'Aortic and pulmonary valve interstitial cells: Cell stiffness and Tissue remodeling capabilities," Presented at the ASME 2006 Summer Bioengineering Conference, June 21 -25, 2006, Amelia Island, FL. Published on CD, "Proceedings of the 2006 Summer Bioengineering Conference." Abstract #BIO2005-157643
90. W. D. Merryman, H. D. Lukoff , R.A. Hopkins, **M. S. Sacks**, "Aortic valve interstitial cell phenotype and biosynthesis: Synergistic effects of cyclic tension and TGF- $\beta$ 1," Presented at the ASME 2006 Summer Bioengineering Conference, June 21 -25, 2006, Amelia Island, FL. Published on CD, "Proceedings of the 2006 Summer Bioengineering Conference." Abstract #BIO2005-152674.
91. W. Sun, **M. S. Sacks**, "Biomechanical simulations of bioprosthetic heart valve deformation," Presented at ASME Frontiers in Biomedical Devices 2006, June 8-9, 2006, University of California, Irvine, Irvine, CA. Abstract available at <http://www.asmeconferences.org/NanoBio06/ViewAcceptedAbstracts.cfm>. Abstract #NanoBio2006-18047.
92. **M. S. Sacks**, R. Gorman, J. H. Gorman, III, R. J. Levy, "A novel mitral valvuloplasty model for heterograft biomaterial in-vivo assessment, " Presented at the Society for Biomaterials 2006 Annual Meeting, April 26 – 29, 2006, Pittsburgh, PA. Published on CD, "Transactions of the 31<sup>st</sup> Annual Meeting of the Society for Biomaterials, Volume XXIX." Abstract #159.
93. T. Courtney, J. Liao, **M. S. Sacks**, J. Stankus, J. Guan, W. Wagner, " Micromechanics of electrospun polyester urethane urea scaffolds," Presented at the Society for Biomaterials 2006 Annual Meeting, April 26 – 29, 2006, Pittsburgh, PA. Published on CD, "Transactions of the 31<sup>st</sup> Annual Meeting of the Society for Biomaterials, Volume XXIX." Abstract #163.
94. R. A. Long, J. Huard, M. B. Chancellor, **M. S. Sacks**, " The effects of substrate on muscle-derived stem cell differentiation, "Presented at the Society for Biomaterials 2006 Annual Meeting, April 26 – 29, 2006, Pittsburgh, PA. Published on CD, "Transactions of the 31<sup>st</sup> Annual Meeting of the Society for Biomaterials, Volume XXIX," Abstract #560.
95. G. C. Engelmayr, Jr., L. Soletti, S. C. Vigmostad, S. G. Budilarto, W. J. Federspiel, K. B. Chandran, D. A. Vorp, **M. S. Sacks**, " Design and qualification of a novel flex-stretch-flow bioreactor for engineering heart valve tissues," Presented at the Society for Biomaterials 2006 Annual Meeting, April 26 – 29, 2006, Pittsburgh, PA. Published on CD, "Transactions of the 31<sup>st</sup> Annual Meeting of the Society for Biomaterials, Volume XXIX," Abstract #574.
96. S. J. Stachelek, I. Alferiev, **M. S. Sacks**, R. J. Levy, " Polyether urethane with covalently attached di-tert-butylphnol and cholesterol resists oxidative degradation," Presented at the Society for Biomaterials 2006 Annual Meeting, April 26 – 29, 2006, Pittsburgh, PA. Published on CD, "Transactions of the 31<sup>st</sup> Annual Meeting of the Society for Biomaterials, Volume XXIX, " #518.
97. G. C. Engelmayr, V. L. Sales, J. E. Mayer, Jr., **M. S. Sacks**, " Synergistic acceleration of stem cell mediated heart valve tissue formation by cyclic flexure and laminar flow," Presented at the Society for Biomaterials 2006 Annual Meeting, April 26 – 29, 2006, Pittsburgh, PA. Published on CD, "Transactions of the 31<sup>st</sup> Annual Meeting of the Society for Biomaterials, Volume XXIX." Abstract #16

98. T. Courtney, J. Liao, **M. S. Sacks**, J. Stankus, J. Guan, W. Wagner, " Meso- and micromechanics of elastomeric electrospun PEUU scaffolds for cardiovascular tissue engineering, " Presented at the Regenerate World Congress on Tissue Engineering and Regenerative Medicine, April 25 -27, 2006, Pittsburgh, PA. Published on CD "Conference Proceedings Regenerate World Congress on Tissue Engineering and Regenerative Medicine." Abstract # 572.
99. W. D. Merryman, H. D. Lukoff, R. A. Hopkins, **M. S. Sacks**, "What modulates the aortic valve interstitial cell phenotype?" Presented at the 10<sup>th</sup> Annual Hilton Head Workshop: Advances in Innovative Technologies and Tissue Engineering for the Treatment of Heart Valve Disease, Hilton Head, SC, March 1 – 5, 2006. Published in "Abstract Book: Advances in Innovative Technologies & Tissue Engineering for the Treatment of Heart Valve Disease," page 5.
- 100.R. Liu, D. Schmidt, **M. S. Sacks**, "A consistent and compressible computational model for heart valve tissues based on a stabilized structural constitutive law," Presented at the 10<sup>th</sup> Annual Hilton Head Workshop: Advances in Innovative Technologies and Tissue Engineering for the Treatment of Heart Valve Disease, Hilton Head, SC, March 1 – 5, 2006.
- 101.V. L. Sales, G. C. Engelmayr, D. Gottlieb, J. A. Johnson, Jr., J. Gao, Y. Wang, **M.S. Sacks**, J. E. Mayer, Jr., "Protein pre-coating of elastomeric tissue-engineered scaffolds in vitro yields enhanced extracellular matrix formation and transdifferentiation of circulating endothelial progenitor cells into smooth muscle cells," Presented at the 10<sup>th</sup> Annual Hilton Head Workshop: Advances in Innovative Technologies and Tissue Engineering for the Treatment of Heart Valve Disease, Hilton Head, SC, March 1 – 5, 2006. Published in "Abstract Book: Advances in Innovative Technologies & Tissue Engineering for the Treatment of Heart Valve Disease," page 33.
- 102.G. C. Engelmayr, V. L. Sales, J. E. Mayer, Jr., **M.S. Sacks**, "Mechanical stimulation of mesenchymal stem cell tissue engineered heart valves," Presented at the 10<sup>th</sup> Annual Hilton Head Workshop: Advances in Innovative Technologies and Tissue Engineering for the Treatment of Heart Valve Disease, Hilton Head, SC, March 1 – 5, 2006. Published in "Abstract Book: Advances in Innovative Technologies & Tissue Engineering for the Treatment of Heart Valve Disease," page 26.
- 103.**M. S. Sacks**, T.C. Courtney, J. Stankus, J. Guan, W. R. Wagner, "Analysis and design of tissue engineered scaffolds that mimic heart valve tissue mechanical anisotropy, Presented at the 10<sup>th</sup> Annual Hilton Head Workshop: Advances in Innovative Technologies and Tissue Engineering for the Treatment of Heart Valve Disease, Hilton Head, SC, March 1 – 5, 2006. Published in "Abstract Book: Advances in Innovative Technologies & Tissue Engineering for the Treatment of Heart Valve Disease," page 78.
- 104.W. D. Merryman, A. Parekh, J. Liao, **M. S. Sacks**, "Collagen gel contraction with aortic and pulmonary valve intersitial cells- matrix remodeling implications," Presented at the 10<sup>th</sup> Annual Hilton Head Workshop: Advances in Innovative Technologies and Tissue Engineering for the Treatment of Heart Valve Disease, Hilton Head, SC, March 1 – 5, 2006. Published in "Abstract Book: Advances in Innovative Technologies & Tissue Engineering for the Treatment of Heart Valve Disease," page 81
- 105.J. Liao, W. D. Merryman, **M. S. Sacks**, "Assessment of cell migration in decellularized valve with dual-chamber bioreactor," Presented at the 10<sup>th</sup> Annual Hilton Head Workshop: Advances in Innovative Technologies and Tissue Engineering for the Treatment of Heart Valve Disease, Hilton Head, SC, March 1 – 5, 2006. Published in "Abstract Book: Advances in Innovative Technologies & Tissue Engineering for the Treatment of Heart Valve Disease," page 84.
