

11th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering

(CMBBE 2013)

**Salt Lake City, Utah, USA
3-6 April 2013**

ISBN: 978-1-63439-437-6

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2013) by Jeffery A. Weiss, Department of Bioengineering, University of Utah
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact Jeffery A. Weiss, Department of Bioengineering,
University of Utah at the address below.

Jeffery A. Weiss, Department of Bioengineering, University of Utah
36 S. Wasatch Drive, Rm. 3100
Salt Lake City, Utah 84112

Phone: 801-587-7833

jeff.weiss@utah.edu

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

SS11: SUBJECT- AND PATIENT-SPECIFIC ARTICULAR JOINT MODELING

A COMPARISON OF STATISTICAL SHAPE ANALYSIS METHODS TO ASSESS RIGHT VENTRICULAR BEHAVIOR	2
<i>J. Wu, Y. Wang, M. Simon, J. Brigham</i>	
CONSIDERATIONS IN SUBJECT-SPECIFIC ARTICULAR JOINT MODELING RELATED TO IMPLEMENTATION IN LARGER POPULATION-BASED STUDIES	5
<i>A. Kern, T. Stockman, D. Anderson</i>	
JOINT CONTACT MECHANICS AND CURVATURE IN DYSPLASTIC HUMAN HIPS	7
<i>C. Henak, C. Abraham, S. Maas, B. Ellis, A. Anderson, C. Peters, J. Weiss</i>	
IN-VIVO MODELING OF THE ANTERIOR OBLIQUE LIGAMENT	9
<i>E. Halilaj, M. Rainbow, D. Moore, D. Laidlaw, J. Crisco</i>	
COMPARISON OF FINITE ELEMENT MODELING AND SURFACE-BASED CONTACT MODELING METHOD FOR NORMAL, INJURED AND SURGICALLY REPAIRED WRISTS	11
<i>J. Johnson, P. Lee, T. McIlff, E. Toby, K. Fischer</i>	
CARTILAGE CONTACT MECHANICS FOLLOWING TREATMENT OF ACETABULAR RETROVERSION WITH PERI-ACETABULAR OSTEOTOMY: A CASE STUDY	13
<i>C. Abraham, J. Weiss, C. Peters, A. Anderson</i>	

SS3A: IMAGE-BASED SIMULATION FOR BIOMECHANICS APPLICATIONS

ACCURATE AND FAST BONE STRENGTH PREDICTIONS OF PATIENT-SPECIFIC PLATE-ROD MODELS BASED ON μCT AND HR-PQCT IMAGES	16
<i>J. Wang, B. Zhou, X. Liu, E. Stein, E. Shane, X. Guo</i>	
IMAGE BASED MODEL CONSTRUCTION, BOUNDARY CONDITION SPECIFICATION AND INVERSE FEA CONTROL: A BASIC MATLAB TOOLKIT FOR FEBIO	18
<i>K. Moerman, A. Nederveen, C. Simms</i>	
IN SILICO DETERMINATION OF THE VERTEBRAL BONY ENDPLATE PERMEABILITY AND ITS RELATION TO INTERVERTEBRAL DISC MECHANOBIOLOGY	20
<i>A. Malandrino, D. Lacroix, S. Ferguson, K. Ito, C. Hellmich, J. Noailly</i>	
EXPERIMENTAL VALIDATION OF SPECIMEN SPECIFIC FINITE ELEMENT MODELS OF FUNCTIONAL SPINAL UNITS	22
<i>S. Tarsuslugil, R. Hall, R. Wilcox</i>	
THE RELATIONSHIP BETWEEN CORTICAL STRUCTURE AND STRENGTH IN THE FEMORAL NECK	24
<i>M. Kersh, M. Pandey, Q. Bui, A. Jones, M. Knackstedt, E. Seeman, R. Zebaze</i>	

SS6: COMPUTATIONAL DESIGN OF SCAFFOLDS FOR TISSUE ENGINEERING

TOPOLOGY OPTIMIZATION OF SCAFFOLDS FOR BONE TISSUE ENGINEERING	27
<i>P. Fernandes</i>	
A NUTRIENT-CELL-MATRIX TRIPHASIC MIXTURE MODEL OF GROWTH OF TISSUE ENGINEERING CONSTRUCTS	29
<i>J. Soares, M. Sacks</i>	
A MODEL TO EXPLORE THE BALANCE BETWEEN DEGRADATION AND MATRIX TRANSPORT IN HYDROGEL SCAFFOLDS	31
<i>F. Vernerey, V. Dhote</i>	
COMPUTATIONAL METHODOLOGY TO DETERMINE THE PERMEABILITY OF NON REGULAR THREE-DIMENSIONAL SCAFFOLDS	33
<i>V. Santamaria, M. Malve, A. Duizabo, A. Mena, G. Ferrer, J. Garcia-Aznar, M. Castellano, I. Garrido</i>	
A MATHEMATICAL MODEL FOR CELL/MATRIX GROWTH ON 3D SURFACES USING THE LEVEL SET METHOD	35
<i>Y. Guyot, I. Papantoniou, Y. Chai, S. Bael, J. Schrooten, L. Geris</i>	

GENERAL SESSION: INVITED SPEAKER SESSION

THE BIOMECHANICS AND MECHANOBIOLOGY OF PRIMARY CILIA	38
<i>M. Downs, K. Lee, D. Hoey, S. Temiyasathit, C. Jacobs</i>	
MODELING OF LYMPHATIC SYSTEM PUMPING	40
<i>J. Moore</i>	
ACUPUNCTURE SIMULATION	42
<i>M. Thiriet, Y. Deleuze, T. Sheu</i>	

SS18: BIOMECHANICAL MODELLING TO UNDERSTAND AND OPTIMIZE SPORTS PERFORMANCE AND INJURY PREVENTION

PREDICTING COMPLEX MOTOR BEHAVIORS WITH MUJOCO – A NEW PHYSICS ENGINE FOR OPTIMAL CONTROL	45
<i>T. Erez, E. Todorov</i>	
COMPUTER SIMULATION OF THE FLIGHT PHASE OF FIGURE SKATING JUMPS	47
<i>T. Kepple, J. Richards</i>	
JOINT MOMENT SYNERGIES IN SPORTS REVEALED BY INDUCED ACCELERATIONS	49
<i>S. Cabral, V. Moniz-Pereira, F. Joao, A. Veloso</i>	
DEVELOPMENT OF A COMPUTATIONAL MODEL FOR STRESS FRACTURES IN HUMANS	51
<i>A. Hadid, Y. Epstein, N. Shabshin, A. Gefen</i>	
FE MODEL SIMULATIONS REVEAL A STRUCTURE-FUNCTION RELATIONSHIP IN THE OFT-INJURED BICEPS FEMORIS LONG HEAD HAMSTRING MUSCLE	53
<i>N. Florentino, F. Epstein, S. Blemker</i>	

SS3B: IMAGE-BASED SIMULATION FOR BIOMECHANICS APPLICATIONS (II)

ANATOMY-SPECIFIC CT-BASED FINITE ELEMENT ANALYSIS FOR PREDICTION OF BONE MECHANICAL PROPERTIES: STRENGTH AND LIMITATIONS	56
<i>P. Zysset, E. Dall'Ara, P. Varga, U. Wolfram, D. Pahr</i>	
ACCURACY AND FEASIBILITY OF DUAL FLUOROSCOPY AND MODEL-BASED TRACKING TO QUANTIFY IN VIVO HIP KINEMATICS DURING CLINICAL EXAMS	58
<i>A. Kapron, S. Aoki, C. Peters, A. Anderson</i>	
SIMULATION OF A PROJECTILE PENETRATION TO HUMAN HEAD VIA MESHLESS METHOD	60
<i>M. Pekedis, H. Yildiz</i>	
LARGE SCALE ELASTOPLASTIC MODELING FOR IN VIVO ASSESSMENT OF BONE STRENGTH FROM HIGH-RESOLUTION PERIPHERAL COMPUTED TOMOGRAPHY	62
<i>J. Owoc, S. Boyd</i>	
3D GEOMETRICAL MODELING OF ADOLESCENT IDIOPATHIC SCOLIOSIS FOR CUSTOMIZED ORTHOPEDIC BRACE DESIGN	64
<i>J.-C. Gesbert, B. Colobert, P. Violas, J.-J. Dufournet, D. Vervaeke, D. Loiseau, L. Rakotomanana</i>	

