Seventh Annual

International Regenerative Rehabilitation

Symposium

Where applied biophysics meets
tissue engineering and cellular therapies

October 11-13, 2018

Welcome

It is our great pleasure to welcome you to Seattle and the Seventh Annual International Symposium on Regenerative Rehabilitation.

It has been another wonderful year in the field of regenerative rehabilitation, as collaborations and research in the field grew at an exponential pace. Within the last year, our international partnerships have grown to 16 participating institutions, with the **Uniformed Services University of the Health Sciences, AO Research Institute Davos,** the **Kessler Foundation,** and **Fondazione Don Carlo Gnocchi** joining the **University of Pittsburgh; Stanford University;** the **University of California, San Francisco;** the **Mayo Clinic; Emory University;** the **University of Virginia; Kyoto University;** the **University Hospital of Pisa; Indiana University; Oregon Health & Science University;** the **University of Washington;** and **Wayne State University.** We are thrilled to be hosted by the University of Washington at this year's event.

Over the next two and a half days, you can expect to learn about cutting-edge and translational research in the domain of regenerative rehabilitation. We have a great agenda planned, covering multiple applicable areas of regenerative rehabilitation. Many distinguished clinicians and scientists and faculty members will be taking part in this symposium. Abstracts presented will be in the form of keynote, plenary, and poster sessions and will include rigorous and thoughtful scientific material. The presenters were carefully recommended and selected by the Scientific Program Committee and were approved by the course directors. These efforts have worked to ensure that the meeting will be a memorable scientific event.

We thank you for participating in this year's meeting and for bringing your expertise and thoughtful perspective to our gathering. We hope that you will enjoy the symposium and that your interactions with various colleagues from around the world will stimulate a creative exchange of ideas. Please enjoy your visit to Seattle, an exciting urban city surrounded by unmatched natural beauty.

Best wishes,

Fabrisia Ambrosio, PhD, MPT
Michael Boninger, MD
Anthony Delitto, PhD, PT, FAPTA
Thomas Rando, MD, PhD
William R. Wagner, PhD

Course Directors

Fabrisia Ambrosio, PhD, MPT
Associate Professor, Department of Physical Medicine and Rehabilitation
University of Pittsburgh
Director of Rehabilitation, UPMC International

Michael Boninger, MD
Professor and UPMC Endowed Vice Chair for Research,
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University of Pittsburgh School of Medicine

Anthony Delitto, PhD, PT, FAPTA
Dean, School of Health and Rehabilitation Sciences
Professor, Department of Physical Therapy
University of Pittsburgh

Thomas A. Rando, MD, PhD
Professor, Department of Neurology and Neurological Sciences
Stanford University School of Medicine
Director of Rehabilitation Research and Development and
Program Chief of Neurology, VA
Palo Alto VA Health Care System

William R. Wagner, PhD
Director, McGowan Institute for Regenerative Medicine
Professor of Surgery, Chemical Engineering, and Bioengineering
University of Pittsburgh

Scientific Program Committee Cochairs

Fabrisia Ambrosio, PhD, MPT
Associate Professor, Department of Physical Medicine and Rehabilitation
University of Pittsburgh
Director of Rehabilitation, UPMC International

David Mack, PhD
Assistant Professor, Department of Rehabilitation Medicine
Institute for Stem Cell and Regenerative Medicine
University of Washington

Symposium Organizers

UPMC Center for Continuing Education in the Health Sciences

The purpose of the Center for Continuing Education in the Health Sciences is to advance the academic, clinical, and service missions of the University of Pittsburgh schools of the health sciences and the University of Pittsburgh Medical Center (UPMC) through the continuing professional development of physicians, pharmacists, and other health professionals and the translation of biomedical knowledge into clinical practice.

ccehs.upmc.com

McGowan Institute for Regenerative Medicine

The McGowan Institute for Regenerative Medicine is a partnership between the University of Pittsburgh and UPMC and serves as a base for scientists and clinical faculty working in tissue engineering and biomaterials, cellular therapies, and medical devices and artificial organs. McGowan's mission is the development of innovative clinical protocols and the commercial transfer of new technologies.

mcgowan.pitt.edu

UPMC Rehabilitation Institute

The largest rehabilitation provider in Western Pennsylvania, the UPMC Rehabilitation Institute serves as the hub of a UPMC network of more than 70 rehabilitation facilities that combine clinical care and research to help patients regain independence and enhance their quality of life. The institute's academic partners include the Department of Physical Medicine and Rehabilitation in the University of Pittsburgh School of Medicine and the Pitt School of Health and Rehabilitation Sciences. These academic partners are national and international leaders in rehabilitation research and education.

upmc.com/services/rehab/rehab-institute

University of Pittsburgh Department of Physical Medicine and Rehabilitation

The mission of Pitt's Department of Physical Medicine and Rehabilitation is to maximize the health, function, and well-being of the people and populations we serve by providing the highest quality rehabilitative medical care; conducting highly relevant, cutting-edge research; and training the next generation of clinicians and researchers. Our research portfolio includes: neural engineering and neural prosthetics; biologics as indicators of pain, injury and recovery; axon regeneration; biomarkers for brain injury; medical homes for spinal cord injury care; and motor learning using transcranial magnetic stimulation.

The department's physicians are experts in the fields of traumatic brain injury, spinal cord injury, sports and musculoskeletal medicine, stroke, and many conditions that would benefit from rehabilitation care. We partner with patients to design and implement personalized approaches that maximize participation, recovery, and well-being.

rehabmedicine.pitt.edu

Symposium Organizers, continued

University of Pittsburgh School of Health and Rehabilitation Sciences

Through academic research, technology design, and rigorous training, the School of Health and Rehabilitation Sciences (SHRS) at the University of Pittsburgh educates the next generation of health professionals who will help others to reach their fullest potential.

SHRS is committed to providing the best learning experience and academic environment possible for our students. Instructional excellence is rigorously pursued. Class sizes are intimate, fostering intellectual exchange and discourse. Students are challenged not just to achieve but to excel—and they do. Graduates of SHRS programs are some of the most sought-after professionals. They are authors, clinicians, and noted researchers; speakers, and consultants. Above all, they are teachers who care passionately about their field and about their students. They want their students to succeed in the classroom and in their chosen professions. An SHRS education is more than classroom lectures. It's hands-on learning either in a clinical setting or in the community. Through our strong relationships with the University of Pittsburgh Medical Center and other clinical partners, our students benefit from a wealth of experiences related to their particular field and area of interest. Students train in schools, hospitals, skilled nursing facilities, ambulatory care sites, and home- and community-based settings.

Undergraduate and graduate degrees, and certificates are offered in these areas of study: clinical dietetics and nutrition; communication science and disorders; speech language pathology; audiology; emergency medicine; health information management; occupational therapy; physical therapy; physician assistant studies; prosthetics and orthotics; rehabilitation counseling; rehabilitation science (undergraduate); rehabilitation science and technology; and sports medicine/athletic training

shrs.pitt.edu

Rehabilitation Research and Development Program at the VA Palo Alto Health Care System Center for Tissue Repair, Regeneration, and Restoration

Thomas Rando directs the Rehabilitation Research and Development (R&D) program at the Palo Alto VA. Within that program, the Center for Tissue Repair, Regeneration, and Restoration (CTR3) focuses primarily on the neuromuscular and musculoskeletal systems and pursues research at the levels of stem cell biology, biomedical engineering, and clinical/translational research.

The VA Palo Alto Rehabilitation R&D Program reflects a long-standing commitment by the U.S. Department of Veterans Affairs to advance the well-being of American veterans through support of a full spectrum of rehabilitation research, from concept to clinic.