- 106.J. Liao, **M. S. Sacks**, "A structural constitutive model for mitral valve leaflets," Presented at the 10<sup>th</sup> Annual Hilton Head Workshop: Advances in Innovative Technologies and Tissue Engineering for the Treatment of Heart Valve Disease, Hilton Head, SC, March 1 – 5, 2006. Published in "Abstract Book: Advances in Innovative Technologies & Tissue Engineering for the Treatment of Heart Valve Disease," page 97.
- 107.T. D. Courtney, **M. S. Sacks**, J. J. Stankus, J. Guan, W. R. Wagner, "Analysis and design of novel electrospun PEUU scaffolds for soft tissue engineering." Presented at the 8<sup>th</sup> Annual Meeting of the Tissue Engineering Society International, October 22 – 25, 2005, Shanghai, P. R. China. Published on CD "Final Program and Abstract Book. TESI 2005." Abstract # 193.
- 108.R. A. Long, J. Huard, M. B. Chancellor, **M. S. Sacks**, " The effects of substrate choice and mechanical stimulation on differentiation of muscle-derived stem cells, " Presented at the 8<sup>th</sup> Annual Meeting of the Tissue Engineering Society International, October 22 – 25, 2005, Shanghai, P. R. China. Published on CD "Final Program and Abstract Book. TESI 2005." Abstract # 369.
- 109.J. A. Stella, **M. S. Sacks**, K. B. Chandran, "A bilayer structural constitutive model for the aortic valve leaflet," Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, "Proceedings of the 2005 BMES Annual Fall Meeting." Abstract #393.
- 110.H. Kim, J. Lu, A. Mirnajafi, **M. S. Sacks**, K. B. Chandran, " Dynamic analysis of tissue heart valves with experimentally derived flexural material properties," Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society,

September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract #391.

- 111.Z. He, **M. S. Sacks**, S. Liou, J. Jimenez, A. P. Yoganathan, “Mitral valve strut chordae insertion strain analysis,” Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract #386.
- 112.J. Nagatomi, **M. S. Sacks**, “A novel viscoelastic model of bladder wall tissue,” Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract # 466.
- 113.K. Toosi, J. Nagatomi, N. Chancellor, **M. S. Sacks**, “Mechanical anisotropy of the urinary bladder wall after spinal cord injury,” Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract #682.
- 114.T. Courtney, **M. S. Sacks**, J. Stankus, J. Guan, W. Wagner, “Analysis and design of novel electrospun PEUU scaffolds for soft tissue engineering,” Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract # 1045.
- 115.**M. S Sacks**, W. D. Merryman, F. Guilak, “Heart valve interstitial cell stiffness: Implications for collagen biosynthesis,” Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract #986.
- 116.A. Yoganathan, J. Jimenez, Z. He, **M. S. Sacks**, “Mitral valve mechanics: application to mitral valve repair,” Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract #988.
- 117.A. Abad, K. B. Chandran, **M. S. Sacks**, “Dynamic strain of the native aortic valve,” Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract #1342.
- 118.R. A. Long, J. Huard, M. Chancellor, **M. S. Sacks**, “Substrate choice governs differentiation of muscle-derived stem cells in vitro,” Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract #1251.
- 119.E. M. Joyce, J. E. Mayer, **M. S. Sacks**, “Effects of transvalvular pressure on the pulmonary valve microstructure,” Presented at the 2005 Annual Fall Meeting of the Biomedical Engineering Society, September 28 – October 1, 2005, Baltimore, MD. Published on CD, “Proceedings of the 2005 BMES Annual Fall Meeting.” Abstract # 1202.
- 120.R. Long, J. Nagatomi, M. B. Chancellor, **M. S. Sacks**, “MMP-I up-regulation as a potential mechanism for increased compliance in muscle-derived stem cell-seeded sis for urologic tissue engineering.” Presented at the XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics, July 31 - August 5, 2005, Cleveland, OH. Published on CD and available at <http://www.isb2005.org/proceedings/ISB05/>.
- 121.J. Nagatomi, M. B. Chancellor, **M. S. Sacks**, “A new approach for modeling and analyzing the viscoelastic behavior of bladder wall tissue.” Presented at the XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics, July 31 - August 5, 2005, Cleveland, OH. Published on CD and available at <http://www.isb2005.org/proceedings/ISB05/>.
- 122.K. K. Toosi, J. Nagatomi, M. B. Chancellor, **M. S. Sacks**, “Time course changes in the mechanical properties of the rat urinary bladder following spinal cord injury.” Presented at the XXth Congress of the International Society of Biomechanics and 29th Annual Meeting of the American Society of Biomechanics, July 31 - August 5, 2005, Cleveland, OH. Published on CD and available at <http://www.isb2005.org/proceedings/ISB05/>.
- 123.R. Liu, **M. S. Sacks**, K. Chandran, “Multiscale mechanical simulations of the heartvalve tissues using a structural constitutive model.” Presented at the 8<sup>th</sup> US National Congress on Computational Mechanics, July 24- 28, 2005, Austin, TX. Published on CD “Conference Proceedings USACM the 8<sup>th</sup> US National Congress on Computational Mechanics, July 24- 28, 2005, Austin, TX.”
- 124.Z. J. Wu, D. Prastein, A. Kilic, S. Moainie, M. Egerton, J. R. Nash, **M. S. Sacks**, B. P. Griffith, “Strain mapping of LVAD unloading and Post-MI remodeling,” Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD “Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO.” Abstract #b0085219.

125. W. D. Merryman, **M. S. Sacks**, I. Youn, F. Guilak, P. M. Krueger, R.A. Hopkins, "Heart valve interstitial cell mechanical properties: effects of right and left side heart transvalvular pressures," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0134667.
126. J. Nagatomi, M. B. Chancellor, **M. S. Sacks**, "Contribution of the extracellular matrix to the viscoelastic behavior of the urinary bladder," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0233408.
127. T. D. Courtney, **M. S. Sacks**, J. J. Stankus, J. Guan, W. R. Wagner, "Analysis and design of novel electrospun PEUU scaffolds for soft tissue engineering," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0241329.
128. **M. S. Sacks**, G. C. Engelmayr, "A model for in-vitro time-dependent tissue formation and effective stiffness in engineered heart valve tissues," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0301289.
129. V. S. Nirmalanandhan, **M. S. Sacks**, M. Rao, B. Haridas, D. L. Butler, "Effect of length of the engineered tendon construct on its structure-function relationships in culture effect of length of the engineered tendon construct on its structure-function relationships in culture," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0369064.
130. K. K. Toosi, J. Nagatomi, M. B. Chancellor, **M. S. Sacks**, "Changes in the mechanical properties of the rat urinary bladder following long-term spinal cord injury," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0391688.
131. G. C. Engelmayr, E. Rabkin-Aikawa, F. J. Schoen, J. E. Mayer, **M. S. Sacks**, "A structural model for predicting the effective stiffness of engineered heart valve tissues based on nonwoven scaffolds," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0420035.
132. R. Liu, **M. S. Sacks**, K. B. Chandran, "Finite element simulations of collagenous tissues using an experimentally derived structural constitutive model," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0297655.
133. Z. He, **M. S. Sacks**, S. Liou, J. Jimenez, A. Yoganathan, "Dynamic surface strain in the mitral valve strut chordae insertion region," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0242644.
134. J. A. Stella, **M. S. Sacks**, K. B. Chandran, "On the biaxial mechanical properties of the layers of the aortic valve leaflet," Presented at the ASME 2005 Summer Bioengineering Conference, Vail, CO, June 22 – 26, 2005. Published on CD "Proceedings of the 2005 Summer Bioengineering Conference Vail Cascade Resort and Spa, Vail, CO." Abstract #b0267096.
