

51st Annual Rocky Mountain Bioengineering Symposium & 51st International ISA Biomedical Sciences Instrumentation Symposium 2014

Biomedical Sciences Instrumentation Volume 50

ISA Volume 498

**Denver, Colorado, USA
4-6 April 2014**

Editors:

M. Tucci

ISBN: 978-1-63266-391-7

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© (2036) by International Society of Automation - ISA
All rights reserved.

Printed by Curran Associates, Inc. (2016)

For permission requests, please contact International Society of Automation - ISA
at the address below.

International Society of Automation - ISA
67 Alexander Drive
Research Triangle Park, NC 27709 USA

Phone: (919) 549-8411
Fax: (919) 549-8288

info@isa.org

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

Review

NEUROPEPTIDES AS BIOLOGICAL SYSTEM INTEGRATORS – MINI REVIEW''''3

Gabi N. Waite¹, Roy W. Geib², Michael W. King³

¹Department of Cellular and Integrative Physiology, ²Department of Microbiology and Immunology, ³Department of Biochemistry and Molecular Biology, Indiana University School of Medicine- Terre Haute, IN, USA

Session I: Biomechanics/Bioinstrumentation

LOCALIZATION OF A MOVING TARGET USING A FLY EYE SENSOR''''34

Md. Arif Khan¹, Robert W. Streeter¹, Cameron H. G. Wright¹, Steven F. Barrett¹ and Susan A. Frost²

¹Dept. of Elec. And Comp. Engineering, University of Wyoming, WY

²NASA Ames Research Center, Moffett Field, California

SENSITIVITY AND STABILITY ANALYSIS OF A NONLINEAR MATERIAL MODEL OF CERVICAL INTERVERTEBRAL DISC UNDER CYCLIC LOADS USING THE

FINITE ELEMENT METHOD''''3; ''''''''

Mike W.J. Arun^{*}, Narayan Yoganandan^{*#}, Brian D. Stemper^{*#}, Mingxin Zheng^{+&}, Aidin Masoudi^{+^}, Brian Snyder^{+^}

^{*}Department of Neurosurgery, Medical College of Wisconsin, Milwaukee, WI, USA

[#] VA Medical Center, Milwaukee, WI, USA

⁺ Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA

[&] Boston University, Boston, MA, USA

[^] Children's Hospital Boston, Boston, MA, USA

QUANTIFICATION OF TOY SWORD KINEMATICS WITH MALE PEDIATRIC VOLUNTEERS''''53''

Stephanie M. Beeman, Steven Rowson, Stefan M. Duma

Virginia Tech – Wake Forest University, Center of Injury Biomechanics

WRIST/ARM SUPPORT TO ASSIST IN FINE MOTOR CONTROL FOR ESSENTIAL TREMOR PATIENTS''''59

Casey Brauchie, Kyle Hurley, Graham Barrett, Scott Morton, Steven Barrett

Mechanical Engineering Department, University of Wyoming, Laramie, WY

Session II: Biomaterial/Drug Delivery

THE EFFECTIVENESS OF POTENT DENTAL ADHESIVES ON THE VIABILITY OF LPS CHALLENGED HUMAN GINGIVAL FIBROBLASTS''''''63''

Angelia D. Garner, Michelle A. Tucci, Hamed A. Benghuzzi

University of Mississippi Medical Center

POLYMER-CONTROLLED EXTENDED COMBINATION RELEASE OF SILVER AND CHLORHEXIDINE FROM A BONE VOID FILLER''''''69''

Jason DeGooyer¹, Sherry N. Davidoff², Benjamin D. Brooks¹, David W. Grainger^{1,2}, Amanda E. Brooks²

¹Department of Bioengineering

²Department of Pharmaceutics and Pharmaceutical Chemistry

University of Utah, Salt Lake City, UT 84112 USA

CHOLESTEROL PRODUCTION INHIBITOR (STATIN) INCREASED ANGIOGENESIS IN SURGICALLY CREATED FEMORAL DEFECT IN AN ANIMAL MODEL''''''76