A firm scientific understanding of the underlying impairment and a multidisciplinary team creates a strong basis for developing new clinical treatments that reduce the disability of veterans and improve the effectiveness of health care delivery by VA clinicians.

rehab.research.va.gov

Symposium Sponsors

International Consortium on Regenerative Rehabilitation (ICRR)

The Alliance for Regenerative Rehabilitation Research and Training (AR3T)

Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD)

National Institute of Neurological Disorders and Stroke (NINDS)

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)

National Institute of Biomedical Imaging and Bioengineering (NIBIB)

UPMC Center for Rehabilitation Services

Special Thanks to our Corporate Sponsor, Juvent Health

Juvent is the current leader of clinically proven, safe mechanotransduction for tissue regeneration, healing, and health. Juvent's micro-impact technology has been published in the leading journals and today can help 50 million Americans to live longer, pain-free lives.

Juvent's mission is to help proven science become clinically available with safety, efficacy, and affordability to all. Juvent helps the world's top researchers, clinicians, regulators, and providers work together to help to ensure that regenerative science becomes clinical reality.

juvent.com/health/

Disclaimer:

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Exhibitors

We gratefully acknowledge support from the following:

Alliance for Regenerative Rehabilitation Research and Training (AR3T)
ar3t.pitt.edu

NIH National Medical Rehabilitation Research Resource (MR3) Network
ncmrr.org

National Rehabilitation Research Resource to Enhance Clinical Trials (REACT)
react.center

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Cohosts

University of Washington

washington.edu

The University of Washington (UW) is one of the world's preeminent public universities. Its impact on individuals, the region, and the world is profound—whether launching young people into a boundless future or confronting the grand challenges of today through undaunted research and scholarship. Ranked 13th in the world on the 2017 Academic Ranking of World Universities, UW educates more than 54,000 students annually. UW turns ideas into impact and transforms lives and the world.

To learn more, visit washington.edu/news.

So what defines UW students, faculty, and community members? Above all, it is a belief in possibility and unshakable optimism. It's a connection to others near and far. It's a hunger to tackle challenges and pursue progress.

University of Pittsburgh

pitt.edu

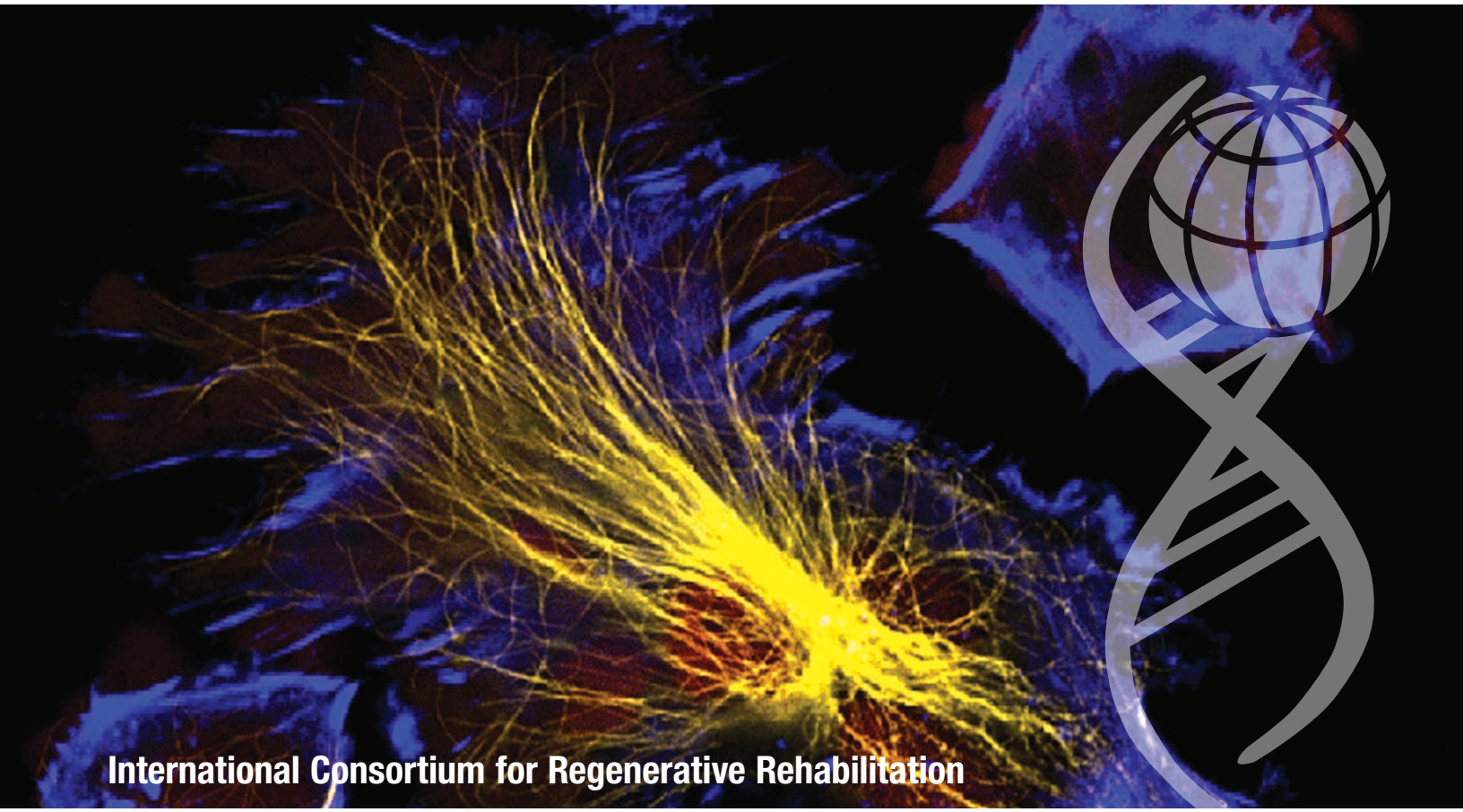
Founded in 1787, the University of Pittsburgh is one of the oldest institutions of higher education in the United States. Pitt people have defeated polio, unlocked the secrets of DNA, led the world in organ transplantation, and pioneered TV and heavier-than-air flight, among numerous other accomplishments.

From research achievements to the quality of its academic programs, the University of Pittsburgh ranks among the best institutions of higher education including being named the top public university in the Northeast by the *Wall Street Journal.*

Faculty members have expanded knowledge in the humanities and sciences, earning such prestigious honors as the National Medal of Science, the MacArthur Foundation's "genius" grant, the Lasker-DeBakey Clinical Medical Research Award, and election to the National Academy of Sciences and the National Academy of Medicine.

Pitt students have earned Rhodes, Goldwater, Marshall, and Truman Scholarships, among other highly competitive national and international scholarships. Alumni have pioneered MRI and TV, won Nobel and Pulitzer prizes, led corporations and universities, served in government and the military, conquered Hollywood and the New York Times bestsellers list, and won Super Bowls and NBA championships.

Cohosts, continued



International Consortium for Regenerative Rehabilitation

ar3t.pitt.edu/icrr

The International Consortium for Regenerative Rehabilitation (ICRR) Leadership Council is a core of vested individuals and institutions who are interested in expanding the strategic footprint of the field of regenerative rehabilitation. Currently, 28 researchers and clinicians representing 16 academic institutions from around the world are partnering to deliver upon a mission that includes educating and training scientists and clinicians across the domains of regenerative medicine and rehabilitation science. The long-term objective of the consortium is to catalyze interdisciplinary collaborations to create new strategies and technologies that will enhance functional recovery and, thus, the quality of life of patients.