SS9A: CONSTITUTIVE MODELLING: FROM EXPERIMENTAL VALIDATION TO CLINICAL APPLICATION

MATERIAL PROPERTY DETERMINATION OF OCULAR TISSUES USING AN INVERSE FINITE ELEMENT APPROACH	67
<i>J. Geest, A. Ayyalasomayajula</i>	
INVERSE ANALYSIS OF SKELETAL MUSCLE TISSUE BASED ON MRI DERIVED 3D GEOMETRY, DEFORMATION AND FIBRE ARCHITECTURE	69
<i>K. Moerman, A. Nederveen, S. Evans, C. Simms</i>	
STRUCTURAL IMAGING AND MODELLING THE MECHANICS OF HEART FAILURE	71
<i>V. Wang, S.-M. Huang, A. Wilson, G. Sands, A. Young, I. Legrice, M. Nash</i>	
A 3D MODEL OF THE HUMAN SOFT PALATE MUSCLE FUNCTION DURING SPEECH: IMPLICATIONS FOR SURGICAL REPAIR OF CLEFT PALATES	73
<i>J. Inouye, C. Pelland, N. Fiorentino, W. El-Nahal, K. Lin, K. Borowitz, S. Blemker</i>	
MECHANICAL BEHAVIOR OF ANNULUS FIBROSUS TISSUE: IDENTIFICATION OF A PORO-HYPER-ELASTIC MODEL FROM EXPERIMENTAL MEASUREMENTS	75
<i>A. Baldit, D. Ambard, F. Cherblanc, P. Royer</i>	

PLENARY SPEAKER: SCOTT DELP – “INSIGHTS FROM SIMULATING GAIT DYNAMICS AND DISORDERS”

GENERAL SESSION: IMPLANT AND JOINT MECHANICS

COMPUTATIONAL MODELING OF WEAR OF ORTHOPAEDIC TOTAL JOINT REPLACEMENTS	79
<i>T. Brown</i>	
SUBJECT-SPECIFIC MODELING OF HIP FRACTURE AND REPAIR USING THE EXTENDED FINITE ELEMENT METHOD	81
<i>A. Ali, L. Cristofolini, E. Schileo, R. Kim, P. Rullkoetter, P. Laz</i>	
A UNIFIED ENVELOPE DESCRIPTION OF VARIATION IN KNEE JOINT LAXITY USING A PRINCIPAL COMPONENT ANALYSIS	83
<i>A. Cyr, L. Maletsky</i>	
QUANTIFICATION AND WEAR PREDICTION DUE TO FEMORAL HEAD DAMAGE IN TOTAL HIP ARTHROPLASTY	85
<i>K. Kruger, N. Tikekar, A. Heiner, J. Lannutti, T. Brown</i>	

DO MODERN THA DESIGNS PROMOTE FRETTING AT HEAD-NECK JUNCTIONS?	87
<i>F. Donaldson, J. Coburn, K. Siegel</i>	

GENERAL SESSION: SOFT TISSUE MECHANICS

CELL VIABILITY IN THE INTERVERTEBRAL DISC UNDER VARIOUS PATHOLOGIC, DYNAMIC LOADING, AND THERAPEUTIC CONDITIONS: 3D FINITE ELEMENT ANALYSIS	90
<i>W. Gu, Q. Zhu, X. Gao, A. Jackson</i>	
EVALUATION OF THE EFFECTS OF GEOMETRIC COMPLEXITY AND MATERIAL PROPERTIES IN SOFT-TISSUE SIMULATION	92
<i>R. Al-Dirini, M. Reed, J. Hu, D. Thewlis</i>	
MODELING OF FIBROUS SOFT TISSUE FATIGUE DAMAGE USING A FIBERREINFORCED MATERIAL MODEL	94
<i>C. Martin, W. Sun</i>	
SKIN AND SUBCUTANEOUS TISSUE LOADING DURING SITTING AFTER PUSHUP MANEUVERS IN WHEELCHAIR USERS	96
<i>A. Levy, K. Kopplin, A. Gefen</i>	
VISCOELASTICITY OF MOUSE SKIN UNDER COMPRESSION IS DEPENDENT ON LEVEL OF STRAIN	98
<i>Y. Wang, K. Marshall, Y. Baba, E. Lumpkin, G. Gerling</i>	

SS7: OPENSIM WORKSHOP: PERFORMING DYNAMIC SIMULATIONS WITH OPENSIM

SS9B: CONSTITUTIVE MODELLING: FROM EXPERIMENTAL VALIDATION TO CLINICAL APPLICATIONS (II)

MECHANICS OF THE MITRAL VALVE: IN VIVO PARAMETER IDENTIFICATION AND THE EFFECT OF PRESTRAIN	102
<i>M. Rausch, E. Kuhl</i>	
INVERSE IMPACT MODELLING OF PASSIVE SKELETAL MUSCLE	104
<i>M. Takaza, K. Moerman, C. Simms</i>	
PERFUSION PRESSURE DRIVEN STIFFENING IN VASCULARISED TISSUE	106
<i>A. Reeve, A. Taberner, M. Nash, P. Nielsen</i>	
A NEW APPROACH FOR NONINVASIVE ASSESSMENT OF PATIENT-SPECIFIC MATERIAL PROPERTIES OF ARTERIAL TISSUE	108
<i>M. Smoljkic, J. Sloten, N. Famaey</i>	
TOWARDS A MULTI-COMPARTMENT FINITE-ELEMENT MODEL OF THE SUPRASPINATUS MUSCLE	110
<i>I. Stavness, S. Kim</i>	

GENERAL SESSION: CLINICAL APPLICATIONS

PATIENT SPECIFIC COMPUTATIONAL MODELING TO FACILITATE OUR UNDERSTANDING OF HIP PATHOMORPHOLOGY	113
<i>C. Peters, J. Weiss, M. Harris, C. Henak, C. Abraham, A. Kapron, A. Anderson</i>	
NEW TENDON-TRANSFER SURGERY FOR ULNAR-MEDIAN NERVE PALSY USING EMBEDDED ADAPTIVE ENGINEERING MECHANISMS	115
<i>J. Montgomery, R. Balasubramanian, K. Mardula, C. Allan</i>	
FINITE ELEMENT SIMULATIONS OF LEFT ATRIAL FILLING FOLLOWING RADIOFREQUENCY ABLATION	117
<i>C. Moyer, P. Norton, J. Ferguson, J. Holmes</i>	
INTEGRATING DUAL ENERGY CT AND PATIENT-SPECIFIC FOOTS MODEL TO EVALUATE TOPHUS FORMATION AND BONE EROSION IN GOUT	119
<i>J. Fernandez, M. Deacon, N. Dalbeth, K. Mithraratne</i>	
PATIENT-SPECIFIC VIRTUAL HIGH-TIBIAL OSTEOTOMY	121
<i>Y. Pauchard, D. McErlain, J. Milner, T. Ivanov, J. Giffin, T. Birmingham, D. Holdsworth</i>	

GENERAL SESSION: NUMERICAL METHODS

IDENTIFICATION OF MATERIAL PROPERTIES OF ASCENDING AORTIC ANEURYSMS USING AN INFLATION TEST	124
<i>S. Evans, A. Romo, P. Badel, S. Avril</i>	
FINITE ELEMENT JOINT MODELING WITH QUADRATIC TETRAHEDRAL ELEMENTS	126
<i>S. Maas, B. Ellis, D. Rawlins, J. Weiss</i>	
FEBIO PARAMETER OPTIMIZATION FOR SPHERICAL INDENTATION OF HUMAN CERVICAL TISSUE	128
<i>K. Myers, K. Yoshida</i>	
USE OF A MICROROBOT FOR VARIABLE-PROFILE DYNAMIC CHARACTERISATION OF SKIN	130
<i>M. Parker, L. Jones, I. Hunter, A. Taberner, P. Nielsen</i>	

COMPARISON OF PERFORMANCE OF IMPLICIT AND EXPLICIT SOLVERS FOR THE ANALYSIS OF MICRO-CT BASED FINITE ELEMENT MODELS	132
<i>M. Taylor, E. Perilli, P. Thurner</i>	

GENERAL SESSION: TISSUE ENGINEERING

BIOMECHANICS IN MUSKULOSKELETAL TISSUE ENGINEERING	135
<i>A. Roshan-Ghias, A. Terrier, A. Pioletti</i>	
INDIVIDUAL-CELL BASED MODEL FOR CHARACTERIZING THE MECHANICAL MICROENVIRONMENT IN MICROCARRIER CELL EXPANSION	137
<i>B. Smeets, T. Odenthal, P. Liedekerke, E. Tijskens, H. Ramon, H. Oosterwyck</i>	
MAGNITUDE OF THE MINIMUM COMPRESSIVE PRINCIPAL STRAIN PREDICTS CHONDROGENIC DIFFERENTIATION OF HUMAN MESENCHYMAL STEM CELLS IN TISSUE ENGINEERED CONSTRUCTS SUBJECT TO CYCLIC LOADING	139
<i>H. Zahedmanesh, M. Stoddart, P. Lezuo, M. Alini, H. Oosterwyck</i>	
A PROCESS FOR CREATING SCAFFOLD FIBER NETWORK GEOMETRY USING RANDOM WALKS	141
<i>J. Carleton, G. Rodin, M. Sacks</i>	
EVALUATION OF CARDIAC TISSUE ENGINEERING APPLICATIONS USING STRONGLY COUPLED ELECTROMECHANICAL MODELS OF THE LEFT VENTRICLE	143
<i>S. Wall, J. Sundnes, J. Guccione</i>	