135. J. M. Connolly, I.S. Alferiev, J. N. Clark-Greul, **M. S. Sacks**, E. Palmatory-Sorichillo, H. S. Rapoport, R. J. Levy, "Bioprosthetic heart valve material calcification is reduced and functionality improved by triglycidylamine (TGA) polyepoxide crosslinking," Presented at the 3<sup>rd</sup> Biennial Meeting of the Society for Heart Valve Disease, Vancouver, BC, Canada, June 17 – 20, 2005. Published in the "Proceedings of the Third Biennial Meeting of the Society for Heart Valve Disease." Abstract #106, pg. 177.
136. J. Liao, L. Yang, J. Grashow, **M. S. Sacks**, "Collagen fibril kinematics in mitral valve leaflet under biaxial elongation, creep, and stress relaxation.," Presented at the 3<sup>rd</sup> Biennial Meeting of the Society for Heart Valve Disease, Vancouver, BC, Canada, June 17 – 20, 2005. Published in the "Proceedings of the Third Biennial Meeting of the Society for Heart Valve Disease." Abstract #85, pg. 154.
137. T.D. Courtney, **M.S. Sacks**, J.J. Stankus, J. Guan, W.R. Wagner, "Structural and mechanical characterization of poly(ester urethane) urea elastomeric scaffolds for cardiovascular soft tissue engineering," Presented at the Society for

- Biomaterials 30<sup>th</sup> Annual Meeting, Memphis, TN, April 27-30, 2005. Published on CD "Transactions of the 30<sup>th</sup> Annual Meeting."
- 138.J. Nagatomi, M. Chancellor, **M.S. Sacks**, "Effects of increased elastin synthesis on the mechanical behaviors of bladder wall tissues, " Presented at the Society for Biomaterials 30<sup>th</sup> Annual Meeting, Memphis, TN, April 27-30, 2005. Published on CD "Transactions of the 30<sup>th</sup> Annual Meeting."
- 139.R.A. Long, J. Nagatomi, J. Huard, M. Chancellor, **M.S. Sacks**, "MMP-1 as a potential mechanism responsible for increased compliance in muscle-derived cell-seeded SIS for urologic tissue engineering applications," Presented at the Society for Biomaterials 30<sup>th</sup> Annual Meeting, Memphis, TN, April 27-30, 2005. Published on CD "Transactions of the 30<sup>th</sup> Annual Meeting."
- 140.G. C. Engelmayr, Jr., E. Rabkin-Aikawa, F. J. Schoen, J. E. Mayer, Jr., and **M. S. Sacks**, "A structural model for predicting the effective stiffness of engineered heart valve tissues based on nonwoven scaffolds," Presented at the Society for Biomaterials 30<sup>th</sup> Annual Meeting, Memphis, TN, April 27-30, 2005. Published on CD "Transactions of the 30<sup>th</sup> Annual Meeting."
- 141.J .M. Connolly, I.S. Alferiev, J.N. Clark-Greuel, N. Eidelman, **M. S. Sacks**, E. Palmatory, S.V. DeFelice, J. Xu, N. Narula, N. Vyavahare, R.J. Levy, "Polyepoxide crosslinking, using triglycidylamine, reduces bioprosthetic calcification while improving structural compliance," Presented at the Society for Biomaterials 30<sup>th</sup> Annual Meeting, Memphis, TN, April 27-30, 2005. Published on CD "Transactions of the 30<sup>th</sup> Annual Meeting."
- 142.**M.S. Sacks**, "Analysis and design of novel electrospun PEUU scaffolds for soft tissue engineering, " Presented at the 9<sup>th</sup> Annual Hilton Head Workshop, ET-2005: Engineering Tissues, Hilton Head, SC, March 9-13, 2005. Published in the meeting proceedings, page 30.
- 143.G.C. Engelmayr, W.D. Merryman, V.L. Sales, E. Rabkin-Aikawa, B.A. Mettler, F.J. Schoen, J. Bischoff, J.E. Mayer, Jr., **M.S. Sacks**, " The effects of cyclic flexure of engineered heart valve tissues seeded with endothelial progenitor cells, "Presented at the 9<sup>th</sup> Annual Hilton Head Workshop, ET-2005: Engineering Tissues, Hilton Head, SC, March 9-13, 2005. Published in the meeting proceedings, page 47.
- 144.W.D. Merryman, I. Youn, P.M. Krueger, R.A. Hopkins, F. Guilak, **M.S. Sacks**, "Effect of transvalvular pressure on heart valve interstitial cell mechanical properties, " Presented at the 9<sup>th</sup> Annual Hilton Head Workshop, ET-2005: Engineering Tissues, Hilton Head, SC, March 9-13, 2005. Published in the meeting proceedings, page 47.
- 145.**M.S. Sacks**, J. Grashow, A. Yoganathan, "Viscoelastic behavior of heart valve tissues under biaxial stretch," Presented at the 2004 ASME International Mechanical Engineering Congress, Anaheim, CA, November 13- 19, 2005.
- 146.V.L. Sales, B.A. Mettler, E. Rabkin-Aikawa, G.C. Engelmayr, M.A. Moses, J. Bischoff, F.J. Schoen, **M.S. Sacks**, J.E. Mayer, "Endothelial progenitor cells as a sole source for tissue-engineered heart valve remodels in vitro," Presented at the AHA National Meeting, New Orleans, LA, November 7-9, 2004.
- 147.J. Nagatomi, F. Demiguel, K. Torimoto, R.H. Getzenberg, M.B. Chancellor, **M.S. Sacks**, "Molecular determinants to increase bladder compliance in spinal cord injury population: A rat model study," Presented at the AHA National Meeting, New Orleans, LA, November 7-9, 2004.
- 148.**M.S. Sacks**, J. Graybill, Y. Enomoto, A. Zeeshan, A.P. Yoganathan, R.J. Levy, R.C. Gorman, and J.H. Gorman, "An in-vivo method for determining dynamic mitral leaflet strain," Presented at the AHA National Meeting, New Orleans, LA, November 7-9, 2004.
- 149.Z. He, J. Ritchie, J.S. Grashow, **M.S. Sacks**, Ajit P. Yoganathan, "In vitro dynamic strain behavior of the mitral valve posterior leaflet," BMES Annual Fall Meeting, Philadelphia, PA, October 16-19, 2004.
- 150.Jonathan S. Grashow, Ajit P. Yoganathan, and **M.S. Sacks**, "Biaxial mechanical behavior of the anterior leaflet of the mitral valve at physiologic strain rates," BMES Annual Fall Meeting, Philadelphia, PA, October 16-19, 2004.
- 151.V.L. Sales, B.A. Mettler, G.C. Engelmayr, J. Johnson., **M.S. Sacks**., J.E. Mayer, "Circulating endothelial progenitor cells elicit matrix remodeling in response to TGF- $\beta$ 1 in tissue-engineered scaffolds," Presented at the Tissue Engineering Society International 2004 Annual Meeting, Lausanne, Switzerland, October 10-13, 2004.
- 152.G.C. Engelmayr, J.E. Mayer, **M.S. Sacks**, "A mathematical model for predicting the flexural rigidity of engineered heart valve tissues based on nonwoven fiber/ matrix interactions," Advances in Tissue Engineering and Biology of Heart Valves, Florence Italy, September 15–18, 2004. Published in the Meeting Proceedings, page 112.

153. W.D. Merryman, G.C. Engelmayr, J.E. Mayer, **M.S. Sacks**, "The in-vitro response of aortic valve leaflets to cyclic tension and the relation to valve interstitial cell phenotype," *Advances in Tissue Engineering and Biology of Heart Valves*, Florence Italy, September 15-18, 2004. Published in the Meeting Proceedings, page 113.
154. **M.S. Sacks**, "A structural model for the native pulmonary valve", Presented at "Advances in Tissue Engineering and Biology of Heart Valves," Florence, Italy, September 15-18, 2004. Published in the Meeting Proceedings, page 52.