The leadership council plays a key role in shaping the future of the field by:

- framing the scientific content for the annual industry symposium;
- demonstrating leadership in the field and introducing emerging trends, therapies, and other information through the symposium, serving as spokespersons for the field as it emerges;
- providing valuable insight and guidance to young investigators, clinicians, therapists and others interested in pursuing regenerative rehabilitation as a career by having firsthand knowledge of potential funding, collaborations, and other opportunities to advance research and clinical activities; and
- building a new area of science that will have a positive impact on patient outcomes in the future.

Course Overview and Objectives

Overview

Advances in the field of regenerative medicine are accelerating at an unprecedented rate. Regrowing a lost limb, restoring function to a diseased organ, and harnessing the body's natural ability to heal itself are becoming part of our reality instead of distant promises. Technologies such as cellular therapies, bioscaffolds, and artificial devices are now in use or are being tested in clinical trials throughout the country.

How do we as clinicians and rehabilitation professionals work with the patient's regenerative medicine team to maximize patient outcomes and to help fully translate research? How do we as investigators in the field of regenerative medicine make the most of these revolutionary results?

Few opportunities are available to bring together scientists and clinicians working in the two currently disparate fields of rehabilitation science and regenerative medicine. However, rehabilitation science and regenerative medicine have to work together closely in order to achieve a successful outcome for the patient. This situation created the need for open, cross-disciplinary work and collaborative communication. This symposium provides the opportunity for researchers and clinicians from around the world to gather and learn about the latest developments, share ideas and concepts, and create sustainable collaborations.

Objectives

During this course, participants will:

- interact with cutting-edge researchers;
- learn of the status of translating scientific discoveries into clinical practice;
- network with colleagues and potential collaborators;
- raise questions, debate implications, plan follow-up studies, and discuss results;
- share the status of their own research and clinical observations; and
- meet with presenters to learn about their thinking and future research directions.

Continuing Education Credit

The University of Pittsburgh School of Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

The University of Pittsburgh School of Medicine designates this live activity for a maximum of 11.0 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Other health care professionals are awarded 1.1 continuing education units (CEUs), which are equal to 11.0 contact hours.

Physical Therapy Professionals

The Symposium received approval through The Federation of State Boards of Physical Therapy's ProCert Program to offer 11 continuing competency units (CCUs) for the 33 states and Puerto Rico that accept ProCert accredited hours toward license renewals. For more details on the ProCert Program and a list of the 33 states, please visit pt.fsbpt.net/aptitude/content/public/fsbptcertification.

*CCUs are a unit of relative value of an activity based on its evaluation against a compreshive set of standards. the CCU determination is a valuation reflecting many factors including, but not limited to, duration of the activity. No conclusion should be drawn that ProCert's CCU correlate to time or duration.

Participation by all individuals is encouraged. Advance notification of any special needs will help us provide better service. Please notify us of your needs at least two weeks in advance of the program by calling +1 412-624-5293.

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Agenda

Thursday, October 11, 2018

Open Symposium

Noon–6 p.m. **Registration Open** *Location: Lake Washington Foyer*

5:30–5:45 p.m. **Welcome** *Location: Lake Washington Ballrooms*

5:30–5:45 p.m.
David Mack, PhD
Associate Professor, Rehabilitation Medicine
University of Washington

5:45–7 p.m. **Opening Plenary Session: Cardiovascular Disease Applications**
Moderator: **David Mack,** PhD
Associate Professor, Rehabilitation Medicine
University of Washington

5:45–6 p.m.
"Regenerating the Heart"
Keynote Speaker: **Charles Murry,** MD, PhD
Professor and Director, Center for Cardiovascular Biology
University of Washington

6:20–6:40 p.m.
"Muscle Function Recovery following Ischemic Injury"
Laura Suggs, PhD
Associate Professor, Biomedical Engineering
University of Texas at Austin

6:40–7 p.m.
"Functional Assessment of Cardiomyocytes Derived from Human Pluripotent Stem Cells"
Nate Sniadecki, PhD
Associate Professor, Mechanical Engineering
University of Washington

Ajourn for the Day

7–9 p.m. **Welcome Reception** *Location: Lake Washington Ballroom Foyer and Great Room*

Friday, October 12, 2018

7:30 a.m.–6 p.m. **Registration Open** *Location: Lake Washington Foyer*

7:30–8:30 a.m. **Continental Breakfast** *Location: Marina Room*

Open Day Two

8:45–9:05 a.m. **Welcome** *Location: Lake Washington Ballrooms*

8:45–8:55 a.m. **Fabrisia Ambrosio,** PhD, MPT
Associate Professor, Physical Medicine and Rehabilitation
University of Pittsburgh

8:55–9:05 a.m. **Peter C. Esselman,** MD
Chair, Department of Rehabilitation Medicine
University of Washington

9:05–9:50 a.m. "Robotics for Regenerative Rehabilitation after Neurologic Injury"
Regenerative Rehabilitation Technologies
Keynote Speaker: **David J. Reinkensmeyer,** PhD
Professor, Mechanical and Aerospace Engineering and Biomedical Engineering
University of California, Irvine

9:50 – 10:10 a.m. **Morning Break**

10:10–11:35 a.m. **Applied Mechanobiology, Part One** *Location: Lake Washington Ballrooms*
Moderator: **Nick Willett,** PhD
Assistant Professor, Orthopaedics
Emory University

10:10-10:35 a.m. "Physiologic, Genetic, and Epigenetic Principles: Optimizing Regeneration Capacity after SCI"
Richard Shields, PhD, PT
Chair, Physical Therapy and Rehabilitation Science
University of Iowa

10:35–11 a.m. "Engineering the Optimal Environment for Neural Regeneration"
Paul George, MD, PhD
Assistant Professor, Neurology
Stanford University Medical Center

11–11:25 a.m. "Muscle Protection for Muscular Dystrophies: A Common Sense Rehabilitation Strategy to Optimize Patient Readiness for Gene and Regenerative Therapies"
Joseph Roche, BPT, Dip. Rehab. PT, PhD
Assistant Professor, Physical Therapy
Wayne State University

Friday, October 12, 2018

11:25–11:35 a.m. "Therapeutic Effects of Combined Cell Transplantation and Rehabilitation in Rats with Brain Injury"
Takafumi Shimogawa, MD
Kyoto University

11:35–11:45 a.m. Rapid Fire Presentations Selected from Poster Abstracts
Charles Latchoumane PhD, MS, University of Georgia
Hikaru Mamiya, University of Pittsburgh
Akira Ito, PhD, Kyoto University
Bo Ri Seo, PhD, Harvard University

Ajourn for Lunch and Poster Session

11:45 a.m.–noon **Group Photo** *Location: TBD*

Noon–12:45 p.m. **Lunch** *Location: Marina Room*

12:45–2:15 p.m. **Poster Session and Refreshments** *Location: Great Room*
Sponsored by the International Consortium on Regenerative Rehabilitation

Reconvene—Start Afternoon Sessions

2:15–3:15 p.m. **Applied Mechanobiology, Part Two** *Location: Lake Washington Ballrooms*
Moderator: **Joseph Roche,** BPT, Dip. Rehab. PT, PhD
Wayne State University

2:15–2:40 p.m. "Using Mechanobiology to Accelerate Bone Healing"
Christopher H. Evans, PhD
Professor, Orthopedics and Physical Medicine and Rehabilitation
Mayo Clinic

2:40–3:05 p.m. "Biomechanical Regulation of Musculoskeletal Cell Fate: From Strain to Secretome"
Martin Stoddart, PhD
Principal Scientist
AO Research Institute Davos

3:05–3:15 p.m. "Promoting Bone Regeneration by Optimization of Rehabilitation Protocols"
Jan Barcik
AO Research Institute Davos

3:15–4:40 p.m. **Regenerative Rehabilitation for Military Medicine** *Location: Lake Washington Ballrooms*
Moderator: **George J. Christ,** PhD
Professor, Biomedical Engineering and Orthopaedic Surgery
University of Virginia