SS19: ABAQUS WORKSHOP: INTRODUCTION TO SCRIPTING IN ABAQUS

GENERAL SESSION: SPINE AND DISC MECHANICS

ADVANCES IN SUBJECT SPECIFIC MODELING AND APPLICATIONS TO SCOLIOSIS	147
<i>W. Skalli, A. Courvoiser, X. Drevelle, C. Vergari, P. Rouch, J. Dubousset</i>	
DIGITAL IMAGE CORRELATION VALIDATION OF SPECIMEN-SPECIFIC VERTEBRAE MODELS	149
<i>H. Gustafson, P. Crompton</i>	
THE DEVELOPMENT AND QUANTITATIVE VALIDATION OF A PROBABILISTIC FINITE ELEMENT STATISTICAL SHAPE MODEL OF THE CERVICAL SPINE	151
<i>W. Francis, T. Eliason, T. Bredbenner, G. Paskoff, B. Shender, D. Nicoletta</i>	
A PARAMETRIC CERVICAL SPINE MODEL ACCURATELY DESCRIBES VARIABILITY IN THE LOADING RESPONSE OF A SET OF INDIVIDUAL CERVICAL SPINE MODELS	153
<i>T. Bredbenner, T. Eliason, W. Francis, G. Paskoff, B. Shender, D. Nicoletta</i>	
ASSESSMENT OF A MUSCLE CONSTITUTIVE MODEL THROUGH THE BIOMECHANICAL ANALYSIS OF A L3-L5 LUMBAR SPINE MUSCULOSKELETAL MODEL UNDER UPPER-BODY INCLINATION	155
<i>T. Toumanidou, G. Fortuny, D. Lacroix, J. Noailly</i>	

SS14: MODELING BRAIN INJURIES IN SPORTS

A PARAMETRIC COMPARISON OF THREE FINITE ELEMENT MODELS OF THE HUMAN HEAD UNDER REPRESENTATIVE IMPACTS IN CONTACT SPORTS	158
<i>S. Ji, H. Ghadyani, J. Beckwith, R. Bolander, T. McAllister, J. Ford, K. Paulsen, K. Ernstrom, R. Raman, S. Jain, R. Greenwald</i>	
COMBINING THE FINITE ELEMENT METHOD WITH STRUCTURAL NETWORK-BASED ANALYSIS FOR MODELING NEUROTRAUMA	160
<i>R. Kraft, A. Dagro, P. McKee, S. Grafton, J. Vettel, K. McDowell, M. Vindiola, A. Merkle</i>	
AN EXPERIMENTAL AND NUMERICAL INVESTIGATION OF HEAD ACCELERATIONS DUE TO STICK IMPACTS IN GIRLS' LACROSSE	162
<i>J. Morse, J. Franck, C. Franck, J. Crisco</i>	
COMPUTATIONAL MODELLING OF CONCUSSIVE IMPACTS	164
<i>S. Kleiven, D. Patton, A. McIntosh</i>	
SHAPE AND SIZE OF THE ADULT BRAIN AND SKULL AND ITS APPLICATION TO YOUTH SPORTS	166
<i>J. Stitzel, J. Urban, J. Maldjian, C. Whitlow</i>	

SS17: INTEGRATIVE SYSTEMS MODELING OF PHYSICAL PERFORMANCE

INTEGRATIVE SYSTEMS MODELING OF MILITARY PHYSICAL PERFORMANCE	169
<i>L. Macfadden, B. Sih, L. Ng</i>	
NEUROMECHANIC: A COMPUTATIONAL PLATFORM FOR INVESTIGATING NEURAL CONTROL OF MOVEMENT AND BIOMECHANICAL PERFORMANCE	171
<i>N. Bunderson, J. Bingham</i>	
RECURRENT NEURAL NETWORKS FOR PHASE OF GAIT CLASSIFICATION USING PURELY MODEL DATA	173
<i>A. Hammond</i>	

QUANTIFYING SENSITIVITY OF BIOMECHANICAL AND NEURAL FEEDBACK PARAMETERS TO STABLE BEHAVIOR WITH THE STABILITY RADIUS METHOD	175
<i>J. Bingham, L. Ting</i>	

GENERAL SESSION: BRAIN AND CNS

COMPUTATIONAL MODELLING OF CNS DISEASES	178
<i>L. Bilston, S. Cheng, D. Fletcher, M. Stoodley</i>	
MODELING, SIMULATION AND VALIDATION OF BLAST INDUCED TRAUMATIC BRAIN INJURY USING FINITE ELEMENT METHODS IN LS-DYNA	180
<i>S. Sharma, R. Makwana, L. Zhang</i>	
MICRO-SCALE FINITE ELEMENT MODEL OF THE PIA ARACHNOID COMPLEX IN SHEAR: A PARAMETRIC EVALUATION	182
<i>G. Scott, B. Coats</i>	
A COMPUTATIONAL STUDY ON BIOMECHANICS OF BRAIN OF A HELMETED HUMAN HEAD MODEL EXPOSED TO BLAST WAVES FROM DIFFERENT ORIENTATIONS	184
<i>M. Jazi, A. Rezaei, G. Karami, F. Azarmi, M. Ziejewski</i>	
BLOOD VESSEL RESPONSE UNDER VARIOUS BLAST LOADINGS: FINITE ELEMENT SIMULATION ON A SIMPLIFIED CYLINDER	186
<i>N.-W. Liu, K. Monson</i>	

GENERAL SESSION: BONE MECHANICS I

LOCAL BONE FORMATION AND RESORPTION IN VIVO IS CONTROLLED MECHANICALLY IN CYCLICALLY LOADED AND IN OVARECTOMIZED MICE	189
<i>R. Muller, F. Schulte, D. Ruffoni, F. Lambers, G. Kuhn, D. Christen, D. Webster</i>	
INVESTIGATION OF THE EFFECT OF DIRECT AND INDIRECT LOAD-BASED TREATMENTS IN AN ELDERLY MURINE TIBIA FRACTURE MODEL: A FE ANALYSIS	191
<i>S. Nasr, N. Duncan</i>	
THE INFLUENCE OF THE YIELD SURFACE SHAPE AND DAMAGE IN THE DEPTHDEPENDENT RESPONSE OF BONE TO NANOINDENTATION USING SPHERICAL AND BERKOVICH TIPS	193
<i>J. Schwiedrzik, P. Zysset</i>	
EACH HUMAN BONE SPECIMEN HAS ITS INDIVIDUAL DENSITY-ELASTICITY RELATIONSHIP	195
<i>S. Eberle, M. Gottlinger, P. Augat</i>	
EFFECTS OF THE CONSTITUTIVE MODEL ON NUMERICAL ANALYSES OF TRABECULAR BONE FAILURE	197
<i>A. Baumann, X. Shi, G. Niebur</i>	

SS20: SIMPLEWARE WORKSHOP

SS4: DENTAL BIOMECHANICS

SURFACE-BASED THREE-DIMENSIONAL FACE ANALYSIS: GROUPWISE REGISTRATION AND AVERAGING	201
<i>A. Zhurov, S. Richmond, J. Middleton</i>	
NON-INVASIVE DETERMINATION OF THE MANDIBULAR TRANSVERSE HORIZONTAL AXIS USING A STRUCTURED LIGHT 3D SCANNER	202
<i>A. Keeling, P. Brunton, R. Holt</i>	
THE EFFECT OF SCREW PRELOAD AND FRAMEWORK MATERIAL ON THE SUCCESS OF CEMENTABLE FIXED PARTIAL PROSTHESIS: A FINITE ELEMENT STUDY	204
<i>I. Hasan, L. Keilig, W. Luckeath, C. Bouraue</i>	
THE EFFECT OF PERIODONTITIS ON THE MATERIAL PARAMETERS OF THE PERIODONTAL LIGAMENT: A COMBINED CLINICAL AND NUMERICAL STUDY	206
<i>C. Bouraue, P. Toutian, U. Demir-Gaydoff</i>	
VALIDATION OF A POROELASTIC MODEL FOR THE NUMERICAL SIMULATION OF PDL	208
<i>C. Bouraue, M. Favino, R. Krause</i>	