155. W. David Merryman, H.Y. Huang, F.J. Schoen, and **M.S. Sacks**, "The effects of cellular contraction on aortic valve leaflet stiffness", "Advances in Tissue Engineering and Biology of Heart Valves," Florence, Italy, September 15-18, 2004. Published in the Meeting Proceedings, page 54.
156. G.C. Engelmayr, John E. Mayer, and **M.S. Sacks**, "Scaffolds to guide cell and collagen fiber orientation in engineered heart valve tissues", "Advances in Tissue Engineering and Biology of Heart Valves," Florence, Italy, September 15-18, 2004. Published in the Meeting Proceedings, page 66.
157. V.L. Sales, B.A. Mettler, E. Rabkin-Aikawa, G.C. Engelmayr, M.A. Moses, J. Bischoff, F.J. Schoen, **M.S. Sacks**, and J.E. Mayer, "Endothelial progenitor cells as a sole source for tissue engineered heart valve remodels in-vitro", "Advances in Tissue Engineering and Biology of Heart Valves," Florence, Italy, September 15-18, 2004. Published in the Meeting Proceedings, page 69.
158. W. David Merryman, B. Mettler, J.S. Grashow, J.E. Mayer, and **M.S. Sacks**, "A novel tissue engineered heart valve bioreactor – from cell culture to implantation", "Advances in Tissue Engineering and Biology of Heart Valves," Florence, Italy, September 15-18, 2004. Published in the Meeting Proceedings, page 82.
159. Z. He, J. Ritchie, **M.S. Sacks**, and A.P. Yoganathan, "Dynamic in-vitro strain history of the native posterior mitral valve leaflet," Presented at 2004 European Society for Biomechanics, s'Hertogenbosch, Netherlands, July 7, 2004. Proceedings published on CDROM.
160. **M.S. Sacks**, J. Grashow, and A.P. Yoganathan, "Viscoelastic behavior of valvular tissues under biaxial stretch," Presented at 2004 European Society for Biomechanics, s'Hertogenbosch, Netherlands, July 7, 2004. Proceedings published on CDROM.
161. **M.S. Sacks** and J.E. Mayer, Jr., "Current progress in heart valve tissue engineering and biomechanics," Presented at 2004 European Society for Biomechanics, s'Hertogenbosch, Netherlands, July 6, 2004. Proceedings published on CDROM.
162. W.D. Merryman and **M.S. Sacks**, "Active contractile properties of aortic valve leaflets under flexure," presented at the 9<sup>th</sup> annual ISACB Biennial meeting, Savannah, GA, March 10-13, 2004. Published in the meeting proceedings, page 19.
163. G. C. Engelmayr, J.E. Mayer, **M.S. Sacks**, "The development of engineered heart valve tissue mechanical properties in-vitro," presented at the 9<sup>th</sup> annual ISACB Biennial meeting, Savannah, GA, March 10-13, 2004. Published in the meeting proceedings, page 34.
164. Daniel Hildebrand, J.E. Mayer, and **M.S. Sacks**, "A pulsatile bioreactor for biologically active heart valves," presented at the 9<sup>th</sup> annual ISACB Biennial meeting, Savannah, GA, March 10-13, 2004. Published in the meeting proceedings, page 35.
165. G. C. Engelmayr, J.E. Mayer, **M.S. Sacks**, "Micromechanical modeling of an engineered heart valve tissue as a short fiber composite," presented at the 8<sup>th</sup> annual Hilton Head Workshop on "Cardiovascular Tissue Engineering: From basic biology to cell-based therapies," Sea Pines Plantation, Hilton Head, March 6-10, 2004. Published in the meeting proceedings, page 39.
166. Daniel Hildebrand, Jon Wu, J.E. Mayer, and **M.S. Sacks**, "A pulsatile bioreactor for biologically active heart valves," presented at the 8<sup>th</sup> annual Hilton Head Workshop on "Cardiovascular Tissue Engineering: From basic biology to cell-based therapies," Sea Pines Plantation, Hilton Head, March 6-10, 2004. Published in the meeting proceedings, page 72.
167. J. Nagatomi, M.B. Chancellor, and **M.S. Sacks**, "Active biaxial mechanical properties of bladder wall tissue," Presented at the ASME 2003 IMECE, Washington D.C., November 15-21, 2003. Published in the CD of the meeting proceedings.
168. T. Gilbert, J. Grashow, S.L.Y. Woo, M.B. Chancellor, and **M.S. Sacks**, "Fiber kinematics of small intestinal submucosa subjected to biaxial stretch," Presented at the ASME 2003 IMECE, Washington D.C., November 15-21, 2003. Published in the CD of the meeting proceedings.
169. Ali Mirnajafi, Leigh McClure, Jeremy Raymer, and **M.S. Sacks**, "Flexural rigidity of the commissure region of the aortic valve leaflet," Presented at the ASME 2003 IMECE, Washington D.C., November 15-21, 2003. Published in the CD of the meeting proceedings.

- 170.J.M. Connolly, I. Alferiev, N. Vyavahare, J. Clark, D. Burton, M. Ghazvini, **M.S. Sacks**, R. J. Levy, "Prevention of bioprosthetic heart valve calcification with triglycidylamine crosslinking," Presented at the AHA annual meeting, Nov. 9-12, Orlando, FL, 2003.
- 171.S.J. Stachelek, I. Alferiev, A. Fu, T.L. Sellaro, J.M. Connolly, R.W. Bianco, **M.S. Sacks**, Robert J Levy, "Prevention of polyurethane prosthetic heart valve leaflet calcification with covalently attached bisphosphonate," presented at the AHA annual meeting, Nov. 9-12, Orlando, FL, 2003.
- 172.J. Guan, **M.S. Sacks**, and W.R. Wagner, "A porous, flexible and biodegradable polyurethane/collagen composite for soft tissue engineering," Presented at the Annual BMES Fall meeting, Nashville, TN, October 1-4, 2003. Published on CD ROM.
- 173.J. Nagatomi, J. Grashow, K. Attar-Toosi, M.B. Chancellor, and **M.S. Sacks**, "Relationship between tissue morphology, composition, and biomechanics of the urinary bladder," Presented at the Annual BMES Fall meeting, Nashville, TN, October 1-4, 2003. Published on CD ROM.
- 174.D. Hildebrand, J. Wu, J.E. Mayer, and **M.S. Sacks**, "Design and evaluation of a pulsatile bioreactor for biologically active heart valves," Presented at the Annual BMES Fall meeting, Nashville, TN, October 1-4, 2003. Published on CD ROM.
- 175.S. Stachelek, I. Alferiev, A. Fu, T.L. Sellaro, J.M. Connolly, R.W. Bianco, **M.S. Sacks**, and R.J. Levy, "Polyurethane heart valve calcification: prevention with bisphosphonate diethylamino derivatization," Presented at the Annual BMES Fall meeting, Nashville, TN, October 1-4, 2003. Published on CD ROM.
- 176.**M.S. Sacks**, J. Grashow, and A.P. Yoganathan, "High strain rate behavior of heart valve tissues," Presented at the Annual BMES Fall meeting, Nashville, TN, October 1-4, 2003. Published on CD ROM.
- 177.T.V. Lam and **M.S. Sacks**, "Transmural strains of heart valve tissues under flexure," Presented at the Annual BMES Fall meeting, Nashville, TN, October 1-4, 2003. Published on CD ROM.
- 178.J. Vande Geest, E.S. DiMartino, M.S. Sacks, and D.A. Vorp, "Age-related differences in biaxial mechanical behavior of human aorta are location-dependent," Presented at the Annual BMES Fall meeting, Nashville, TN, October 1-4, 2003. Published on CD ROM.
- 179.Z. He, **M.S. Sacks**, A.P. Yoganathan, "Effects of papillary muscle position on the in vitro dynamic strain on the porcine mitral valve," presented at the International Society for Heart Valve Disease biannual meeting in Paris, France, 2003. Published in the meeting proceedings, page. 96.
- 180.**M.S. Sacks**, A.P. Yoganathan, "A structural constitutive model for the mitral valve leaflets," presented at the International Society for Heart Valve Disease biannual meeting, Paris, France, 2003. Published in the meeting proceedings, page 84.