3:15–3:25 p.m. "Clinical Development of Regenerative Rehabilitation Products for Military Applications"
Colonel **David L. Saunders,** MD, MPH
Medical Director, Combat Trauma and Acute Rehabilitation
U.S. Army Medical Materiel Development Activity

Friday, October 12, 2018

3:25–3:50 p.m. "Regenerative Rehabilitation in the Challenges and Clinical Research Gaps"
Nelson Hager, MD, MS
Vice Chair, Department of Physical Medicine and Rehabilitation
Uniformed Services University of the Health Sciences

3:50–4:05 p.m. **Afternoon Break**

4:05–4:30 p.m. "Basic Science Initiatives in Regenerative Rehabilitation in the Military"
Shailly Jariwala, PhD
Senior Biomedical Engineer
Uniformed Services University

4:30–4:40 p.m. "Is the Metabolic Plasticity of the Muscle Remaining after Volumetric Muscle Loss Injury a Limitation to Rehabilitation Efficacy?"
Sarah M. Greising, PhD
University of Minnesota

4:40–5:05 p.m. **Break: Refreshments in Great Room**

5:05–5:55 p.m. **Closing the Gap: Funding and Education** *Location: Lake Washington Ballrooms*
Moderator: **TBA**

5:05–5:15 p.m. "Regenerative Rehabilitation: The Promise and the Challenge"
Lloyd Rose, PhD
Clinical and Rehabilitative Medicine Research Program
U.S. Army Medical Research and Materiel Command

5:15–5:25 p.m. "Training Tomorrow's Leaders"
Trevor Dyson-Hudson, MD
Director, Spinal Cord Injury Research and Outcomes and Assessment Research
Kessler Foundation

5:25–5:35 p.m. "Programs to Support Regenerative Rehabilitation Research"
Alison Cernich, PhD
Director, National Center for Medical Rehabilitation Research
Eunice Kennedy Shriver National Institute of Child Health and Human Development

5:35–5:55 p.m. Panel Discussion

5:55–6 p.m. **Closing Remarks for the Day**

Conclusion of Day Two

Dinner on Your Own

Saturday, October 13, 2018

8–10:30 p.m. **Student Social** *Location: Woodmark Beach Café*

7 a.m.–noon **Registration Open** *Location: Marina Room Foyer*

7–7:45 a.m. **Clinical Special Interest Group Breakfast** *Location: Bayshore Room*

7–8 a.m. **Continental Breakfast** *Location: Marina Room*

Opening of Day 3

8–8:05 a.m. **Opening of Symposium**
Fabrisia Ambrosio, PhD, MPT
Associate Professor, Physical Medicine and Rehabilitation
University of Pittsburgh

8:05–9:55 a.m. **Translating the Science: Clinical Trials** *Location: Marina Room*
Moderator: **Marzia Bedoni,** PhD
Research Coordinator, Nanomedicine and Clinical Biophotonics Area, Biomedical Technology Department
Fondazione Don Carlo Gnocchi

8:05–8:30 a.m. "Tribulations in Translation from the Preclinical Side of Stroke Neurorehabilitation"
Theresa A. Jones, PhD
Professor, Psychology and Neuroscience Institute
University of Texas at Austin

8:30–8:55 a.m. "Engineered Neuroplasticity for Spinal Cord Rehabilitation"
Chet Moritz, PhD, PT
Associate Professor, Rehabilitation Medicine
University of Washington

8:55–9:20 a.m. "An Industry Perspective on Incorporating Rehabilitation Protocols in Clinical Research for Biologically Derives Scaffolds"
Thomas Gilbert, PhD
Chief Science Officer, Research and Development and Clinical Research
ACell Inc.

9:20–9:45 a.m. "Emerging Approaches to Predict, Monitor, and Improve Physiological Resilience"
Shawn Flanagan, PhD, MHA
Assistant Professor, Sports Medicine and Nutrition
School of Health and Rehabilitation Sciences
University of Pittsburgh

9:45–9:55 a.m. "An Affordable Device for Reach-to-Grasp Assistance in Patients with Upper Limb Impairment"
Robert Matthew, PhD, M.Eng
University of California at Berkeley

9:55–10:15 a.m. **Morning Break**

Saturday, October 13, 2018

10:15 a.m.–noon — **Clinical Applications**

10:15–10:40 a.m. — "Extracellular Vesicles Involved in Response to Rehabilitation Treatment of Neurological and Cerebrovascular Diseases"
Marzia Bedoni, PhD
Research Coordinator, Nanomedicine and Clinical Biophotonics Area, Biomedical Technology Department
Fondazione Don Carlo Gnocchi

10:40–11:05 a.m. — "How Metabolic Coupling between Exercise and Diet Regulate Neural Repair"
Isobel A. Scarisbrick, PhD
Associate Professor, Physical Medicine and Rehabilitation, and Physiology
Mayo Clinic

11:05–11:30 a.m. — "New Concepts in the Treatment of Orthopedic Conditions"
Gerard Malanga, MD
Physiatrist and Head, Regenerative Medicine Program
Kessler Institute for Rehabilitation

11:30 a.m. — Discussion Moderator
Peter C. Esselman, MD
Chair, Department of Rehabilitation Medicine
University of Washington

11:30 a.m.–noon — **Group Discussion: Better Communication/Engagement**

Noon–12:15 p.m. — **Closing of Symposium**
Final Remarks
Fabrisia Ambrosio, PhD, MPT
Associate Professor, Physical Medicine and Rehabilitation
University of Pittsburgh

Announcement of Poster Contest Winners

Presentation of Awards Sponsored by the International Consortium of Regenerative Rehabilitation

Conclusion of Symposium

Agenda, continued

12:30–2 p.m. **Postsymposium Workshops**

Track 1

Preclinical Models for Regenerative Rehabilitation
Linda Noble-Haeusslein, PhD
Professor, Neurology and Psychology
University of Texas at Austin

Track 2

Clinical Study Design for Regenerative Rehabilitation
Marcas Bamman, PhD, FACSM
Professor, Cell Development and Integrative Biology
Director, Center for Exercise Medicine
University of Alabama at Birmingham

Course Director Bios

Fabrisia Ambrosio, PhD, MPT

Fabrisia Ambrosio is the director of rehabilitation for UPMC International and an associate professor in the Department of Physical Medicine and Rehabilitation at the University of Pittsburgh. She holds secondary appointments in the Departments of Physical Therapy, Bioengineering, Orthopaedic Surgery, and Microbiology and Molecular Genetics. In addition, she is a faculty member in the neurology residency program in the Department of Physical Therapy and a member of the McGowan Institute for Regenerative Medicine faculty.

Ambrosio graduated with a Master of Science in physiology-endocrinology with a specialization in skeletal muscle physiology from Laval University in Québec City, Québec, Canada. She also graduated with a Master of Physical Therapy degree from the Medical College of Pennsylvania and Hahnemann University (now Drexel University College of Medicine) in Philadelphia, Pa. In 2005, Ambrosio completed her PhD in rehabilitation science and technology at the University of Pittsburgh.

Ambrosio's research has the long-term goal of developing regenerative rehabilitation approaches to improving skeletal muscle healing and functional recovery. Her laboratory uses murine and human models to investigate the underlying mechanisms by which targeted and specific mechanotransductive signals can be used to enhance donor and/or host stem cell functionality. Ambrosio's research has been supported by the National Institutes of Health, the U.S. Department of Defense, the Foundation for Physical Therapy, Claude D. Pepper Older Americans Independence Center, and University of Pittsburgh Institute on Aging, among others.