GENERAL SESSION: BONE MECHANICS II

MULTIPHYSICS SIMULATIONS OF BONE AND FLUID INTERACTION	211
<i>G. Niebur, E. Birmingham, P. McHugh</i>	
PATIENT-SPECIFIC VERIFIED AND VALIDATED SIMULATIONS OF THE MECHANICAL RESPONSE OF HUMAN FEMURS WITH METASTATIC TUMORS	213
<i>R. Mayo, N. Trabelsi, C. Milgrom, Z. Yosibash</i>	
RAPID PREDICTION OF THE STRAIN FIELD WITHIN THE INTACT FEMUR USING SURROGATE MODELLING TECHNIQUES	215
<i>M. Taylor, M. Strickland, P. Nair</i>	

CORTICAL BONE AT THE METAPHYSIS HAS GREATER ADAPTIVE RESPONSE TO LOADING THAN DIAPHYSIS: A 3D DYNAMIC IN VIVO MORPHOMETRY STUDY	217
<i>A. Birkhold, H. Razi, G. Duda, S. Checa, B. Willie</i>	
MUSCLE LOADING INFLUENCES BONE REMODELING IN THE NATURAL ACETABULUM	219
<i>J. Fernandez, M. Sartori, D. Lloyd, J. Munro, V. Shim</i>	

GENERAL SESSION: CARDIOVASCULAR MECHANICS, ARTERIAL

AN APPROACH TO ESTIMATE OUTCOMES OF SILK STENT DEPLOYMENT TO CEREBRAL ANEURYSMS USING TRANSIENT CFD ANALYSIS	222
<i>E. Sunbuloglu, B. Erdem, K. Kirkkopru, E. Bozdog, P. Beyaz, C. Islak</i>	
EXPERIMENTAL CHARACTERIZATION AND RELATED MODELING OF DAMAGE MECHANISMS IN SOFT BIOLOGICAL TISSUES	224
<i>T. Schmidt, D. Balzani, A. Schriefl, G. Holzapfel</i>	
HEMODYNAMIC SIMULATIONS IN COMPLIANT BLOOD VESSELS: APPLICATION TO THE TOTAL CAVOPULMONARY CONNECTION AND METHODOLOGY FOR IN-VIVO VALIDATION	226
<i>L. Mirabella, C. Haggerty, T. Passerini, A. Barker, M. Piccinelli, A. Powell, P. Nido, A. Veneziani, M. Markl, A. Yoganathan</i>	
VALIDATION OF AN OPEN SOURCE FRAMEWORK FOR THE SIMULATION OF BLOOD FLOW IN RIGID AND DEFORMABLE VESSELS	228
<i>T. Passerini, A. Quaini, U. Villa, A. Veneziani, S. Canic</i>	
COMPUTATIONALLY EFFICIENT SIMULATION OF ARTERIAL SURFACE STIFFNESS THROUGH AUTOMATED GENERATION OF FE MODELS FROM IVUS-VH IMAGES	230
<i>C. Bennetts, A. Erdemir, M. Young</i>	

GENERAL SESSION: DENTAL BIOMECHANICS II

BIOMECHANICAL INVESTIGATION OF UNEXPECTED TOOTH MOVEMENTS DURING RETENTION PHASE	233
<i>L. Keilig, T. Eber, J. Raiman, C. Bourauel</i>	
COMPUTATIONAL MODELLING FOR TOOTH MOVEMENT IN ORTHODONTIC TREATMENT	235
<i>J. Chen, N. Abidin, S. Tammareddi, W. Li, M. Swain, Q. Li</i>	
MEASURING BITING FORCE OF INCLINED IMPLANTS RETAINING MANDIBULAR OVER DENTURE USING NOVEL SENSOR	237
<i>M. Elramady, T. Nassef, M. Awadalla, F. Mohamed</i>	
DIFFERENT KINDS OF ORTHODONTIC TREATMENT FOLLOWING PERIODONTITIS - NUMERICAL SIMULATIONS AND BIOMECHANICAL ANALYSIS	239
<i>S. Reimann, C. Reichert, M. Cortez, I. Hasan, A. Kettenbeil, L. Keilig, A. Jager, C. Bourauel</i>	
NUMERICAL ANALYSIS OF THE EFFECT OF IMPLANT GEOMETRY TO STRESS DISTRIBUTIONS OF DENTAL IMPLANT SYSTEM	241
<i>T. Topkaya, M. Solmaz, S. Dundar, H. Adin</i>	

SS1: FEBIO WORKSHOP #1 – TETRAHEDRAL ELEMENTS AND CONTACT

PLENARY SPEAKER: SUVRANU DE – “VIRTUAL SURGERY”

GENERAL SESSION: CARDIAC MECHANICS

BIOMECHANICS OF ACELLULAR INJECTION THERAPIES FOR MYOCARDIAL INFARCTION	246
<i>T. Franz</i>	
NEW FINITE ELEMENT METHODS FOR BIOMECHANICS SIMULATIONS OF THE WHOLE HEART USING CUBIC HERMITE MESHES WITH EXTRAORDINARY NODES	248
<i>A. Krishnamurthy, M. Gonzales, C. Villongco, G. Sturgeon, W. Segars, R. Kerckhoffs, A. McCulloch</i>	
SPLINE BASED MICROSTRUCTURAL MAPPING FOR SOFT BIOLOGICAL TISSUES: APPLICATION TO AORTIC VALVES	250
<i>A. Agrawal, V. Aguilar, C. Lee, J. Gorman, R. Gorman, M. Sacks</i>	
NONLINEAR IN-VIVO MATERIAL PARAMETER IDENTIFICATION OF THE MITRAL VALVE LEAFLET	252
<i>M. Rausch, W. Bothe, D. Miller, E. Kuhl</i>	
REDUCED ORDERED MODEL OF A HUMAN LEFT AND RIGHT VENTRICLE BASING ON POD METHOD	254
<i>P. Przybyla, W. Stankiewicz, M. Morzynski, S. Stefaniak, M. Jemielity</i>	

GENERAL SESSION: CELL MECHANICS

CELLULAR MECHANICS OF ADIPOCYTES	257
<i>R. Katzungold, N. Shoham, P. Girshovitz, N. Shaked, D. Benayahu, A. Gefen</i>	

MODIFIED HELFRICH ELASTICITY: MOLECULAR DYNAMIC SIMULATION OF THE LIPID BILAYER TENDING	259
<i>J. Kim, W. Cai, P. Pinsky, C. Steele</i>	
EFFECT OF STRUCTURAL DAMAGE OF EXTRACELLULAR MATRIX ON THE MECHANICAL BEHAVIOUR OF IN-SITU CHONDROCYTES	261
<i>E. Moo, S. Han, S. Federico, A. Jinha, Z. Abusara, N. Osman, B. Pingguan-Murphy, W. Herzog</i>	
THERMODYNAMICAL MODEL FOR STRESS-FIBER ORGANIZATION IN ADHERENT CELLS	263
<i>L. Foucard, F. Vernerey</i>	
DYNAMICS OF MECHANICAL SIGNAL TRANSMISSION THROUGH A NETWORK OF PRESTRESSED ACTIN STRESS FIBERS: ROLE OF CYTOSKELETAL ORGANIZATION	265
<i>C. Gouget, Y. Hwang, A. Barakat</i>	

GENERAL SESSION: LIGAMENT AND TENDON MECHANICS

WHY INTER-INSERTIONAL DISTANCE IS A POOR CORRELATE FOR LIGAMENT LOAD: ANALYSIS FROM IN VIVO DATA	268
<i>N. Shrive, M. Atarod, J. Rosvold, C. Frank</i>	
A FINITE ELEMENT MODEL OF THE TRICEPS SURAE TO EXPLORE ACHILLES TENDON SLIDING AND ADHESION DURING ECCENTRIC CONTRACTIONS	270
<i>G. Handsfield, L. Chernak, D. Thelen, S. Blemker</i>	
FINITE ELEMENT PREDICTIONS OF SUPERIOR LABRAL TEAR MECHANICS SECONDARY TO ROTATOR CUFF TEARS	272
<i>E. Hwang, J. Carpenter, R. Hughes, M. Palmer</i>	
CONTINUUM DESCRIPTION OF THE TIME-AND STRAIN-DEPENDENT POISSON'S RATIO OF LIGAMENT UNDER FINITE DEFORMATION	274
<i>A. Swedberg, S. Reese, S. Maas, B. Ellis, J. Weiss</i>	
PRE-FAILURE MODEL OF ACHILLES TENDON LENGTHENING SURGERY CORRELATES MAXIMUM STRESSES AND INDUCED TENDON SLIDING GAP	276
<i>G. Forell, T. Nelson, T. Stephens, A. Bowden</i>	