- 181.G. C. Engelmayr, E. Rabkin, F. W. H. Sutherland, F.J. Schoen, J.E. Mayer, **M.S. Sacks**, "Dynamic flexural incubation of engineered heart valve tissues," presented at the International Society for Heart Valve Disease biannual meeting in Paris, France, 2003. Published in the meeting proceedings, page 78.
- 182.D. Hildebrand, J. Wu, J.E. Mayer, and **M.S. Sacks**, "Development and evaluation of a novel pulsatile flow loop for biologically active heart valves," presented at the International Society for Heart Valve Disease biannual meeting in Paris, France, 2003. Published in the meeting proceedings, page 66.
- 183.**M.S. Sacks**, "The relation between collagen structure and interstitial cell geometry in the aortic valve leaflet," presented at the International Society for Heart Valve Disease biannual meeting in Paris, France, 2003. Published in the meeting proceedings, page 66.
- 184.W. Sun, H.Y. Huang, C. Argento, M. Scott, and **M.S. Sacks**, "Finite element implementation of a structural constitutive model for planar collagenous tissues," Proceedings of the Second MIT conference on Computational Solid and Fluid Mechanics, pg. 210, 2003.
- 185.Lu, S.H., Cannon, T.W., Chermansky, C., Pruchnic, R., Somogyi, G., **Sacks, M.S.**, de Groat, W.C., Huard, J., Chancellor, M.B.: "Muscle-derived stem cells seeded acellular scaffolds improves compliance and develop calcium dependent contractile activity that is modulated by nicotinic receptors." 2003 101st Annual Meeting AUA, J. Urol., 169:100-101A, 2003.
- 186.Lu, S.H., Cannon, T.W., Chermansky, C., Pruchnic, R., Somogyi, G., **Sacks, M.S.**, de Groat, W.C., Huard, J., Chancellor, M.B.: "Muscle-derived stem cells seeded acellular scaffolds improves compliance and develop calcium dependent contractile activity that is modulated by nicotinic receptors." 2003 Society of Female Urology and Neurourology Annual Meeting, Chicago, April 26, 2002.

187. J.H. Horton, R.H. Getzenberg, **M.S. Sacks**, R. Dhir, N. Yoshimura, R. Heyman, G. Brenes, D. Borello-France, W.C. de Groat, M.B. Chancellor, "Center for Urologic Research Excellence in SCI: A Model for Research Integration," *Journal of Spinal Cord Medicine*, Vol. 26, pp. S46, Supp. 1, 2003.
188. G.C. Engelmayr, Jr., F.W.H. Sutherland, E. Rabkin, F.J. Schoen, J.E. Mayer, Jr., and **M.S. Sacks**, "Dynamic flexure has independent, differential effects on engineered heart valve tissue development," Presented at the 2003 annual meeting of the Society for Biomaterials, Reno, NV, 2003.
189. G.C. Engelmayr, Jr., F. W. H. Sutherland, John E. Mayer, Jr., and **M.S. Sacks**, "Transparent grids with well-defined rectangular pores for use in tissue engineered scaffold design," Presented at the 2003 annual meeting of the Society for Biomaterials, Reno, NV, 2003.
190. S.H. Lu, **M.S. Sacks**, R. Pruchnic, J. Huard, and M.B. Chancellor, "Biaxial mechanical properties of muscle-derived stem cell seeded small intestinal submucosa for bladder wall reconstitution," Presented at the 2003 annual meeting of the Society for Biomaterials, Reno, NV, 2003.
191. J. Guan, **M.S. Sacks**, W.R. Wagner, "Development of a flexible, biodegradable scaffold capable of growth factor release," Presented at the 2003 annual meeting of the Society for Biomaterials, Reno, NV, 2003.
192. W. Sun, G. Fulchiero, J. Lovekamp, N. Vyavahare, M. Scott, and **M.S. Sacks**, "Low cycle tensile fatigue behavior of heart valve biomaterials," Presented at the 2003 annual meeting of the Society for Biomaterials, Reno, NV, 2003.
193. **M.S. Sacks**, G.C. Engelmayr, Jr. and John E. Mayer, Jr. "Biomechanical considerations in heart valve tissue engineering," Presented at the Engineering Tissues meeting, Hilton Head, SC, 2003.
194. G. Engelmayr, F.W.H. Sutherland, J.E. Mayer, and **M.S. Sacks**, "A novel bioreactor for the flexural stimulation of tissue engineered heart valve biomaterials", presented at the 2002 BMES annual fall meeting, Houston, TX, 2002.
195. Z.M. He, L. Baijens, S. Wanant, P. Shah, S. He, B. Sugimoto, **M. S. Sacks**, and A. P. Yoganathan, "In vitro dynamic strain analysis of the porcine mitral valve", presented at the 2002 BMES annual fall meeting, Houston, TX, 2002.
196. F.W.H. Sutherland, T.E. Perry, M. Sherwood, Y. Masuda, C.A. Garcia, D.L. McLellan, G.C. Engelmayr, **M.S. Sacks**, John E. Mayer Jr., "Bone marrow derived pulmonary valve substitutes display favorable hemodynamic function in vivo," Presented at the annual meeting of the AHA, Chicago, IL, Nov. 2002.
197. **M.S. Sacks** "Incorporating quantitative morphological information in structural constitutive models for soft tissues", presented at the ASME IMECE 2002 by invitation from N. Katsube, Ohio State Univ.
198. G. Engelmayr, F.W.H. Sutherland, J.E. Mayer, and **M.S. Sacks**, "A novel bioreactor for the flexural stimulation of tissue engineered heart valve biomaterials", presented at the ASME IMECE 2002.
199. W. Sun, **M.S. Sacks**, and M. Scott, "Finite element implementation of a structural constitutive model for heart valve biomaterials", presented at the ASME IMECE 2002.
200. J.P. Vande Geest, **M.S. Sacks**, and D.A. Vorp, "Age related differences in the biaxial mechanical behavior of human abdominal aorta", to be presented at the ASME IMECE 2002.
201. S.W. Lu, S. Chung, D. C. Gloeckner, T.L. Sellaro, **M.S. Sacks**, J. Huard, W.C. de Groat, C. Chermansky, and M.B. Chancellor, "Could muscle-derived stem cell make small intestinal submucosa more compliant for bladder reconstitution?", Proceedings of the annual AUA meeting, Orlando, FL, May 22-25, 2002.
202. **M.S. Sacks**, K.J. Gulesarian, D.P. Martin, and J.E. Mayer, "Dynamic incubation increases flexural stiffness in tissue engineered heart valves," Presented at the Annual meeting of the Society for Biomaterials, Tampa, FL, April 24-27, 2002.
203. **M.S. Sacks**, K.J. Gulesarian, D.P. Martin, and J.E. Mayer, "Regional variations in extracellular matrix deposition in tissue engineered heart valves," Presented at the Annual meeting of the Society for Biomaterials, Tampa, FL, April 24-27, 2002.
204. W. Sun, **M.S. Sacks**, and M. Scott, "Non-linear anisotropic finite elements for heart valve biomaterials," Published in the Proceedings of the Prosthetic Heart Valve Workshop, pg. 25, Hilton Head, SC, March 6-10, 2002.
205. Z. He, L. Baijens, S. Wanant, P. Shah, S. He, **M.S. Sacks**, and A.P. Yoganath, "In-vitro dynamic strain analysis of the porcine mitral valve," Published in the Proceedings of the Prosthetic Heart Valve Workshop, pg. 30, Hilton Head, SC, March 6-10, 2002.
206. **M.S. Sacks**, T.L. Sellaro, W. Sun, W.S. Slaughter, and M. Scott, "A fatigue damage model for bioprosthetic heart valves," Published in the Proceedings of the Prosthetic Heart Valve Workshop, pg. 43, Hilton Head, SC, March 6-10, 2002.

207. G. Englemayr, **M.S. Sacks**, and J.E. Mayer, Jr. , "A fatigue damage model for bioprosthetic heart valves," Published in the Proceedings of the Prosthetic Heart Valve Workshop, pg. 50, Hilton Head, SC, March 6-10, 2002.