Ambrosio has published and recorded several educational modules on the topic of regenerative rehabilitation and has assumed national leadership roles in several work group efforts to promote the integration of regenerative medicine technologies with rehabilitation approaches. She is the founding course director of the Annual International Symposium on Regenerative Rehabilitation. She also is the founding director of the International Consortium for Regenerative Rehabilitation, which includes 16 participating institutions in North America, Europe, and Asia.

Course Director Bios, continued

Michael Boninger, MD

Michael Boninger has joint appointments in the Departments of Bioengineering and Rehabilitation Science and Technology, and the McGowan Institute for Regenerative Medicine. He is the senior medical director for post-acute care for the Health Services Division of UPMC. He also is a physician researcher for the U.S. Department of Veterans Affairs.

Boninger has an extensive publication record of more than 250 papers. His central research focus is on enabling increased function and participation for individuals with disabilities through development and application of assistive, rehabilitative and regenerative technologies. Boninger also has extensive experience in and publications related to training researchers. His students have won more than 50 national awards.

Boninger holds four United States patents and has received numerous honors, including being inducted into the National Academy of Medicine (formerly the Institute of Medicine) of the National Academy of Sciences.

Anthony Delitto, PhD, PT, FAPTA

Anthony Delitto is the dean of the University of Pittsburgh School of Health and Rehabilitation Sciences (SHRS) and professor in its Department of Physical Therapy. He received his BS in physical therapy from the University at Buffalo, State University of New York, and his MHS in physical therapy and his PhD from Washington University in St. Louis. He is active in the Sections on Orthopedics and Education and is past president of the Section on Research for the American Physical Therapy Association (APTA). Delitto has authored or coauthored more than 100 peer-reviewed research papers. He actively treats people with painful musculoskeletal disorders, and his current research is focused on implementing classification and treatment effectiveness studies into quality improvement initiatives. He also is conducting trials on exercise interventions for people with Parkinson's disease. He was awarded one of the first large pragmatic trials from the Patient-Centered Outcomes Research Institute, a multisite, $13 million grant (the TARGET study) to investigate innovative ways to reduce the transition of acute low back pain by having physical therapists partner with primary care physicians and deliver psychologically informed physical therapy to patients with acute low back pain who are at risk for persistent pain.

His awards include the Golden Pen Award from APTA (1992), the Steven J. Rose Award for Excellence in Research from the APTA Section on Orthopaedics (1993, 1994, 1996, 2003, 2006, 2007, and 2015), the Marian Williams Award for Research in Physical Therapy from APTA (1997), and being named the Catherine Worthingham fellow of APTA for 2000.

Thomas A. Rando, MD, PhD

Thomas Rando is professor of neurology and neurological sciences and director of the Glenn Center for the Biology of Aging at the Stanford University School of Medicine. He also is chief of neurology at the VA Palo Alto Health Care System, where he is director of the rehabilitation research and development program, which is focused on the emerging field of regenerative rehabilitation. Research in the Rando laboratory concerns the basic biology of stem cells, how stem cells function in adult tissue homeostasis, and how their function is altered during aging and in response to physical activity. Groundbreaking work from his laboratory showed that much of the age-related decline in stem cell function is due to influences of the aged environment and can be reversed by exposing the aged cells to a youthful systemic environment.

Rando has received numerous honors and awards, including being named a Paul Beeson Physician Faculty Scholar in Aging, a Senior Scholar Award from the Ellison Medical Foundation, and a Breakthroughs in Gerontology Award from the American Federation for Aging Research. In 2005, he received the prestigious National Institutes of Health (NIH) Director's Pioneer Award for his work at the interface between stem cell biology and the biology of aging, and in 2013, he received a Transformative Research Award from NIH to study the mechanisms of the benefits of physical activity on tissues and stem cells throughout the body, with a particular focus on the muscle-brain axis and how muscle activity leads to enhanced neurogenesis and cognitive function. In 2016, he was elected to the National Academy of Medicine.

Course Director Bios, continued

William R. Wagner, PhD

William R. Wagner is director of the McGowan Institute for Regenerative Medicine as well as a professor of surgery, chemical engineering, and bioengineering at the University of Pittsburgh. He serves as scientific director of the National Science Foundation Engineering Research Center on Revolutionizing Metallic Biomaterials and chief science officer for the Armed Forces Institute of Regenerative Medicine. He holds BS and PhD degrees in chemical engineering from Johns Hopkins University and the University of Texas) at Austin, respectively. Wagner is the founding editor and editor-in-chief of one of the leading biomaterials journals, *Acta Biomaterialia.* He is past president of the American Society for Artificial Internal Organs and is past chair and current council member of the Tissue Engineering and Regenerative Medicine International Society (TERMIS) Americas region. He is a fellow and former vice president of the American Institute for Medical and Biological Engineering and also has been elected a fellow of the Biomedical Engineering Society, the International Union of Societies for Biomaterials Science and Engineering, TERMIS, and the American Heart Association. In 2006, he was included in the *Scientific American* 50, the magazine's annual list recognizing leaders in science and technology from the research, business, and policy fields. His research has generated numerous patents and patent filings that have resulted in licensing activity; the formation of a company that began clinical trials in 2014; and University of Pittsburgh Innovator Awards in 2007, 2008, 2009, 2010, and 2014. In recent years, he has been awarded the Society for Biomaterials Clemson Award for Applied Research, the University of Pittsburgh Chancellor's Distinguished Research Award, and the TERMIS-Americas Senior Investigator Award. In 2017, he was inducted into the National Academy of Inventors, and in 2018, he was named Inventor of the Year by the Pittsburgh Intellectual Property Law Association.

Wagner's research interests are in cardiovascular engineering, with projects that address medical device biocompatibility and design, biomaterial development, and tissue engineering.

Speaker Biographies

Marzia Bedoni, PhD, received her MSc degree in biological sciences in 2004 and her PhD in morphological science in 2007 from the University of Milan. From 2007 to 2010, she carried out her postdoctorate at the Laboratory of Nanomedicine and Biophotonics (LABION) of Fondazione Don Carlo Gnocchi (FDG) granted by the Cariplo Foundation's Seed Capital and Seventh Framework Programme.

Since January 2011, she has been a permanent researcher at FDG, and within the past year, she became head of the Nanomedicine and Biophotonics Area. During her time at LABION, she has worked on projects that include nano-biophotonics for the characterization of exosomes as regenerative rehabilitation markers; biophotonics application for diagnosis and therapy monitoring in neurodegenerative diseases (Alzheimer's disease and amyotrophic lateral sclerosis), skin diseases (psoriasis, cancer), and leukemia; nanoparticles' toxicity on human skin biology; and biocompatibility in transdermal drug delivery and dry electrodes devices.

Since 2007, she has been a lecturer in human anatomy in the Faculty of Medicine and Surgery at the University of Milan. She has received awards during international congresses for her research studies, has authored several papers published in peer-reviewed scientific journals and abstracts for national and international congresses, and is a coinventor of four patents.

Bedoni is a member of the Leadership Council of the International Consortium for Regenerative Rehabilitation, a former board member of the Society for Cutaneous Ultrastructure Research, and a member of the European Society of Dermatological Research and the Italian Society of Human Anatomy. She is involved in several national and international projects.

Alison Cernich, PhD, serves as director of the National Center for Medical Rehabilitation Research (NCMRR) at the Eunice Kennedy Shriver National Institute of Child Health and Human Development, National Institutes of Health (NIH). She provides oversight for the portfolio of NCMRR and works within NIH to coordinate rehabilitation research. She serves on multiple interagency strategic planning committees and government oversight committees for major research initiatives in the federal government relevant to disability and rehabilitation research.