SS23: ANSYS WORKSHOP: ENGINEERING SIMULATION FOR CLINICAL APPLICATIONS

SS22: THE SCIENTIFIC COMPUTING AND IMAGING INSTITUTE AT THE UNIVERSITY OF UTAH: OVERVIEW, IMAGE-BASED MODELING, SIMULATION AND SCIRUN

SS10: MUSCULOSKELETAL MODELING

MUSCLE SYNERGIES IMPROVE ESTIMATION OF KNEE CONTACT FORCES DURING WALKING	281
<i>B. Fregly, J. Walter, A. Kinney, S. Banks, D. D'Lima, T. Besier, D. Lloyd</i>	
A COSIMULATION FRAMEWORK TO PROBE THE INFLUENCE OF LIGAMENT PROPERTIES ON KNEE KINEMATICS AND KINETICS DURING HUMAN GAIT	283
<i>D. Thelen, A. Schmitz</i>	
SURGICAL SIMULATIONS BASED ON LIMITED QUANTITATIVE DATA: WHAT CAN WE LEARN?	285
<i>J. Nichols, M. Bednar, W. Murray</i>	
PREDICTION OF HIP CONTACT FORCES USING A MUSCULOSKELETAL LOWER LIMB MODEL: A FALSIFICATION APPROACH	287
<i>L. Modenese, A. Gopalakrishnan, A. Phillips</i>	
TIBIOFEMORAL JOINT FORCES DURING THE STANCE PHASE OF GAIT AFTER ACL RECONSTRUCTION	289
<i>B. Sanford, J. Williams, A. Zucker-Levin, W. Mihalko</i>	

SS15: FEBIO WORKSHOP #2 – MULTIPHASIC MATERIALS

SS2: COMPUTATIONAL METHODS FOR BIO-IMAGING AND VISUALIZATION

AUTOMATED SPATIO-TEMPORAL ALIGNMENT OF PLANTAR PRESSURE IMAGE	293
<i>F. Oliveira, J. Tavares</i>	
CHARACTERISING THE OPTICAL ACTIVITY OF BOVINE PERICARDIUM USING POLARIMETRY	295
<i>K. Wang, J. Jor, N. Lippok, A. Taberner, M. Nash, P. Nielsen</i>	
GENETIC ALGORITHMS WITH THE FUNDAMENTAL SOLUTION OF LAPLACE FOR THE INVERSE PROBLEM OF ELECTROCARDIOGRAPHY	297
<i>B. Ainseba, M. Bendahmane, A. Lopez</i>	
ACCURACY OF IN VIVO ASSESSMENT OF CORTICAL BONE POROSITY MEASURED BY HIGH-RESOLUTION PERIPHERAL QUANTITATIVE COMPUTED TOMOGRAPHY	299
<i>B. Jorgenson, H. Buie, S. Boyd</i>	

SS5: COMPUTATIONAL SKIN MECHANOBIOLOGY

A NOVEL METHOD FOR IN-VITRO MECHANICAL CHARACTERIZATION OF THE TOP LAYERS OF THE SKIN	301
<i>C. Oomens, E. Lamers, G. Peters</i>	
ON THE BIOMECHANICS AND MECHANOBIOLOGY OF GROWING SKIN	303
<i>A. Zollner, M. Holland, A. Gosain, E. Kuhl</i>	
ON THE BIOMECHANICS AND MECHANOBIOLOGY OF GROWING SKIN	305
<i>S. Evans, G. Boyer, J. Molimard, H. Zahouani</i>	
ON THE MECHANICS OF THE DERMAL-EPIDERMAL JUNCTION OF HUMAN SKIN	307
<i>D. Garcia-Martinez, G. Limbert</i>	
FINITE ELEMENT MODELING OF SOFT TISSUES FOR PRESSURE ULCERS PREVENTION	309
<i>V. Luboz, A. Perrier, M. Bucki, N. Vuillerme, F. Cannard, B. Diot, Y. Payan</i>	

GENERAL SESSION: CARDIOVASCULAR MECHANICS, STENTS

VIRTUAL BENCH TESTING OF MINIMALLY INVASIVE CARDIOVASCULAR DEVICES: FROM BENCH TO BED	312
<i>M. Beule, S. Bock, F. Iannaccone, N. Debusschere, P. Segers, B. Verhegghe, P. Verdonck</i>	
INFLUENCE OF STENT POROSITY ON THE ENDOVASCULAR TREATMENT OF INTRACRANIAL ANEURYSMS LOCATED NEAR A BIFURCATION: A COMPUTATIONAL INVESTIGATION	314
<i>H. Chan, A. Tang, A. Tsang, G. Leung, K. Leung, K. Chow</i>	
COMPUTATIONAL FLUID DYNAMICS SIMULATIONS INCLUDING OXYGEN MASS TRANSPORT IN STENTED CORONARIES	316
<i>B. Keller, S. Seshadhri, F. Migliavacca, G. Dubini</i>	
MULTI-OBJECTIVE OPTIMIZATION OF CORONARY STENTS	318
<i>S. Tammareddi, Q. Li</i>	
VIRTUAL STENT DEPLOYMENT IN STENOTIC CAROTID ARTERIES : A GEOMETRICAL ASSESSMENT OF THE STENT BEHAVIOR	320
<i>F. Iannaccone, M. Beule, G. Santis, P. Segers, B. Verhegghe</i>	

SS16: GROWTH, REMODELING AND ADAPTATION OF BIOLOGICAL TISSUE

BONE ADAPTATION MODELING FOR TREATMENT PLANNING IN VIRTUALLY AUGMENTED HIGH-RESOLUTION HUMAN BONES	323
<i>S. Badilatti, R. Widmer, A. Levchuk, D. Webster, S. Ferguson, R. Muller</i>	
ADAPTIVE RESPONSE OF DIAPHYSEAL BONE TO MECHANICAL LOADING SPATIALLY RELATES TO LOCAL STRAINS WITH HIGHER THRESHOLD IN PERIOSTEUM THAN ENDOSTEUM	325
<i>H. Razi, A. Birkhold, G. Duda, B. Willie, S. Checa</i>	
COMPUTATIONAL GROWTH MODEL OF THE CAROTID ARTERY BIFURCATION IN HYPERTENSIVE DISEASE	327
<i>P. Saez, M. Malve, E. Pena, M. Martinez, E. Kuhl</i>	
EFFECTS OF THE ACTIVE FORCES GENERATED BY NEOVESSEL SPROUTS ON ECM DEFORMATION AND MICROVASCULAR ALIGNMENT DURING ANGIOGENESIS	329
<i>L. Edgar, S. Maas, J. Guilkey, J. Weiss</i>	
INCREASING GLUCOSE AVAILABILITY IN LARGE ENGINEERD CARTILAGE CONSTRUCTS USING NUTRIENT CHANNELS: A FINITE ELEMENT STUDY	331
<i>R. Nims, A. Cigan, M. Albro, D. Park, G. Vunjak-Novakovic, C. Hung, G. Ateshian</i>	

SS21: MATERIALISE WORKSHOP: MIMICS & ABAQUS WORKSHOP: FROM MEDICAL SCAN DATA TO FEA AND BEYOND

SS8: DYNAMIC MUSCULOSKELETAL SIMULATIONS

CHANGES IN MODEL-PREDICTED MUSCLE ACTIVATION WITH SUBJECT-SPECIFIC PARAMETERS FOR INDIVIDUALS POST-STROKE	335
<i>B. Knarr, D. Reisman, S. Binder-Macleod, J. Higginson</i>	
EFFECTS OF OBESITY ON INDIVIDUAL MUSCLE FUNCTION DURING WALKING	337
<i>Z. Lerner, D. Haight, W. Board, R. Brown</i>	
THE NUMBER AND CHOICE OF MUSCLES IMPACT THE RESULTS OF MUSCLE SYNERGY ANALYSES	339
<i>K. Steele, M. Tresch, E. Perreault</i>	
MODELING FOOT-GROUND INTERACTION WITH FOOT SURFACE CONTOUR AND ELASTIC FOUNDATION MODELING	341
<i>W. Aerts, F. Groote, J. Sloten, I. Jonkers</i>	

NEUROMUSCULAR MODEL OF HUMAN LOCOMOTION BASED ON SPINAL REFLEXES THAT EMBED FUNDAMENTAL PRINCIPLES OF LEGGED DYNAMIC SYSTEMS	343
<i>H. Geyer, S. Song, R. Desai</i>	