208. **M.S. Sacks**, "Heart valve biomechanics and extracellular matrix," pg. 30, Cardiovascular Pathology vol. 11, 2002.
209. **M.S. Sacks**, "A structural constitutive model for planar collagenous tissues that integrates SALS-derived fiber orientation data," Presented at the ASME IMECE01, New York, NY, 2001 (Published on CD).
210. W. Sun and **M.S. Sacks**, "Tensile Fatigue damage behavior of heart valve biomaterials," Presented at the Fall BMES meeting, October 4-7, 2001, Durham, NC. Published in pg. S-4, vol. 29, supplement 1, Annals of Biomedical Engineering, 2001.
211. D. C. Gloeckner and **M.S. Sacks**, "3D fiber architecture of the urinary bladder wall," Presented at the Fall BMES meeting, October 4-7, 2001, Durham, NC., Published in pg. S-33, vol. 29, supplement 1, Annals of Biomedical Engineering, 2001.
212. **M.S. Sacks**, K.J. Gulesarian, D.P. Martin, J.E. Mayer, "Collagen fiber architecture of tissue engineered heart valves," Presented at the Fall BMES meeting, October 4-7, 2001, Durham, NC. Published as pg. S-149, vol. 29, supplement 1, Annals of Biomedical Engineering, 2001.
213. D. Hildebrand and **M.S. Sacks**, "A novel testing system for fatigue studies of heart valve biomaterials," Presented at the Fall BMES meeting, October 4-7, 2001, Durham, NC. Published as pg. S-4, vol. 29, supplement 1, Annals of Biomedical Engineering, 2001.
214. T. Sellaro and **M.S. Sacks**, "Contribution of inter-layer bonding mechanical energy in acellular collagenous scaffolds," Fall BMES meeting, October 4-7, 2001, Durham, NC. Published as pg. S-149, vol. 29, supplement 1, Annals of Biomedical Engineering, 2001.
215. **M.S. Sacks**, "Integration of quantitative morphological data into structural constitutive models," Fall BMES meeting, October 4-7, 2001, Durham, NC. Published as pg. S-149, vol. 10, supplement 1, Annals of Biomedical Engineering, 2001.
216. W.R. Wagner, Jianjun Guan, **M.S. Sacks**, "Synthesis and characterization of highly elastomeric, bioerodible poly(ester-urethane) ureas," Fall BMES meeting, October 4-7, 2001, Durham, NC. Published as pg. S-149, vol. 29, supplement 1, Annals of Biomedical Engineering, 2001.
217. D.C. Gloeckner, **M.S. Sacks**, M.O. Fraser, M.B. Chancellor, G.T. Somogyi, W.C. de Groat, "Active biaxial mechanical response of the urinary bladder wall," ASME BED Vol. 50, pp. 773-774, 2001.
218. W. Sun, **M.S. Sacks**, M. Scott, "A robust constitutive model for heart valve biomaterials," ASME BED Vol. 50, pp. 539-540, 2001.
219. **M.S. Sacks**, H. Sugimoto, C.P. Conrad, A.P. Yoganathan, "Dynamic tissue stresses in the functioning mitral valve," ASME BED Vol. 50, pp. 537-538, 2001.
220. C.P. Conrad, H. Sugimoto, S. He, Z. He, **M.S. Sacks**, A.P. Yoganathan, "Measurement of dynamic strain in the mitral valve," ASME BED Vol. 50, pp. 145-146, 2001.
221. **M.S. Sacks** and H. Sugimoto, "Effects of cuspal stiffness on the opening and closing dynamics of the aortic heart valve," Presented at the First Biennial Meeting of the Society for Heart Valve Disease, London, UK, June 11-18, 2001.
222. **M.S. Sacks**, E. Rabkin, F. Schoen, "Layer specific non-calcific damage to collagen in structurally failed bioprosthetic heart valves," Presented at the First Biennial Meeting of the Society for Heart Valve Disease, London, UK, June 11-18, 2001.
223. **M.S. Sacks**, J. Ulrich, K. Gulesarian, D.P. Martin, and J.E. Mayer, "Effects of static vs. dynamic incubation on the flexural mechanical properties of tissue engineered heart valve cusps," Presented at the First Biennial Meeting of the Society for Heart Valve Disease, London, UK, June 11-18, 2001.
224. S.M. Wells, T.L. Sellaro, and **M.S. Sacks**, "Effects of stress-state during fixation on the fatigue properties bioprosthetic heart valve tissues," Presented at the First Biennial Meeting of the Society for Heart Valve Disease, London, UK, June 11-18, 2001.
225. **M.S. Sacks** and M. Scott, "Relation between local collagen fiber architecture and flexural properties in glutaraldehyde treated bovine pericardium," Presented at the First Biennial Meeting of the Society for Heart Valve Disease, London, UK, June 11-18, 2001.
226. **M.S. Sacks**, Kausal, S., and J.E. Mayer, "Large displacement flexural properties of tissue engineered heart valve scaffolds," ASME BED vol. 48, pp. 105-106, 2000.

227. W.S. Slaughter and **M.S. Sacks**, "Modeling fatigue damage in chemically treated soft tissues," Invited paper for the ASME Symposium on "Functional Biomaterials," Orlando, FL, November 7, 2000. Published in MD-Vol. 94, pp. 107-108, ASME, 2000.
228. **M.S. Sacks**, "Keynote Talk: Constitutive modeling and its applications," presented at the BMES annual meeting, Seattle, WA, Oct. 12-14, 2000. (Published on CD ROM)
229. **M.S. Sacks** and D.B. Smith, "A generalized thin-walled membrane shell approach for in-vivo stress analysis of anatomic structures," presented at the BMES annual meeting, Seattle, WA, Oct. 12-14, 2000. (Published on CD ROM)
230. D.H.J. Wang, **M.S. Sacks**, D.A. Vorp, "Modification of a 3-D reconstruction technique for abdominal aortic aneurysm that includes intraluminal thrombus," Presented at the BMES annual meeting, Seattle, WA, Oct. 12-14, 2000. (Published on CD ROM)
231. **M.S. Sacks**, "Collagen as the source of viscoelasticity in bioprosthetic heart valve tissues," presented at the World Congress on Medical Physics and Biomedical Engineering, Chicago, July 23-28, 2000 (Published on CD ROM).
232. **M.S. Sacks**, H. Sugimoto, and A.K.S. Iyengar, "Effects of heart valve mechanical properties on their dynamic motion," presented at the World Congress on Medical Physics and Biomedical Engineering, Chicago, July 23-28, 2000 (Published on CD ROM).
233. **M.S. Sacks**, U. Stock, S. Hoerstrup, J.E. Mayer, "Flexural properties of a tissue engineered heart valve cusp," presented at the Sixth World Biomaterials Congress, Kamuela, Hawaii, May 15-20, 2000 (Published on CD ROM).
234. S.M. Wells and **M.S. Sacks**, "Effects of stress-state during fixation on the fatigue properties of bioprosthetic heart valves," to be presented at the Sixth World Biomaterials Congress, Kamuela, Hawaii, May 15-20, 2000 (Published on CD ROM)
235. D.C. Gloeckner, **M.S. Sacks**, M. Chancellor, G.T. Somogyi, W.C. deGroat, "Changes in biaxial mechanical properties in the rat urinary bladder wall due to spinal cord injury," Journal of Urology, Vol. 163, No. 4, supplement, AUA annual meeting, Atlanta, GA, May 2000 (Published on CD ROM).
236. **M.S. Sacks** and F.J. Schoen, "Mechanisms of calcification-independent collagen damage in explanted clinical bioprosthetic heart valves," Presented at the International Society for Applied Cardiovascular Biology (ISACB) meeting in Tucson, AZ, March 9-11, 2000 (Published on CD ROM).
237. **M.S. Sacks**, "A structural constitutive model for chemically treated soft tissues," ASME IMECEX-99 Nashville, TN, November, 1999.