Speaker Biographies, continued

Trevor Dyson-Hudson, MD, is director of the Centers for Spinal Cord Injury Research and Outcomes and Assessment Research at the Kessler Foundation in West Orange, N.J. He is a research associate professor in the Department of Physical Medicine and Rehabilitation (PM&R) at Rutgers New Jersey Medical School in Newark, N.J. Dyson-Hudson is co-director of the Northern New Jersey Spinal Cord Injury System at Kessler—a National Institute on Disability, Independent Living, and Rehabilitation Research-funded spinal cord injury model system of care. He received his medical degree from the Albert Einstein College of Medicine (AECOM).

In 1992, while he was a third-year medical student, Dyson-Hudson sustained a spinal cord injury (C6 tetraplegia, complete) while playing rugby football. Following a year of rehabilitation, he returned to medical school and graduated in 1995. He completed a medical internship at AECOM in 1996 and a research fellowship in rehabilitation research and complimentary and alternative medicine in 2000 in the PM&R at Rutgers New Jersey Medical School that was supported by a National Instututes of Health postdoctoral fellowship supplement for individuals with disabilities.

Dyson-Hudson's research interests include the preservation and restoration of function and mobility in persons with SCI and the prevention and treatment of common secondary medical complications affecting this population. Dyson-Hudson holds committee appointments in the American Spinal Injury Association and the American Paraplegia Society (APS)/Academy of Spinal Cord Injury Professionals and is on the APS Board of Directors.

Peter Esselman, MD, MPT, is a professor in and chairman of the Department of Rehabilitation Medicine at the University of Washington, a board-certified physician at the Rehabilitation Medicine Clinic at Harborview, chair of rehabilitation medicine at UW and Harborview.

When it comes to patient care, Esselman believes that the patient and family are the most important parts of the interdisciplinary rehabilitation team.

Esselman earned his MD at UW. His clinical interests include inpatient and outpatient rehabilitation of individuals after traumatic injuries and stroke, with a focus on traumatic brain injury and burn injuries. His research interests include improving the outcome of individuals after burn injuries, especially regarding their return to work.

Christopher Evans, PhD, is director of the Rehabilitation Medicine Research Center at the Mayo Clinic. His interests focus on the application of biological therapies, particularly gene therapy, to the treatment of disorders of bones and joints. He was the principal investigator on the world's first arthritis gene therapy clinical trial and also is developing gene therapies for bone healing and cartilage repair. Evans is past president of the Orthopaedic Research Society and is a fellow of the Royal Society of Chemistry, Royal College of Pathologists, and Learned Society of Wales.

Shawn Flanagan, PHD, MHA, is an assistant professor at the Neuromuscular Research Laboratory/Warrior Human Performance Research Center in the Department of Sports Medicine and Nutrition in the School of Health and Rehabilitation Sciences at the University of Pittsburgh.

Flanagan received his baccalaureate from Denison University, a master's degree in Kinesiology at the University of Connecticut, a master's degree in Health Policy and Management at the University of Pittsburgh, and a doctorate in Kinesiology and Neuroscience at The Ohio State University.

His background is in neuroscience and physiology with training in brain stimulation, imaging, neuroendocrinology, and physical exercise. At the University of Pittsburgh, Flanagan's overall research interests emphasize neurobiological factors that contribute to human performance optimization, stress, resilience, and injury. Current work includes the influence of the brain/cognition on injury and human performance optimization, psychological and physiological resilience, biomarkers of adaptation and injury, and novel clinical rehabilitation techniques for return to duty/play.

Flanagan's research projects are/have been supported by the U.S. Department of Defense, National Aeronautics and Space Administration, and the National Strength and Conditioning Association. Flanagan is a member of the Society for Neuroscience, American Physiological Society, Endocrine Society, and American College of Sports Medicine. He received an Ohio State University Doctoral Fellowship Award and an American Kinesiology Association Graduate Student Writing Award, and he co-authored two research publications that were awarded Best Scientific Paper by the Journal of the American College of Nutrition. He has more than 35 peer-reviewed publications and was recently named an associate editor for the *Journal of Strength and Conditioning Research.*

Speaker Biographies, continued

Paul George, MD, PhD, is a stroke neurologist who received his MD from Harvard University and completed his residency and fellowship training at Stanford University. His doctoral research was performed at the Massachusetts Institute of Technology (MIT) in bioelectrical engineering through the Harvard-MIT Health Sciences and Technology program. George's current research is focused on optimizing the ability of stem cells to improve patient function following stroke. His research combines biomaterial scaffolds and neural stem cells to enhance neural repair mechanisms.

Thomas Gilbert, PhD, has served as chief science officer at ACell Inc. since 2015, after serving as ACell's vice president of research and development from 2012 to 2015. Previously, Gilbert was assistant professor of surgery, cardiothoracic surgery, and bioengineering at the University of Pittsburgh and was a faculty member at the McGowan Institute for Regenerative Medicine. His research includes the study of processing and use of extracellular matrix scaffold materials (including urinary bladder matrix) for the development of regenerative medicine strategies in a variety of body systems.

Gilbert has coauthored more than 50 peer-reviewed articles and several book chapters, and has applied for several patents related to extracellular matrix technology. His funding sources included the National Institutes of Health and the National Science Foundation. He also has worked as a metallurgist for the Perryman Company in Houston, Pa. Gilbert has a BS in materials science and engineering from Carnegie Mellon University and a PhD in Bioengineering from the University of Pittsburgh.

Nelson Hager, MD, MS, is vice chair of the Department of Physical Medicine and Rehabilitation at the Uniformed Services University of the Health Sciences in Bethesda, Md. He received his MD from the Uniformed Services University of the Health Sciences, his MS in physical education from Indiana University and his BS in physical education from the U.S. Military Academy.

As a former infantryman with two company commands (the 60th Mechanized Infrantry and the 32 Light Infantry Battalion), Hager brings an acute awareness of the needs of the intrepid soldier and appreciation for the military way of life, as well as an unwavering desire to serve these honorable individuals. He has received numerous awards for his service, including the Meritorious Service Medal (4), the Army Commendation Medal (2), the National Defense Service Medal (2), an Army Service Ribbon, a Global War on Terror Service Medal, a Ranger Tab, an Airborne Parachutist Badge and an Expert Infantryman's Badge. Hager is the former chief of physical medicine and rehabilitation at Tripler Army Medical Center, as well as chairman of the Physical Medicine and Rehabilitation Service at Walter Reed National Military Medical Center; inducted into the Order of Military Merit for distinguished contributions to army medicine.

Shailly Jariwala, PhD, received her BS in biomedical engineering from the University of Mumbai, India in 2006. She enrolled as a grad student in the Department of Biomedical and Chemical Engineering at Syracuse University, receiving her MS in 2009 and her PhD in 2013. In her graduate research, she led efforts in development and characterization of novel acrylic two-solution bone cements for treatment of spinal compression fractures. As a postdoctoral fellow in the Department of Orthopedics and Rehabilitation at Pennsylvania State University College of Medicine, she gained vast expertise in design, development, and characterization of orthopaedic biomaterials (bone grafts) and translational research models (osseointegrated implants, mechanical loading of implants).

Jariwala is a past recipient of the prestigious Entrepreneur Fellowship at the Center for the Translation of Rehabilitation Engineering Advances and Technology, offered jointly by the National Institutes of Health and the Dartmouth Biomedical Engineering Center for Orthopedics. There, Jariwala was the project lead for design, development, manufacturing, and nonclinical regulatory testing of an intraosseous infusion needle placement guide (TibFinder, Class I medical device). She also delivered expert consultation to accelerate commercialization of rehabilitation and assistive technologies, including guidance of U.S. Food and Drug Administration regulatory and reimbursement strategies for new medical devices. Jariwala currently is the senior biomedical engineer for the Center for Rehabilitation Sciences Research at the Uniformed Services University of the Health Sciences and is responsible for leading, planning, and conducting biomedical research and development in support of a portfolio of projects in regenerative medicine that includes neuroregeneration, orthopedic tissue repair, biomaterials design, 3-D printing, and 3-D bioprinting.