PLENARY SPEAKER: ANDREW MCCULLOCH

GENERAL SESSION: CARDIOVASCULAR, LARGE VESSELS

SIMULATION HEART VALVE BIOMATERIAL FATIGUE	347
<i>M. Sacks, R. Fan</i>	
INVERSE METHOD OF STRESS ANALYSIS FOR INTRACRANIAL ANEURYSMS	349
<i>J. Lu, S. Hu, M. Raghavan</i>	
IDENTIFICATION OF THE ANISOTROPIC STRESS-STRAIN RELATIONSHIP OF HUMAN AORTIC WALLS IN VIVO	351
<i>A. Wittek, D. Karatolios, S. Vogt, R. Moosdorf, P. Bihari, T. Schmitz-Rixen, C. Blasé</i>	
REGISTRATION-ENHANCED RECONSTRUCTION OF DENSE-MRI TISSUE DISPLACEMENT FIELDS.....	353
<i>A. Gomez, S. Merchant, E. Hsu</i>	

GENERAL SESSION: MUSCULOSKELETAL MODELING II

FUNCTIONAL OUTCOME PREDICTION AFTER SURGICAL INTERVENTIONS: THE CASE OF ACETABULAR RECONSTRUCTION.....	356
<i>W. Bartels, J. Demol, I. Jonkers, J. Sloten</i>	
THE EFFECTS OF FATIGUE ON POST-STROKE MUSCLE FORCE PRODUCTION AND CENTER OF MASS ACCELERATION: A MUSCULOSKELETAL SIMULATION ANALYSIS.....	358
<i>C. Brandis, L. Awad, H. Hsiao, M. Marion, T. Kesar, B. Knarr, J. Higginson, S. Binder-MacLeod</i>	
DOES MUSCULO-SKELETAL DYNAMIC SIMULATION PROPERLY PREDICT ARM MUSCLE ACTIVATION DURING GAIT?	360
<i>H. Yoon, S. Lee, Y. Kim, K. Lee</i>	
NECK STIFFNESS PROPERTIES IN A LAMB - AN ANIMAL MODEL OF SHAKEN BABY SYNDROME	362
<i>T. Lintern, N. Gamage, A. Taberner, P. Nielsen, F. Bloomfield, M. Nash</i>	
A NEW GEOMETRICALLY CONSISTENT MUSCULOSKELETAL MODEL OF THE LOWER EXTREMITY BASED ON IMAGING AND CADAVER MEASUREMENTS	364
<i>R. Fluit, P. Pellikaan, V. Carbone, M. Krogt, M. Damsgaard, B. Koopman, N. Verdonchot</i>	

SS13: MULTISCALE BIOMECHANICS: BRIDGING FROM THE BODY/ORGAN LEVEL TO THE TISSUE/CELL/MICROSTRUCTURAL LEVEL

PREDICTING CELL MECHANICS FROM JOINT & TISSUE LOADING.....	367
<i>A. Erdemir</i>	
COLLAGEN BASED PHYSICAL SURROGATES FOR THE DEVELOPMENT OF MULTISCALE MODELING AND VALIDATION METHODS.....	369
<i>S. Reese, J. Weiss</i>	
DYNAMIC CYTOSKELETAL AND CONTRACTILE UNIT REORGANISATION IN AIRWAY SMOOTH MUSCLE: RELEVANCE TO FORCE AND LENGTH ADAPTATION	371
<i>B. Brook, O. Jensen</i>	
IMPORTANCE OF SPLIT-LINES OF CARTILAGE AND COLLAGEN FIBRILS IN THE PERICELLULAR MATRIX ON CELL DEFORMATIONS IN A KNEE JOINT	373
<i>P. Tanska, A. Bidhendi, M. Mononen, R. Korhonen</i>	
CONCURRENT SIMULATION OF MUSCLE FORCE AND TISSUE STRESS DURING MOVEMENT: MULTISCALE MODELING FROM THE BODY TO TISSUE LEVELS.....	375
<i>T. Guess, A. Stylianou, M. Kia, Y. Lu, R. Derakhshani, P. Pulasani</i>	

GENERAL SESSION: JOINT CONTACT MECHANICS

FINITE ELEMENT MODELING OF FRICTIONLESS SLIDING CONTACT BETWEEN MULTIPHASIC MATERIALS UNDER FINITE DEFORMATION	378
<i>G. Ateshian</i>	
EFFECTS OF CONSTITUTIVE MODEL ON SPECIMEN-SPECIFIC PREDICTIONS OF CARTILAGE MECHANICS IN THE HUMAN HIP	380
<i>C. Henak, G. Ateshian, S. Maas, J. Weiss</i>	
APPLICATION OF BIPHASIC CARTILAGE TO A THREE DIMENSIONAL NATURAL HIP UNDER STATIC AND DYNAMIC LOADS.....	382
<i>J. Li, T. Stewart, Z. Jin, J. Fisher, R. Wilcox</i>	

THE EFFECT OF MALALIGNMENT ON KNEE JOINT CONTACT STRESSES AND FORCES DURING HEEL STRIKE AND TOE OFF	384
<i>F. Reisse, R. Walker, D. Carpanen, M. Lenhoff, S. Rozbruch, C. Imhauser, M. Koff, J. Dowell, H. Hillstrom, R. Mootanah</i>	

GENERAL SESSION: MULTISCALE MODELING

MULTI-SCALE MODELLING IN PHYSIOLOGY: FROM THE DISCRETE TO THE HOMGENISED	387
<i>T. David, M. Shaikh, R. Brown</i>	
EVOLUTION OF BONE VOLUME FRACTION IN BONE REMODELING: A MULTISCALE ANALYTICAL INVESTIGATION	389
<i>M. Colloca, R. Blanchard, C. Hellmich, K. Ito, B. Rietbergen</i>	
MICROMECHANICS OF HAVERSIAN BOVINE BONE	391
<i>S. Nohakhti, O. Katsamenis, O. Andriotis, G. Limbert, P. Thurner</i>	
MULTISCALE MODELING AND INTERDISCIPLINARY APPROACH FOR MYOCARDIUM TISSUE ENGINEERING AND OPTIMIZATION OF PULMONARY VALVE REPLACEMENT SURGICAL PROCEDURES	393
<i>D. Tang, C. Yang, T. Geva, R. Rathod, A. Tang, M. Kural, H. Zuo, K. Billiar, G. Gaudette, P. Nido</i>	
A MULTISCALE 3D-FEM MODEL FOR ANISOTROPIC LIVER PERFUSION AND CELL METABOLISM	395
<i>T. Ricken, D. Werner, H. Holzhutter, M. König, U. Dahmen, O. Dirsch</i>	

SS12: COMPUTATIONAL MODELING OF SKELETAL MUSCLE ACROSS SCALES

ACTIVATION-DEPENDENT RATES OF FORCE DEVELOPMENT SIMULATED USING A HUXLEY-TYPE CROSS-BRIDGE MODEL WITH ADDED COOPERATIVITY	398
<i>K. Campbell</i>	
PREDICTION OF MUSCLE FIBER STRETCH RECEPTOR RESPONSE USING FINITE ELEMENTS	400
<i>J. Halloran</i>	
MULTISCALE MODELING OF THE NEUROMUSCULAR SYSTEM	402
<i>T. Heidlauf, O. Rohrlé</i>	
FORWARD-DYNAMICS TRACKING SIMULATION OF COUPLED MULTIBODY AND FINITE ELEMENT MODELS: APPLICATION TO THE TONGUE AND JAW	404
<i>C. Sanchez, I. Stavness, J. Lloyd, S. Fels</i>	
MUSCLE SHORT-RANGE STIFFNESS IS THE MAJOR CONTRIBUTOR TO THE ENDPOINT STIFFNESS OF THE HUMAN ARM	406
<i>X. Hu, W. Murray, E. Perreault</i>	

POSTER SESSION: BONE MECHANICS

COMPUTATIONAL BONE ADAPTATION FOLLOWING POSTEROLATERAL SPINE FUSION	409
<i>F. Pfeiffer, D. Abernathie, C. Ward, D. Smith</i>	
MAPPING TRABECULAR ANISOTROPY OF THE PROXIMAL FEMUR FOR APPLICATION TO IMAGE-BASED FINITE ELEMENT ANALYSIS	411
<i>W. Enns-Bray, S. Boyd</i>	
PATIENT SPECIFIC VERTEBRAL STRENGTH ASSESSMENT IN PATIENTS WITH INFILTRATED MULTIPLE MYELOMA CANCER	413
<i>O. Holub, D. Skrzypiec, E. Dall'Ara, U. Wolfram, D. Pahr, J. Timothy, G. Cook, N. Kapur, P. Zysset, R. Hall</i>	
COMPUTER SIMULATION OF BONE REMODELING AROUND LUMBAR PEDICLE SCREW	415
<i>M. Tuna, E. Sunbuloglu, E. Bozdog</i>	