Felix Adah, Hamed Benghuzzi, Michelle Tucci, George Russell, Barry England

University of Mississippi Medical Center, University of Michigan Medical School

PHOTODEGRADABLE HYDROGELS FOR SELECTIVE CAPTURE AND RELEASE OF MAMMALIAN CELLS''''84

Paige Fischer^{***}, Mark Tibbitt^{**}, April Kloxin^{*}, Kristi Anseth^{**} and John Oakey^{***}

^{*}University of Delaware, UNITED STATES

^{**}University of Colorado, Boulder, UNITED STATES

^{***}University of Wyoming, UNITED STATES

DEVELOPMENT AND VERIFICATION OF A HYDROSTATIC PRESSURE CHAMBER FOR DETERMINING THE EFFECT OF PRESSURE ON LIVER

PROGENITOR CELLS''''8:

Sarah McMullen^{1*}, Emily Maggio^{1*}, Nathan Millard¹, Alyssa Dennis¹, Barry Landrum², Jayson Alexander², Michael Weeks², Jessica L. Sparks¹

¹Miami University College of Engineering and Computing

²Miami University Instrumentation Lab

MORPHOMETRIC ANALYSIS OF THE LOCATION AND ACTIVITY OF CYTOKINES IN THE TISSUE IMPLANT RESPONSE''''99

Kenneth R. Butler, Hamed Benghuzzi, Michelle Tucci, Aaron Puckett

University of Mississippi Medical Center, Jackson, MS 39216

Session III: Trauma

OPTIMIZATION OF A SIMPLIFIED AUTOMOBILE FINITE ELEMENT MODEL USING TIME VARYING INJURY METRICS""": 5

James P. Gaewsky, Kerry A. Danelson, Caitlin M. Weaver, Joel D. Stitzel
Virginia Tech-Wake Forest Center for Injury Biomechanics

EXAMINING LETHALITY RISK FOR RODENT STUDIES OF PRIMARY BLAST LUNG INJURY"""; 4

William Brad Hubbard¹, Christina Hall¹, Venkata Siva Sai Sujith Sajja¹, Erin Lavik², Pamela VandeVord^{1,3}

¹School of Biomedical Engineering and Sciences, ²Virginia Polytechnic and State University

³Department of Biomedical Engineering, Case Western Reserve University

HIGH MAGNITUDE HEAD IMPACTS EXPERIENCED DURING YOUTH FOOTBALL PRACTICES""":322"

Tyler Young, Steven Rowson, Stefan M. Duma
Virginia Tech-Wake Forest University Center for Injury Biomechanics

DEVELOPMENT OF A SIMPLIFIED FINITE ELEMENT MODEL OF THE 50TH PERCENTILE MALE OCCUPANT LOWER EXTREMITY""":328

Doron Schwartz, Daniel P. Moreno, Joel D. Stitzel, F. Scott Gayzik

Wake Forest University School of Medicine

Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences

WHEELCHAIR-MOUNTED ROBOTIC ARM TO HOLD AND MOVE COMMUNICATION DEVICE""":337

Kyle Hurley, Casey Brauchie, Graham Barrett, Scott Morton, Steven Barrett

Mechanical Engineering Department, University of Wyoming

A METHOD FOR INDUCING AND DETERMINING BIOMECHANICS ASSOCIATED WITH ENDPLATE FRACTURES IN THE LUMBAR SPINE""":33;

Kristen L. Kiehl¹, William H. Curry, Brian D. Stemper¹, Gerald Eckardt¹, Jamie L. Basiden¹, Dennis J. Maiman¹, Narayan Yoganandan¹, Barry S. Shender²

¹Department of Neurosurgery, Medical College of Wisconsin, and Zablocki VA Medical Center

²Naval Air Warfare Center, Aircraft Division

Session IV: Neurobiology/Cancer

A PILOT STUDY ON THE EFFECT OF TAI CHI EXERCISE ON PERIPHERAL BLOOD CYTOKINES ASSOCIATED WITH NOCICEPTIVE PAIN IN HEALTHY VOLUNTEERS""347