Theresa A. Jones, PhD is a professor in the psychology department and Neuroscience Institute at the University of Texas at Austin. Her central focus is on understanding how experience- and activity-dependent plasticity interact with injury-induced signals to shape neural and vascular reorganization and functional outcome after stroke, as studied primarily in rodent models of poststroke upper extremity impairment.

David Mack, PhD, is an associate professor in the Departments of Rehabilitation Medicine and Bioengineering as well as an investigator in the Institute for Stem Cell and Regenerative Medicine at the University of Washington. He has a long-standing interest in how stem cells make cell fate decisions during embryonic development by coordinating their intrinsic genetic program with cues from their surrounding microenvironment. The goal of Mack laboratory researchers is to apply their understanding of these basic biological processes to develop stem cell and genome-editing therapies for patients with neuromuscular diseases. Mack's expertise is rooted at the intersection of genetics, developmental biology, cancer biology, biomaterials, and new technologies arising from the field of regenerative medicine.

Gerard Malanga, MD, is a renowned specialist in the nonsurgical treatment of orthopedic and sports-related injuries, including neck and back pain, shoulder and knee injuries, and other musculoskeletal conditions. He has expertise in musculoskeletal ultrasound, ultrasound-guided injections and various biologic treatments and now leads The Kessler Foundation's Regenerative Medicine Program. A graduate of Villanova University, Malanga earned his medical degree at the University of Medicine and Dentistry of New Jersey (now Rutgers New Jersey Medical School), and completed a sports medicine fellowship at the Mayo Clinic in Rochester, Minn. He is board certified in physical medicine and rehabilitation, pain medicine, and sports medicine.

Malanga is the founder of New Jersey Sports Medicine, LLC, and New Jersey Regenerative Institute, LLC, in Cedar Grove, N.J. He also is a clinical professor of physical medicine and rehabilitation at Rutgers New Jersey Medical School. He has lectured throughout the country on a variety of musculoskeletal, spine, and pain management topics. His extensive list of publications includes original research and book chapters as well as the textbooks *Whiplash and Scientific Evidence of Musculoskeletal Physical Examination* and *The Atlas of Ultrasound-Guided Musculoskeletal Injections.* His research interests include stem cell treatments for orthopedic conditions, ultrasound treatment for musculoskeletal conditions, and treatment of chronic tendinosis.

Malanga provides sports medicine services to several New Jersey high schools, colleges, and professional teams. Since 1999, he has served as the head team physician of New Jersey City University. In addition, he serves as a consultant to the Rutgers University athletic department and the National Hockey League Players' Association.

A fellow of the American Academy of Physical Medicine and Rehabilitation (AAPM&R) and the American College of Sports Medicine, Malanga also is chair of the AAPM&R's Task Force on Regenerative Medicine. He has been active in the Physiatric Association of Spine, Sports, and Occupational Rehabilitation; North American Spine Society; and American Institute of Ultrasound Medicine. In addition, he was recently elected to the Board of Directors of the American Academy of Regenerative Medicine.

For his work, Malanga has been recognized as one of the best doctors in America, and more specifically in New Jersey and the New York metro area, by Castle Connolly, *New Jersey Monthly, Inside Jersey* and *New York* magazine.

Chet Moritz, PhD, is a University of Washington associate professor in the Division of Physical Therapy of the Department of Rehabilitation Medicine. Moritz teaches courses in muscle and exercise physiology. He employs a mix of active, collaborative, and problem-based learning strategies in the classroom. He also mentors graduate students in the rehabilitation sciences, neurobiology and behavior, and physiology and biophysics PhD programs. Moritz is developing treatments for paralysis using brain-computer interfaces and neurotechnology. Motor paralysis from stroke or spinal cord injury can be severe and long lasting despite damage to a relatively small area of the nervous system. The goal is to develop neuroprosthetic devices capable of bypassing these damaged areas and restoring volitional control of movement to paralyzed limbs. This approach has been demonstrated to be feasible by using activity recorded from the motor cortex to directly control electrical stimulation of paralyzed muscles.

In addition to replacing lost motor function, we are also attempting to guide and promote the regeneration of damaged neural tissue. Targeted electrical microstimulation can be used to increase the strength of synaptic connections among neurons via

Speaker Biographies, continued

mechanisms of Hebbian plasticity. Moritz currently is investigating whether this synchronous stimulation, applied across an injury site, can guide neurons to make connections with appropriate targets and testing novel methods for the physical therapy and rehabilitation of movement disorders. A portable visual feedback device has been developed to train children with cerebral palsy to produce functional muscle synergies. By connecting the activity of impaired muscles to control the movements of popular computer games, volitional control of coordinated muscle activity can be improved.

Charles E. Murry, MD, PhD, is a cardiovascular pathologist whose clinical interests span ischemic heart disease, cardiac transplantation, atherosclerosis, heart failure, cardiomyopathy, valvular disease, and nonatherosclerotic vascular disease.

Murry is director of the Center for Cardiovascular Biology; William and Mary Conner Chair for the Institute for Stem Cell and Regenerative Medicine; and professor of pathology, bioengineering, medicine/cardiology at the University of Washington School of Medicine in Seattle, Wash.

Murry's research interests center on stem cell biology and cardiovascular diseases. His laboratory studies pluripotent human stem cells (embryonic stem cells and induced pluripotent stem cells) and also carries out some adult stem cell biology. The center uses differentiating stem cells as systems to understand molecular regulation of cardiovascular development, and tissue engineering approaches to learn the rules for tissue assembly and growth. They use induced pluripotent stem cells to model genetic diseases such as cardiomyopathy in vitro. A large portion of the lab's efforts are directed at harnessing stem cells to promote muscle regeneration of the injured heart.

David Reinkensmeyer, PhD, is a professor in the Departments of Mechanical and Aerospace Engineering, Anatomy and Neurobiology, Biomedical Engineering, and Physical Medicine and Rehabilitation at the University of California, Irvine. He received a BS in electrical engineering from the Massachusetts Institute of Technology and MS and PhD degrees in electrical engineering from the University of California, Berkeley, where he studied robotics and the neuroscience of human movement. He carried out postdoctoral studies at the Rehabilitation Institute of Chicago and Northwestern University Medical School, building one of the first robotic devices for rehabilitation therapy after stroke. He became an assistant professor at UC Irvine in 1997, establishing a research program that develops robotic and sensor-based systems for movement training and assessment following neurologic injuries and disease. He is a coinventor of the T-WREX arm training exoskeleton, commercialized by Hocoma A.G. as ArmeoSpring and now in use in more than 700 rehabilitation facilities worldwide for people with stroke, spinal cord injury, multiple sclerosis, cerebral palsy, and orthopedic injuries. He also is coinventor of the MusicGlove hand training device, now being commercialized by Flint Rehabilitation Devices. He is codirector of the NIDILRR COMET Robotic Rehabilitation Engineering Center, codirector of the National Instututes of Health K12 Engineering Career Development Center in Movement and Rehabilitation Sciences, and editor-in-chief of the Journal of NeuroEngineering and Rehabilitation. He recently received the Innovator of the Year Award from the Henry Samueli School of Engineering and the Distinguished Midcareer Faculty Research Award from UC Irvine.