POSTER SESSION: CARDIOVASCULAR MECHANICS

A MULTISCALE MODEL OF THE INFLUENCE OF OXYGEN DURING BONE FRACTURE HEALING	417
<i>A. Carlier, L. Geris, H. Oosterwyck</i>	
THE ROLE OF LOCAL MECHANICAL STRAINS/STRESSES IN CALLUS TISSUE PATTERNING DURING LARGE BONE DEFECT HEALING	419
<i>S. Checa, G. Duda</i>	
VALIDATION OF SUBJECT-SPECIFIC FINITE ELEMENT MODELS OF COMPOSITE BONES USING OPTICAL FULL-FIELD STRAIN MEASUREMENTS	421
<i>L. Grassi, S. Vaananen, S. Yavari, H. Weinans, J. Jurvelin, A. Zadpoor, H. Isaksson</i>	
A POROELASTIC STUDY OF MICRO-MECHANICAL STIMULI IN TRABECULAR BONE	423
<i>C. Sandino, D. McErlain, J. Schipilow, S. Boyd</i>	
A MULTIPHASE FLOW METHODOLOGY FOR QUANTIFYING BLOOD ELEMENT DAMAGE IN CARDIOVASCULAR FLOWS	426
<i>B. Yun, C. Aidun, A. Yoganathan</i>	
A MULTISCALE MODEL OF THE NEONATAL CIRCULATORY SYSTEM FOLLOWING HYBRID NORWOOD PALLIATION	428
<i>A. Ceballos, R. Osorio, E. Divo, I. Argueta-Morales, C. Caldarone, A. Kassab, W. Decampoli</i>	

FINITE ELEMENT SIMULATIONS TO INVESTIGATE THE MECHANICAL BEHAVIOR OF COATED BIODEGRADABLE STENTS	430
<i>N. Debusschere, B. Verhegghe, P. Dubruel, M. Beule, P. Segers</i>	
1D, 2D AND 3D STRUCTURAL MODELS FOR HILL-TYPE MUSCLE MODELS	432
<i>J. Wakeling, A. Randhawa</i>	
EXPERIMENTAL AND FINITE ELEMENT EVALUATION OF ABDOMINAL AORTIC STENT GRAFT MECHANICS	434
<i>S. Bock, F. Iannaccone, M. Beule, F. Vernassen, P. Segers, B. Verhegghe</i>	
BIDIRECTIONAL GLENN AND HIGH ALTITUDE: MODELING THE PERFORMANCE OF PALLIATED SINGLE VENTRICLE	436
<i>R. Khiabani, C. Vallecilla, N. Sandoval, M. Fogel, J. Briceno, A. Yoganathan</i>	
INVESTIGATION OF EFFECT OF SPIRAL FLOW ON HEMODYNAMIC CHANGES IN A MODEL OF ABDOMINAL AORTIC ANEURYSM	438
<i>A. Javadzadegan, M. Behnia</i>	
CT IMAGING AND VOLUMETRIC ANALYSIS OF HEART DEFORMATION DURING SIMULATED PEDIATRIC CPR	440
<i>G. Glass, R. Kent, M. Maltese, D. Bass, M. Sochor</i>	
COMPUTATIONAL MODELING OF THE REPOLARIZATION SEQUENCE IN THE HUMAN HEART	442
<i>D. Hurtado, S. Castro, E. Kuhl</i>	

POSTER SESSION: CONSTITUTIVE MODELING

UNCONFINED COMPRESSION OF PORCINE CORNEAL STROMA; A TRANSVERSELY ISOTROPIC BIPHASIC ANALYSIS	445
<i>H. Hatami-Marbini, E. Etebu</i>	
MECHANICAL CHARACTERIZATION OF LIVER PARENCHYMA THROUGH DYNAMIC TENSILE TESTS AND SPECIMEN SPECIFIC FINITE ELEMENT MODELS	447
<i>C. Untaroiu, Y.-C. Lu</i>	
A MUSCLE MODEL BASED ON FELDMAN'S LAMBDA MODEL: 3D FINITE ELEMENT IMPLEMENTATION	449
<i>M. Nazari, P. Perrier, Y. Payan</i>	
MODELING TISSUES WITH DISTRIBUTED FIBERS USING GENERALIZED HIGH-ORDER STRUCTURE TENSORS AND DIRECTIONAL BUCKLING	451
<i>D. Cortes, D. Elliott</i>	

POSTER SESSION: COMPUTATIONAL METHODS

THE IMPORTANCE OF BIOLOGICAL VARIATION IN BIOMECHANICAL SIMULATIONS: A META-ANALYSIS OF CURRENT MODELING PRACTICES	454
<i>D. Cook, M. Julias, E. Nauman</i>	
APPROXIMATION METHOD TO OBTAIN ELASTICITY TENSOR FROM GREEN-NAGHDI RATE OF THE KIRCHHOFF STRESS	456
<i>H. Liu, W. Sun</i>	
SIMULATING TWO TONE SUPPRESSION IN COCHLEAR MECHANICS USING A COMPUTATIONAL MODEL	458
<i>J. Meaud, K. Grosh</i>	
A DEFORMABLE CELL MODEL AND ITS APPLICATION TO INVESTIGATE INITIAL CELL SPREADING	460
<i>T. Odenthal, B. Smeets, P. Liedekerke, E. Tijssens, H. Oosterwyck, H. Ramon</i>	
THREE DIMENSIONAL ARTICULATING CARTILAGE MODELING USING STATISTICAL ATLASES	462
<i>E. Fatah, M. Mahfouz</i>	

POSTER SESSION: DENTAL BIOMECHANICS

CHALLENGING ISSUES IN BIOMECHANICS DEVELOPED FOR DENTAL APPLICATIONS	465
<i>Y. Gutman, J. Keller</i>	

POSTER SESSION: DYNAMIC SIMULATION

A DYNAMIC COMPUTER MODEL FOR SIMULATION OF HIP REDUCTIONS WITH THE PAVLIK HARNESS IN DEVELOPMENTAL HIP DYSPLASIA	468
<i>O. Ardila, E. Divo, F. Mosleh, G. Rab, A. Kassab, C. Price</i>	
SEPARATION OF DICHOTOMOUS KINEMATIC DATA INTO A SUBSPACE FORMED BY SUPORT VECTOR MACHINE DISCRIMINANTS AND ITS ORTHOGONAL COMPLEMENT	470
<i>V. Tschanner, H. Enders, C. Maurer</i>	
A REALISTIC DYNAMIC SIMULATOR OF CERVICAL SPINE FOR VIRTUAL IN-VITRO CADAVERIC STUDY	472
<i>D. Lim, Y. Kim</i>	

COMPARISON OF GLOBAL AND SEGMENT OPTIMIZATION ON JOINT MOMENT ESTIMATION DURING STAIR ASCENT AND DESCENT IN THE ELDERLY	474
<i>V. Moniz-Pereira, S. Cabral, F. Carmide, A. Veloso</i>	
MODELING THE DYNAMICS OF A 3D CONTINUUM-MECHANICAL TWO-MUSCLE MUSCULOSKELETAL SYSTEM	476
<i>M. Sprenger, S. Schmitt, Y. Wang, O. Rohrle</i>	
QUANTITATIVE VALIDATION OF ANYBODY MUSCULOSKELETAL SYSTEM (AMS) USING EMG DURING FORWARD HOPPING AND SIDE JUMPING	478
<i>A. Wibawa, N. Verdonshot, J. Halbertsma, J. Burgerhof, R. Diercks, G. Verkerke</i>	
DEVELOPMENT OF A MUSCULOSKELETAL MODEL TO DETERMINE KNEE CONTACT FORCE DURING WALKING ON BALLAST USING OPENSIM	480
<i>H. Xu, A. Merryweather, D. Bosswick</i>	
CONTINUOUS VARIABILITY ASSESSMENT OF VERTICAL GROUND REACTION FORCES DURING LANDING	482
<i>A. Nordin, J. Dufek</i>	