238. A.K.S. Iyengar, **M.S. Sacks**, "Dynamic imaging of BHV cuspal motion using laser projection," Proceedings of the first joint BMES-EMBS meeting, Atlanta, Ga., pp. 182, 1999 (Published on CD ROM).
239. **M.S. Sacks**, D.B. Smith, M. Thornton, and A.K.S. Iyengar "Real time deformation of the bioprosthetic heart valve," Proceedings of the first joint BMES-EMBS meeting, Atlanta, Ga., pp. 173, 1999 (Published on CD ROM).
240. D.B. Smith, **M.S. Sacks**, D.A. Vorp "A modified cylindrical coordinate system for the geometric analysis of abdominal aortic aneurysms," 1999 Joint BMES-EMBS meeting, Atlanta, GA (Published on CD ROM).
241. D. Gloeckner, **M.S. Sacks**, M. Chancellor, W. deGroat "Active and passive biaxial mechanical properties of urinary bladder wall," 1999 Joint BMES-EMBS meeting, Atlanta, GA (Published on CD ROM).
242. **M.S. Sacks** and F.J. Schoen, "The importance of collagen degradation in the failure of bioprosthetic heart valves, ASME/AiChE Summer Bioengineering Meeting, Big Sky, Montana, July, 1999.
243. **M.S. Sacks**, D.C. Gloeckner, M.B. Chancellor, W.C. deGroat, F.X. Schneck, "Biaxial mechanical properties of the urinary bladder wall (by invitation), ASME/AiChE Summer Bioengineering Meeting, Big Sky, Montana, July, 1999.
244. D. B. Smith, **M. S. Sacks**, M. B. Chancellor, and N. L. Block, "In-vivo surface geometric analysis of the Urinary Bladder, " ASME/AiChE Summer Bioengineering Meeting, Big Sky, Montana, July, 1999.
245. **M.S. Sacks** and D.C. Gloeckner, "Large displacement flexural properties of the bioprosthetic aortic valve cusp," ASME/AiChE Summer Bioengineering Meeting, Big Sky, Montana, July, 1999.
246. **M.S. Sacks** and F.J. Schoen, "Calcification-independent collagen damage in explanted clinical porcine bioprosthetic heart valves," World Symposium on Heart Valve Disease, London, England, June 12-14, 1999.
247. **M.S. Sacks** and D.C. Gloeckner, "Implication of compressive buckling as the major structural failure mode in porcine bioprosthetic heart valves," World Symposium on Heart Valve Disease, London, England, June 12-14, 1999.

248. N. Vyavahare, M. Ogle, F.J. Schoen, **M.S. Sacks**, and R.J. Levy, "Mechanisms of bioprosthetic heart valve failure: Fatigue causes collagen denaturation and glycosaminoglycan loss," World Symposium on Heart Valve Disease, London, England, June 12-14, 1999.
249. S.D. Waldman, **M.S. Sacks**, J.M. Lee, "Imposed state of deformation determines local collagen fiber orientation but not apparent mechanical properties," Canadian Biomaterials Society 19<sup>th</sup> Annual Meeting, June 2-5, Quebec City, Canada.
250. **M.S. Sacks**, M.B. Chancellor, W.C. deGroat, F.X. Schneck, and N. Block, "3D in-vivo surface curvature of the human bladder," American Urological Association Annual Meeting, Dallas, TX.
251. **M.S. Sacks** and F.J. Schoen, "Calcification-independent collagen damage in explanted clinical bioprosthetic heart valves," accepted for oral presentation at the 1999 Society for Biomaterials Meeting, April 28-May 2, Providence, Rhode Island.
252. **M.S. Sacks** and D.C. Gloeckner, "Biaxial mechanical properties of intestinal collagen layer," accepted for oral presentation at the 1999 Society for Biomaterials Meeting, April 28-May 2, Providence, Rhode Island.
253. **M.S. Sacks** and F.J. Schoen, "The importance of collagen degradation in the failure of bioprosthetic heart valves," International Society for Applied Cardiovascular Biology (ISACB) "Circulator," Spring/Summer 1999.
254. **M.S. Sacks** and D.C. Gloeckner, "A constitutive model for processed intestinal collagen layer," 1998 Tissue Engineering Society, Orlando, FL.
255. K.L. Billiar and **M.S. Sacks**, "Long-term mechanical fatigue response of porcine bioprosthetic heart valves," ASME IMECEX-98 in Anaheim, CA.
256. D.C. Gloeckner and **M.S. Sacks**, "Biaxial fiber kinematics and structural constitutive modeling of small intestinal submucosa," ASME IMECEX-98 in Anaheim, CA.
257. **M.S. Sacks**, "Constitutive models for heart valve tissues", 1998 BMES, Cleveland, OH (*by invitation*).
258. **M.S. Sacks**, "A structural model for bovine pericardium as a bioprosthetic material," International Symposium on Biocomposites: Performance and Design, Atlanta, GA.
259. D.C. Gloeckner, K.L. Billiar, **M.S. Sacks**, "The bending behavior of fixed porcine aortic cusp," 3<sup>rd</sup> World Congress of Biomechanics, Sapporo, Japan.
260. D.B. Smith, **M.S. Sacks**, M.L. Raghavan, M.P. Federle, M.W. Webster, D.A. Vorp, "A biquintic hermite finite element for surface geometric analysis of abdominal aortic aneurysms," 3<sup>rd</sup> World Congress of Biomechanics, Sapporo, Japan.
261. **M.S. Sacks** and J. Zhou, "Biaxial mechanical behavior of chemically treated bovine pericardium including in-plane shear: A comparison of constitutive models," 3<sup>rd</sup> World Congress of Biomechanics, Sapporo, Japan, 1998.
262. D.C. Gloeckner, K.L. Billiar, **M.S. Sacks**, "Effects of fatigue on the bending behavior of bioprosthetic aortic heart valve," 1998 ASAIO meeting, New York, NY.
263. K.L. Billiar and **M.S. Sacks**, "Biaxial fatigue damage in bioprosthetic heart valves: structural modeling" 1998 ASAIO meeting, New York, NY.
264. **M.S. Sacks**, "Toward more realistic constitutive models for natural and bioprosthetic heart valve tissues," Prosthetic Heart Valve Workshop, Hilton Head, NC, Feb. 16-20, 1998.
265. **M.S. Sacks**, L.E. Bowes, E.D. Hiester, J. Brahmawari, P.M. Mertz, W.H. Eaglstein, "Small angle light scattering for dermal wound collagen structural analysis," 17<sup>th</sup> Southern Biomedical Engineering Conference, San Antonio, TX.
266. **M.S. Sacks**, "A micro-structural constitutive model for chemically treated bovine pericardium," BED vol. 36, pgs. 335-336, ASME 1997 International Congress and Exposition, Dallas, TX.
267. K.L. Billiar and **M.S. Sacks**, "Effect of chemical fixation on the fiber kinematics of bovine pericardium," BED vol. 36, pgs. 339-340, ASME 1997 International Congress and Exposition, Dallas, TX.
268. **M.S. Sacks**, "Microstructure-biaxial mechanical response of porcine intestinal submucosa," 1997 BMES Annual Fall Meeting, San Diego, CA, vol. 25, supp. 1, pg. S44, 1997.
269. K.L. Billiar and **M.S. Sacks**, "A micro-structural constitutive model for the aortic valve cusp," 1997 BMES Annual Fall Meeting, San Diego, CA, vol. 25, supp. 1, pg. S20, 1997.
270. **M.S. Sacks**, D.A. Vorp, M.L. Raghavan, M.P. Federle, M.W. Webster, "A non-invasive surface geometric analysis of in-vivo abdominal aortic aneurysms," ASME Summer Bioengineering Conference, Sun River, Oregon, June 11-15, 1997

271. **M.S. Sacks**, D.C. Gloeckner, K.L. Billiar, R.D.B. Jaquiss, "Microstructure-biaxial mechanical response of porcine intestinal submucosa," ASME Summer Bioengineering Conference, Sun River, Oregon, June 11-15, 1997
272. K.L. Billiar and **M.S. Sacks**, "A numerical-experimental method for integrating strain and fiber structure for the aortic valve," ASME Summer Bioengineering Conference, Sun River, Oregon, June 11-15, 1997.