Roy W. Geib¹, Hongtao Li^{1,2}, Gabi N. Waite¹

¹Indiana University School of Medicine Terre Haute

²University of North Carolina School of Medicine

COMPARISON OF POTENTIAL PREVENTIVE THERAPEUTIC AGENTS GREEN TEA, THYMOQUINONE, AND DILINOLEOYLPHOSPHATIDYLCHOLINE ON HUMAN NEUROBLASTOMA CELLS""354

Kim Kennedy, Michelle Tucci, Ham Benghuzzi

University of Mississippi Medical Center

ANALYSIS OF CORTICAL AND SUB-CORTICAL REGIONS IN AUTISTIC MR IMAGES USING LEVEL SET METHOD AND STRUCTURE TENSORS""362

A. R. Jac Fredo[†], G. Kavitha[†], S. Ramakrishnan^{*}

[†]Department of Electronics Engineering, MIT campus, Anna University, Chennai, India.

^{*}Non-Invasive Imaging Lab, Biomedical Engineering Group, Department of Applied Mechanics, Indian Institute of Technology Madras, Chennai, India.

COMPARISON OF CONVENTIONAL AND SUSTAINED DELIVERY OF ANTIOXIDANTS TO SUPPRESS THE CAOv-3 CELL LINE IN OVARIAN CANCER""372

Jennifer L. Harpole, Michelle Tucci, Hamed Benghuzzi

University of Mississippi Medical Center

FPGA BASED HARDWARE SYNTHESIS FOR AUTOMATIC SEGMENTATION OF RETINAL BLOOD VESSELS IN DIABETIC RETINOPATHY IMAGES""378

Sivakamasundari. J¹, Kavitha. G², Sujatha. C. M³, Ramakrishnan. S⁴

¹Department of Instrumentation Engineering, MIT Campus, Anna University, Chennai, India.

²Department of Electronics Engineering, MIT Campus, Anna University, Chennai, India.

³Department of ECE, CEG Campus, Anna University, Chennai, India.

⁴Biomedical Engineering Group, Department of Applied Mechanics, IIT Madras, Chennai, India.

Session V: Bioengineering

AUTOMATED TESTING OF THE CONTROLLED RESISTANCE EXERCISE DEVICE (C-RED) FOR SPACEFLIGHT""386

David C. Paulus¹, Daniel M. Settlege²

University of Arkansas-Fort Smith, Mechanical Engineering

University of Arkansas-Fort Smith, Economics

IN-SITU VERIFICATION OF ACCURACY, PRECISION AND RESOLUTION OF FORCE AND BALANCE PLATFORMS""393

Guido Pagnacco¹, Frederick Robert Carrick², Cameron H.F. Wright¹, Elena Oggero¹

¹Electrical and Computer Engineering Department, University of Wyoming

²Carrick Institute for Graduate Studies, Cape Canaveral, FL

MILITARY BOOT ATTENUATES AXIAL LOADING TO THE LOWER LEG""39;

Narayan Yoganandan, Michael Schlick, Mike W. J. Arun, Frank A. Pintar

Medical College of Wisconsin, Department of Neurosurgery

NASA ASTRONAUTS, PROSTHETICS AND THE MANNED SPACE PROGRAM""3: 8

Paul Frenger

A Working Hypothesis, Inc. Houston, TX

ESTIMATION OF INSTANTANEOUS MEDIAN FREQUENCY IN SURFACE ELECTROMYOGRAPHY SIGNALS USING QUADRATIC TIME FREQUENCY DISTRIBUTION""3; 3

P. A. Karthick, S. Ramakrishnan

Biomedical Engineering Group, Department of Applied Mechanics Indian Institute of Technology, Madras, Chennai, India

Session VI: (Education/ Modeling II)

A LINK BETWEEN OCCUPANT AND VEHICLE ACCELERATIONS DURING COMMON DRIVING TASKS""3; 9

Anne C. Mathias, Peggy A. Shibata, James K. Sprague

Engineering Systems, Inc., Aurora, Illinois

THE INFLUENCE OF DISTRACTIONS ON DRIVER RESPONSE TIME: AN ERP PILOT STUDY""427

Chaitanya Bhavaraju¹, Patrick Patterson², Supriya Patibanda¹

¹Lakireddy Bali Reddy College of Engineering, Andhra Pradesh, India

²Texas Tech University, Lubbock, TX 79409

A VALIDATION OF ESTIMATED TOTAL PERIPHERAL RESISTANCE USING TWIN DATA""432

LaBarron K. Hill^{1,3}, John J. Sollers III², Christopher L. Edwards³, Julian F. Thayer⁴ and Keith E. Whitfield⁵