POSTER SESSION: FEM APPLICATIONS

THINNING OF THE HUMAN ACHILLES TENDON IN ITS MEDSECTION CAUSES STRESS CONCENTRATION IN THE REGION OF TENDON RUPTURE	485
<i>V. Shim, J. Fernandez, P. Gamage, T. Wren, C. Regnery, P. Hunter, D. Lloyd, T. Besier</i>	
MODELLING OF MAMMOGRAPHIC COMPRESSION OF ANTROPOMORPHIC SOFTWARE BREAST PHANTOM USING FEBIO	487
<i>M. Lago, A. Maidment, P. Bakic</i>	
DEVELOPMENT OF AN EYE FINITE ELEMENT MODEL FOR INTRAOCULAR PRESSURE PREDICTIONS IN CHILDREN	489
<i>J. Saffioti, B. Coats</i>	
VALIDATED 3D FINITE ELEMENT MODEL OF RAT TIBIAL ANTERIOR MUSCLE	491
<i>A. Ramirez-Martinez, B. Calvo, J. Grasa</i>	
PATIENT-SPECIFIC 3D SURGICAL SIMULATION OF DISTRACTION OSTEOGENESIS AND LEFORT I OSTEOTOMY USING THE FINITE ELEMENT METHOD	493
<i>M. Pekedis, S. Olmez, S. Dogan, H. Yildiz</i>	
THE EFFECT OF DIFFERENT MENISCUS MODELLING TECHNIQUES ON THE LOAD TRANSFER FUNCTION OF THE MENISCUS	495
<i>D. Carpanen, R. Walker, F. Reisse, M. Lenhoff, M. Koff, H. Hillstrom, R. Mootanah</i>	
FINITE ELEMENT MODEL OF HUMAN SKIN MECHANICAL BEHAVIOUR USING SUCTION TEST	497
<i>D. Gad, J. Rowson, R. Voncken, R. Lewis, S. Franklin</i>	
SIMULATION OF SWALLOWING DYSFUNCTION AND ARTIFICIAL RESPIRATORY AFTER A MONTGOMERY T- TUBE INSERTION	499
<i>O. Trbelsi, M. Mave, M. Doblare</i>	

POSTER SESSION: INJURY & DISEASE

VERIFICATION OF A SHOCK TUBE FINITE ELEMENT MODEL FOR BLAST OCULAR INJURY SIMULATIONS	502
<i>D. Shedd, B. Coats</i>	
DEVELOPMENT OF GEOMETRY-BASED HELMET COMPARISON TECHNIQUES FOR PROTECTING CRITICAL BRAIN AREAS AGAINST IMPACTS	504
<i>M. Ford, P. Matic, A. Leung</i>	
MICROBIOMECHANICAL MODELS FOR THE ULTRASONIC DETECTION OF BREAST CANCER IN SURGICAL MARGINS	506
<i>M. Grover, T. Doyle</i>	
BIOMECHANICAL ANALYSIS OF INFANT FALL IMPACTS USING HIC TO PREDICT INJURY SEVERITY	508
<i>K. Mefferd, N. Ryan-Wenger, J. Dufek</i>	
ANALYSING THE POSITIONS THAT COULD POTENTIALLY LOAD THE ANTERIOR CRUCIATE LIGAMENT OF THE KNEE DURING QUADRICEPS CONTRACTION	510
<i>A. Imran</i>	
BIOMECHANICAL MODELS FOR THE MOLECULAR PROFILING OF BREAST CANCER WITH HIGH-FREQUENCY ULTRASOUND	512
<i>T. Doyle, J. Stiles, B. Curtis</i>	

POSTER SESSION: IMAGING AND IMAGE BASED SIMULATION

SEMI AUTOMATION OF MEAN AXIS OF ROTATION (MAR) ANALYSIS USING COMPUTER VISION	515
<i>M. Abbasi, G. Desmoulin, F. Ferrie, A. Khan</i>	

A COMPREHENSIVE SUBJECT SPECIFIC ANATOMICAL BASED 3-D BIOMECHANICAL MODEL TO EVALUATE PUTATIVE MECHANISMS UNDERLYING PELVIC ORGAN PROLAPSE: DEVELOPMENT AND VALIDATION	517
<i>J. Luo, L. Chen, J. Ashton-Miller, J. Delancey</i>	
IDENTIFICATION OF KNEE LIGAMENT ATTACHMENT SITES ON MRI SCAN IMAGES.....	519
<i>D. Janssen, H. Rachmat, L. Zavenbergen, R. Diercks, B. Verkerke, N. Verdonshot</i>	
COMPUTED TOMOGRAPHY AS A TOOL TO THE NUMERICAL ANALYSIS OF THE HUMAN FACE.....	521
<i>N. Coto, L. Driemeier, P. Noritomo, R. Granero, R. Dias, M. Alves</i>	
TRACING AS A TOOL FOR DETERMINING MURINE AIRWAY MORPHOLOGY FROM MICROFOCUS COMPUTER ASSISTED TOMOGRAPHY DATA.....	523
<i>N. Udell, I. Sinclair, M. Nixon, H. Haitch, P. Thurner</i>	
DEVELOPMENT OF A COMPUTED TOMOGRAPHY IMAGING AND RECONSTRUCTION PROTOCOL FOR ANATOMICAL CHARACTERIZATION OF EX VIVO JEJUNO(ILEO)CECAL SIDE-TO-SIDE ANASTOMOSES IN HORSES.....	525
<i>B. Iotti, F. Sammartano, A. Valazza, G. Giusto, M. Gandini</i>	
A RELIABLE, LOW-COST PACS SYSTEM FOR SMALL AND MEDIUM VETERINARY PRACTICES BUILT USING OPEN-SOURCE TECHNOLOGY	527
<i>B. Iotti, A. Valazza</i>	
RESTORATION OF FULL ANATOMY FROM PARTIAL BONES.....	528
<i>E. Fatah, M. Mahfouz</i>	
THE METHOD OF AUTOMATIC CREATION OF 3D OBJECTS FROM DICOM IMAGES	530
<i>D. Gawel, P. Przybyla, T. Kotwicki, M. Nowak</i>	

POSTER SESSION: IMPLANT & JOINT MECHANICS

USING STATISTICAL MODELING TO CHARACTERIZE RELATIONSHIPS BETWEEN KNEE SHAPE AND KINEMATICS.....	533
<i>C. Rao, L. Smoger, C. Fitzpatrick, L. Maletsky, P. Rullkoetter, P. Laz</i>	
STRUCTURE AND FUNCTION OF THE FOOT AND ANKLE: A DISCRIMINANT ANALYSIS TO ASSESS FOOT TYPE IN ASYMPTOMATIC HEALTHY INDIVIDUALS	535
<i>H. Hillstrom, J. Song, R. Mootanah, S. Rao, A. Kraszewski, J. Hafer, S. Backus, J. Deland</i>	
REAL TIME FINGER JOINT ANGLE CONTROL FOR PROSTHETICS USING SEMG SENSOR AND SYSTEM IDENTIFICATION	537
<i>P. Yarlagadda, Y. Yihnu, A. Gracia, M. Schoen</i>	
ESTIMATION OF JOINT FORCES AND MOMENTS INDUCED BY KNEE FUSION FOR THE PURPOSES OF THE DESIGN AND OPTIMIZATION OF AN ARTHRODESIS IMPLANT	539
<i>E. Lucas, J. O'Donnell, J. Desjardins, R. Hutchinson</i>	
INFLUENCE OF PRETENSION OF LIGATURE ON LUMBAR SPINE AFTER INTERSPINOUS PROCESS SURGERY	541
<i>D. Choi, K. Kim, Y. Kim</i>	
FINITE ELEMENT ANALYSIS OF THE EFFECT OF DEGENERATED INTERVERTEBRAL DISC ON THE LUMBAR SPINE BIOMECHANICS	543
<i>W. Park, K. Kim, Y. Kim</i>	
SIMULATION OF VERTEBROPLASTY FOR THE STABILIZATION OF COMPLEX VERTEBRAL FRACTURES.....	545
<i>I. Koh, P. Vogt, S. Ferguson</i>	
EFFECTS OF THE DEPTH OF CARTILAGE DEFECT ON THE KNEE JOINT MECHANICS: A DEPTH-DEPENDENT FIBER-REINFORCED POROELASTIC MODEL	547
<i>Y. Dabiri, S. Ahsanizadeh</i>	
A COMPARATIVE CASE STUDY OF THE PRE AND POST OPERATIVE STRESS DISTRIBUTION IN A DYSPLASTIC HIP JOINT	549
<i>F. Bueno-Palomeque, C. Cortes-Rodriguez, C. Garcia-Sarmiento, M. Cuervo-Campos</i>	
ADAPTIVE DUAL CONTROL OF THE LEG SPRING	551
<i>W. Kim, F. Joao, A. Veloso, D. Araujo</i>	
Author Index	