273. **M.S. Sacks** and K.L. Billiar, "biaxial mechanical behavior of bioprosthetic heart valve leaflets subjected to accelerated testing," International Association for Cardiac Biological Implants, Fourth Scientific Meeting, Washington, DC, May 4, 1997.
274. D.B. Smith, K.L. Billiar, **M.S. Sacks**, A. LiVecchi, "Post-fixation structural analysis: a new method to produce mechanically uniform bovine pericardial tissue," ASAIO, 43<sup>rd</sup> Annual Conference, May 1-3, 1997.
275. **M.S. Sacks**, E.D. Hiester, and F.J. Schoen, "Calcification induced damage to collagen in explanted bioprosthetic heart valves," Society for Biomaterials, 23<sup>rd</sup> Annual Meeting, May 1, 1997.
276. **M.S. Sacks**, "On the biaxial mechanical coupling behavior of chemically treated bovine pericardium," 1996 ASME Advances in Bioengineering, BED-Vol. 33, pgs. 373-374, S. Rastegar, Ed.
277. **M.S. Sacks**, D.B. Smith, "Structural damage of porcine bioprosthetic heart valves subjected to long-term accelerated testing," 1996 ASME Advances in Bioengineering, pgs. 225-226, BED-Vol. 33, S. Rastegar, Ed.
278. K.L. Billiar, **M.S. Sacks**, "Fiber mobility in bovine pericardium," Annals of Biomedical Engineering, Vol. 24, pg. S-40, Supplement 1, 1996.
279. **M.S. Sacks**, D.B. Smith, F. Patanyi, and R. Schroeder, "Use of MRI to reconstruct fatigued bioprosthetic heart valve 3D geometry" ASAIO, Vol. 42, No.2, pg. 29, 1996.
280. **M.S. Sacks**, E.D. Hiester, L.E. Bowes, J. Brahmawari, and P.M. Mertz, "Collagen fiber architecture measurement by small angle light scattering: A method for fibrosis detection," Proceedings of the International Meeting for Bioengineering and the Skin, pg. 8, 1996.
281. K.L. Billiar, **M.S. Sacks**, G. Singh, and K. Thompson, "Collagen fiber mobility under biaxial stretch," presented at the 5<sup>th</sup> World Congress of Biomaterials, Program and Transactions, Vol. I, pg. 615, 1996.
282. **M.S. Sacks**, D.B. Smith, and R. Schroeder, "Fatigue of bioprosthetic heart valve leaflets," 5<sup>th</sup> World Congress of Biomaterials, Program and Transactions, Vol. I, pg. 250, 1996.
283. **M.S. Sacks**, "Biaxial mechanical behavior of fixed bovine pericardium," presented at the 5<sup>th</sup> World Congress of Biomaterials, Program and Transactions, Vol. I, pg. 620, 1996.
284. E.D. Hiester and **M.S. Sacks**, "The bovine pericardial sac: optimal material selection sites," presented at the 5<sup>th</sup> World Congress of Biomaterials, Program and Transactions, Vol. II, pg. 730, 1996.
285. M.C. Lewis, J.P. Lafferty, **M.S. Sacks**, N.E. Pinnas, V.S. Pallares, "Bevel orientation and dural puncture," presented at the 70<sup>th</sup> International Anesthesia Research Society Clinical and Scientific Congress, Washington, D.C., March 8-12, 1996.
286. **M.S. Sacks**, D.B. Smith, and C. J. Chuong, "Alterations in the collagen fiber architecture of porcine bioprosthetic heart valve leaflets due to accelerated testing," Presented at the 1995 ASME Winter Annual Meeting, San Francisco, CA.
287. **M.S. Sacks**, D.B. Smith, and C.J. Chuong, "Collagen architecture of the porcine aortic valve leaflet," ASAIO, Vol. 41, No. 1, 1995.
288. **M.S. Sacks**, C.J. Chuong, and H. Cao, "Microstructure-mechanical anisotropy relations in photo-oxidized bovine pericardium," SES, 1995.
289. **M.S. Sacks** and D.B. Smith, "Biaxial mechanical behavior of fatigued bioprosthetic leaflets," Presented at the 1995 BMES Annual Fall Meeting, published in Annals of Biomedical Engineering, supplement 1, Vol. 23, 1995.
290. **M.S. Sacks** and C. J. Chuong, "Collagen fiber architecture of bovine pericardium," ASAIO, Vol. 40, 1994.
291. **M.S. Sacks**, E.D. Hiester, C.J. Chuong, "Collagen fiber architecture of the bovine pericardial sac," Presented at the 1994 BMES Annual Fall Meeting, published in Annals of Biomedical Engineering, supplement 1, Vol. 22, 1994.
292. **M.S. Sacks**, C.J. Chuong, Craig Halberstadt, and Michael Kwan, "Collagen fiber architecture of cultured dermal tissue measured using small angle light scattering," Presented at the ASME 1993 Winter Annual Meeting, New Orleans, LA.
293. **M.S. Sacks** and C.J. Chuong, "Biaxial mechanical properties of right ventricular free wall myocardium," presented at the ASME 1992 Winter Annual Meeting, Anaheim, CA.

294. R.P. Cochran, K.S. Kunzelman, C.J. Chuong, **M.S. Sacks**, R.C. Eberhart, "Nondestructive analysis of mitral valve collagen fiber orientation," ASAIO Transactions, vol. 37, no. 3, pp. M447-8, 1991.
295. **M.S. Sacks** and C.J. Chuong, "In-vivo regional tension of the right ventricle free wall derived from membrane shell mechanics," First World Congress of Biomechanics, La Jolla CA, 1990.
296. Chuong, **M.S. Sacks**, and J.L. Pean, "Morphological changes in the diaphragm after phrenic denervation," First World Congress of Biomechanics, La Jolla CA, 1990.
297. **M.S. Sacks**, C.J. Chuong, and G.H. Templeton, "Right ventricular free wall tension and function derived from magnetic resonance images," Joint APS and ATS meeting, Rochester MN, 1989.
298. G.H. Templeton, **M.S. Sacks**, F. Schweip, and C.J. Chuong, "Description of right ventricular kinematics using a three dimensional coordinate system," Joint APS and ATS meeting, Rochester MN, 1989.
299. **M.S. Sacks**, P.L. Kronick, and M.P. Dahms, "Quantification of vertical fiber defect by small angle light scattering," 20th Congress, International Union of Leather Technologists and Chemists Societies, Philadelphia, PA, 1989.
300. **M.S. Sacks** and C.J. Chuong, "Collagen fiber orientation of the diaphragmatic central tendon quantified by small angle light scattering," Proceedings of the World Congress on Medical Physics and Biomedical Engineering, 1988.
301. K.S. Kunzelman, **M.S. Sacks**, R.P. Cochran, R.C. Eberhart, "Mitral valve leaflet collagen distribution by laser analysis," Seventh Southern Biomedical Conference, Eds. R.C. Eberhart and L.L. Howard, 1988.
302. P.L. Kronick and **M.S. Sacks**, "The role of interfibrillar gel in the mechanical response of bovine hide," Proceedings of the International Symposium on Structural Relationships in Connective Tissues, Kibbutz Ginossar, Israel, 1987.
303. P.L. Kronick and **M.S. Sacks**, "Time-temperature superposition principle applied to dynamic mechanical properties of calf skin at sub-zero temperatures," 1987 Advances in Bioengineering, Eds. D.L. Butler and P.A. Torzilli, ASME, 1987.
304. **M.S. Sacks** and R.P. Hubbard, "Response of tendon to repeated elongation," 1983 Advances in Bioengineering, ASME.
305. **M.S. Sacks** and R.P. Hubbard, "Mechanical response of collagenous tissue to repeated elongation." J. American Osteopathic Association, vol. 1, 1983.
306. **M.S. Sacks**, "Mechanical and histological evaluations of sheet and meshed skin grafts. Student-originated studies projects," Abstract Reports NSF 81-70, 1980.