¹Center for the Study of Aging and Human Development, Duke University, Durham, NC

²Department of Psychological Medicine, University of Auckland, New Zealand

³Department of Psychiatry, Duke University Medical Center, Durham, NC

⁴Department of Psychology, The Ohio State University, Columbus, OH

⁵Department of Psychology and Neuroscience, Duke University, Durham, NC

FUNCTIONALITY OF EMPIRICAL MODEL-BASED PREDICTIVE ANALYTICS FOR THE EARLY DETECTION OF HEMODYNAMIC INSTABILITY""43;

Richard L. Summers¹, Matt Pipke², Stephan Wegerich², Gary Conkright², Kristen C. Isom¹

¹Department of Emergency Medicine, University of Mississippi Medical Center, Jackson, MS

²VGBio, Naperville, IL

THOUGHTS ON AN INTEGRATIVE APPROACH TO TEACH WELLNESS WITHIN THE CONTEXT OF A TRADITIONAL SCIENCE/BIOENGINEERING CURRICULUM""447

Roy W. Geib, Gabi N. Waite

Indiana University School of Medicine-Terre Haute, Indiana

REVIVING A MEDICAL WEARABLE COMPUTER FOR TEACHING PURPOSES""453

Paul Frenger

A Working Hypothesis, Inc. Houston, TX

USING POSTUROGRAPHY TO MEASURE BALANCE CONTROL DURING SEATED TAI CHI""457

Roy W. Geib,¹ Hongtao Li,^{1,2} Gabi N. Waite,¹ Guido Pagnacco,³ Elena Oggero,³ and Beverly L. Roberts⁴

¹Indiana University School of Medicine

²University of North Carolina Medical School

³University of Wyoming

⁴University of Florida

Session VII: Trauma and Modeling III

METHODOLOGY FOR MAPPING FOOTBALL HEAD IMPACT EXPOSURE TO HELMET PADS FOR REPEATED LOADING TESTING''''464

Anna MacAlister, Tyler Young, Ray W. Daniel, Steven Rowson, Stefan M. Duma
Virginia Tech-Wake Forest University Center for Injury Biomechanics

MEMBRANE CHARACTERISTICS FOR BIOLOGICAL BLAST OVERPRESSURE TESTING USING BLAST SIMULATORS''''46:

Vanessa D. Alphonse^{1*}, Venkata Siva Sai Sujith Sajja^{1*}, Andrew R. Kemper¹, Dave V. Ritzel², Stefan M. Duma¹, and Pamela J. VandeVord^{1,3}

¹Virginia Tech – Wake Forest University Center for Injury Biomechanics, Blacksburg, VA, USA

²Dyn-FX Consulting Ltd., Amherstburg, ON, Canada

³Salem VA Medical Center, Research & Development Service. Salem, VA, USA

AGREEMENT IN GAIT SPEED FROM SMARTPHONE AND STOPWATCH FOR FIVE METER WALK IN LABORATORY AND CLINICAL ENVIRONMENTS''''476

Rahul Soangra, Thurmon E. Lockhart

School of Biomedical Engineering and Sciences, Virginia Tech-Wake Forest University
Industrial & Systems Engineering, Virginia Tech

ENDURING EYE CARE WITH SMARTPHONES AIDING REAL TIME DIAGNOSIS''''487

Sudhakar M.S., Bhoopathy Bagan K

Department of Electronics Engineering, Madras Institute of Technology, Anna University, India

AGE-RELATED DIFFERENCES IN HEAD IMPACT EXPOSURE OF 9-13 YEAR OLD FOOTBALL PLAYERS''''4: 7

Bryan R. Cobb, Steven Rowson, Stefan M. Duma

School of Biomedical Engineering & Sciences, Virginia Tech-Wake Forest University

Session VIII: Trauma and Imaging

HEAD ACCELERATION MEASUREMENTS IN MIDDLE SCHOOL FOOTBALL''''4; 3

Ray W. Daniel, Steven Rowson, Stefan M. Duma

Virginia Tech-Wake Forest University, School of Biomedical Engineering and Science

DEVELOPMENT OF AUTOMATED GAIT ASSESSMENT ALGORITHM USING THREE INERTIAL SENSORS AND ITS RELIABILITY""4; 9

Thurmon E. Lockhart, Rahul Soangra, Charles Chung, Christopher Frames, Peter Fino, Jian Zhang

School of Biomedical Engineering and Sciences, Industrial and Systems Engineering, Mechanical Engineering, Virginia Tech

SEGMENTATION OF VENTRICLES IN ALZHEIMER MR IMAGES USING ANISOTROPIC DIFFUSION FILTERING AND LEVEL SET METHOD""529

K.R.Anandh¹, C.M.Sujatha¹, S.Ramakrishnan²

¹ Department of ECE, CEG Campus, Anna University, Chennai, India.

²Biomedical Engineering Group, Department of Applied Mechanics, Indian Institute of Technology Madras, Chennai, India.

DIFFERENTIATING sEMG SIGNALS UNDER MUSCLE FATIGUE AND NON-FATIGUE CONDITIONS USING LOGISTIC REGRESSION CLASSIFIERS""536

Venugopal G and Ramakrishnan S

Non-Invasive Imaging and Diagnostics Lab, Biomedical Engineering Group

Department of Applied Mechanics, Indian Institute of Technology Madras, Chennai, India

PROPOSAL OF A NEW TRACTOGRAPHIC FEATURE FOR ANALYSIS OF WHITE MATTER IN ALZHEIMER DIFFUSION MR IMAGES""544

Ranjan Piyush and S. Ramakrishnan

Biomedical Engineering Group, Department of Applied Mechanics

Indian Institute of Technology Madras, Chennai - 600036, India

FILTERING OF HIGH NOISE BREAST THERMAL IMAGES USING FAST NON-LOCAL MEANS""54:

S.S.Suganthi and S.Ramakrishnan

Biomedical Engineering Group, Department of Applied Mechanics

Indian Institute of Technology Madras, Chennai – 600036, India

Poster Session

THE EFFECTS OF SUSTAINED DELIVERY OF ESTROGEN ON BONE STRENGTH AND CARDIOVASCULAR PANELS IN OSTEOPOROTIC FEMALE RATS""558

Jill White, Gerri Wilson, Michelle Tucci, Hamed Benghuzzi

University of Mississippi Medical Center

PATHOPHYSIOLOGICAL RESPONSES ASSOCIATED WITH EXPOSURE OF TQ AND EGCG USING CAO V-3 OVARIAN CANCER LIKE CELLS""567

Jennifer L. Harpole, Michelle Tucci, Hamed Benghuzzi

University of Mississippi Medical Center

IMPLEMENTATION OF STANDARDIZED COLOR-CODED ISOLATION SIGNS AT A TEACHING HOSPITAL AND THEIR EFFECT ON COMPLIANCE WITH ISOLATION PRECAUTIONS""575

Elham Ghonim and Hamed Benghuzzi

University of Mississippi Medical Center

THE EFFECT OF COMBINATION TREATMENTS OF EPIGALLOCATECHIN-3-GALLATE, THYMOQUINONE, AND 5-FLUOROURACIL ON FADU

NASOPHARYNGEAL CARCINOMA CELLS""583

Sharita Williams, Michelle Tucci, Hamed Benghuzzi

University of Mississippi Medical Center

EFFECTS OF METFORMIN AND INSULIN ON H9C2 RAT CARDIOMYOCYTES IN CELL CULTURE WITH ELEVATED GLUCOSE LEVELS""589

Lishia Lee, Michelle Tucci, Hamed Benghuzzi

University of Mississippi Medical Center

IL-5; A DIFFUSE BIOMARKER ASSOCIATED WITH BRAIN INFLAMMATION AFTER BLAST EXPOSURE""597

Venkata Siva Sai Sujith Sajja, Catherine Tenn, Lori J. McLaws, Pamela VandeVord

School of Biomedical Engineering and Sciences, Virginia Polytechnic and State University

Defense Research and Development Canada Suffield

Research Services, Salem VAMC

***IN VITRO* EVALUATION OF THE EFFECTS OF TOBRAMYCIN AND PARATHYROID HORMONE ON MESENCHYMAL STEM CELLS""5: 5**

Brad Martin, Michelle Tucci, Hamed Benghuzzi

University of Mississippi Medical Center

THE EFFECTS OF THYMOQUINONE AND DOXORUBICIN ON LEUKEMIA AND CARDIOMYOCYTE CELL LINES""5: 3

R. Keith Brown, Gerri Wilson, Michelle Tucci, Hamed Benghuzzi

University of Mississippi Medical Center

AN ULTRASONIC STRIDE LENGTH MEASURING SYSTEM EMPLOYING TWO DIGITAL COMPASSES''''5; 9

Hiromichi Maki, Hidekuni Ogawa, Yoshiharu Yonezawa, Allen W. Hahn, W. Morton Caldwell
Department of Health Science, Hiroshima Institute of Technology, Japan
Department of Veterinary Medicine and Surgery, University of Missouri-Columbia
Caldwell Biomedical Electronics

EFFECT OF SENSOR-TARGET-BACKGROUND DISTANCE ON TARGET TRACKING USING A FLY EYE SENSOR''''625

Md. Arif Khan¹, Robert W. Streeter¹, Cameron H. G. Wright¹, Steven F. Barrett¹, Susan A. Frost²

¹Department of Electrical and Computer Engineering, University of Wyoming, Laramie, Wyoming 82071

²NASA Ames Research Center, Moffet Field, California 94035

EXPERIMENTAL INDUCTION OF LUNG DAMAGE IN THE F344 RAT UPON EXPOSURE TO CITRAL, RETINOIC ACID (ATRA), OVALBUMIN AND MOLD SPORES''''62;

Ibrahim O. Farah¹, Carlene Holt-Gray¹, Joseph A. Cameron¹, Michelle Tucci², Zelma Cason² and Hamed Benghuzzi²

¹Department of Biology, Jackson State University, Jackson, MS 39217, and the ²University of Mississippi Medical Center, Jackson, MS 39216.

RESULTS OF TARGET TRACKING WITH A *MUSCA DOMESTICA* INSPIRED SENSOR''''639

Robert W. Streeter¹, Md. Arif Khan¹, Steven F. Barrett¹, Cameron H.G. Wright¹, and Susan Frost²

¹Department of Electrical and Computer Engineering, University of Wyoming, Laramie, Wyoming 82071

²NASA Ames Research Center, Moffet Field, California 94035

IMPACT OF PAIRED COMBINATIONS OF RETINOIC ACID (ATRA) AND OVALBUMIN ON F344 RAT LUNG TISSUES AND IMPROVEMENT OF RELATED PATHOLOGY BY CITRAL''''645

Ibrahim O. Farah¹, Carlene Holt-Gray¹, Joseph A. Cameron¹, Michelle Tucci², Zelma Cason² and Hamed Benghuzzi²

¹Department of Biology, Jackson State University, Jackson, MS 39217, and the ²University of Mississippi Medical Center

ALL-TERRAIN SELF-LEVELING WHEELCHAIR""653

Andrew Schofield, Steven Barrett
Electrical and Computer Engineering Department
University of Wyoming, Laramie, WY

**THE EFFECT OF TRANSFORMING GROWTH FACTOR ON MCCOY FIBROBLAST
CELLS""659**

Hamed Benghuzzi, David Black, Joseph A. Cameron, and Michelle Tucci
University of Mississippi Medical Center
Jackson, MS 39216

THE EFFECT OF GROWTH FACTOR ON OSTEOBLAST CELL SIGNALING""667

Michelle Tucci, Joel Davis, and Hamed Benghuzzi
University of Mississippi Medical Center
Jackson, MS 39216