Joseph Roche, BPT, Dip. Rehab PT, PhD (who goes by his last name, Roche) received his Bachelor's Degree in physical therapy in 1998, and has worked as a clinician in various clinical settings. Roche earned his PhD in Physical Rehabilitation Science (Rehabilitation Physiology Track) in 2008, from the University of Maryland Baltimore, where he also completed his postdoctoral fellowship in muscle biology. Roche joined Wayne State University in Detroit, as an assistant professor, in 2014, where he has set up an independent research program in neuromuscular regenerative rehabilitation. Roche's main research focus is to find ways to prevent and reverse muscle loss that occurs due to muscular dystrophies, aging, and trauma.

Lloyd F. Rose, PhD, is the portfolio manager for the Clinical and Rehabilitative Medicine Research Program at the U.S. Army Medical Research and Materiel Command.

Rose graduated in 1994 from the University of Texas at Austin with a BA in history. Following a stint with the U.S. Department of the Treasury, Rose returned to the University of Texas at Austin, receiving his Bachelor of Science degree in microbiology in 2006. From 2006 to 2012, Rose studied poxvirus immune evasion mechanisms, earning a PhD in microbiology and immunology from the University of Texas Health Science Center at San Antonio. After completing his degree, he began a postdoctoral fellowship at the U.S. Army Institute of Surgical Research,

working on burns, scarring, and skin regeneration. In 2015, he moved to the U.S. Army Medical Research and Materiel Command at Fort Detrick, Md., to manage research projects in regenerative medicine. Currently, Rose serves as the regenerative medicine portfolio manager in the Clinical and Rehabilitative Medicine Research Program, responsible for planning, budgeting, and execution of Army, Defense Health Program, and Congressional Special Interest funds directed toward dynamic and innovative regenerative medicine research.

David Saunders, MD, MPH, served as a product manager in the Tissue Injury and Regenerative Medicine (TIRM) Office at U.S. Army Medical Materiel Development Activity (USAMMDA) from 2015 to 2018. He was appointed medical director when TIRM merged with the Combat Trauma and Acute Rehabilitation Project Management Office in mid-2018. Saunders has extensive experience in the advanced clinical development of regenerative medicine products intended to restore form and function in wounded warfighters. He manages products and provides
medical governance and subject matter expertise to a large portfolio of projects, including skin and limb regeneration, hemorrhage control, and extracorporeal life support. Prior to joining USAMMDA, Saunders served as a malaria clinical trialist for 10 years in Southeast Asia, leading the Department of Immunology and Medicine at the Armed Forces Research Institute of Medical Sciences.

Isobel Scarisbrick, PhD, is director of the Neural Regeneration Laboratory within the Rehabilitation Medicine Research Center at the Mayo Clinic. She received her PhD from the University of California, Irvine and is currently an associate professor of physiology and biomedical engineering at the Mayo Clinic. Her research interests include discovery of new targets for repair of the injured and diseased central nervous system, with an emphasis on developing new methods to treat traumatic injury to the spinal cord and neuroinflammatory conditions affecting myelin. These studies have been funded by federal, private, and nonprofit research awards, including grants from the National Institutes of Health, the National Multiple Sclerosis Society, Neilsen Foundation, and the Christopher and Dana Reeve Foundation. She is a globally recognized scientist credited with a number of important scientific breakthroughs related to the mechanisms of neuroinflammation, neurodegeneration, astrogliosis, and myelin homeostasis. These research efforts have resulted in six issued patents and significant publications in leading neuroscience journals. Her discoveries have been recognized by numerous awards, including the C.P. Leblond Research Award, Genentech Research Award, Weil Award in Experimental Neuropathology, and Mayo Clinic Neurology Basic Science Research Award. Dr. Scarisbrick's research also was recently recognized with the Translational Research or Human Neuroscience Studies in Spinal Cord Injury Award from the American Spinal Cord Injury Association and the E.K. Frey–E. Werle and Henner Graeff Promotion Prize recognizing important new contributions promoting progress in contemporary protease research that has high clinical relevance. Scarisbrick also is an outstanding educator who has received several awards for teaching, including the 2018 Outstanding Physician/Scientist Teacher of the Year Award from the Mayo Clinic School of Health Sciences.

Richard K. Shields, PT, PhD, FAPTA, received a bachelor's degree in biology, a postbaccalaureate degree in physical therapy from the Mayo Clinic, a master's degree in exercise physiology, and a PhD with an emphasis in movement control from the University of Iowa. Shields managed the acute spinal cord injury program at the University of Iowa for several years. He developed lines of research related to how various doses of stress impact tissue health in people with central nervous system injury. His work strives to improve the health quality of individuals who suffer from reduced activity from paralysis, obesity, injury, or age. His research has been funded for the last 20 years by the National Institutes of Health, the U.S. Department of Veterans Affairs, and several private foundations. Shields has published more than 100 scientific papers and has delivered more than 200 scientific presentations. He was the recipient of the Iowa Neurology Clinical Research Award, the APTA Neurology Section Research Excellence Award, the University of Iowa Outstanding Mentor and Teaching Award, the Mayo Clinic Outstanding Alumnus Award, the American Physical Therapy Association (APTA) Williams Research Award, and the Maley Research Award; was named a Catherine Worthingham fellow by APTA, delivered the 48th Mary McMillan Lecture at the APTA National Meeting; and received the Regents Award for Faculty Excellence from the University of Iowa. He is a professor in and chair of the Department of Physical Therapy and Rehabilitation Sciences within the Carver College of Medicine at the University of Iowa.

Speaker Biographies, continued

Nathan Sniadecki, PhD, is an associate professor in the Department of Mechanical Engineering, associate chair for research and infrastructure, adjunct associate professor of bioengineering, and a member of the Center for Cardiovascular Biology and Institute for Stem Cell and Regenerative Medicine at the University of Washington.

Sniadecki's research is in the areas of cell biomechanics, mechanobiology, and biomedical microelectromechanical systems. His lab is developing micro- and nanoscale tools to understand the mechanical properties of cells. The lab uses arrays of flexible silicone posts to measure the contractile forces of cells, computational modeling to examine cell mechanics, and microfluidic devices to investigate the cardiovascular system. The long-term goals of his work are to understand the ways in which mechanics play a role in tissue growth and cardiovascular disease and how cell mechanics can be used to improve human health through better diagnostic systems and improved tissue engineering. Sniadecki is the chief technology officer and cofounder of Stasys Medical Corporation and scientific advisor for Micro Phone Lens. He is an associate editor for the American Society of Mechanical Engineer's *Journal of Biomechanical Engineering.*

Martin Stoddart, PhD, FRSB, has been working as a principal scientist at the AO Research Institute Davos (ARI) since 2009, where he is responsible for the Stem Cell Focus Area. His interests include the use of mesenchymal stem cells for bone and cartilage repair, in particular the role of mechanoregulation during the initiation of mesenchymal stem cells chondrogenesis. This has led to an increased understanding of chondrogenesis under complex physiological loads in the absence of exogenous growth factors. He completed his bachelor's in biology in 1995 and his MPhil in 1996 at the University of Aberystwyth. He completed his doctoral thesis in oncology at the University of Nottingham. In 2000, he moved to the Laboratory for Experimental Cartilage Research in Zürich, Switzerland, initially as a postdoc and from 2003 as group head, moving to ARI in 2005. In 2002, he took a sabbatical at the Center for Molecular Orthopedics at Harvard Medical School and Brigham and Women's Hospital Boston, Mass., to learn viral gene transfer techniques. Stoddart was awarded an honorary professorship from the Albert-Ludwigs University in Freiburg, Germany in 2015 and an Honorary Professorship from the Institute for Science and Technology in Medicine at Keele University, United Kingdom, in 2016. Also in 2016, he was elected a fellow of the Royal Society of Biology. He is chair of the Orthopedic Research Society Basic Science Education Committee and deputy cochair of the International Cartilage Regeneration & Joint Preservation Society Basic Science Committee. He is an editor of *Tissue Engineering* Parts A, B, and C, scientific editor for the eCM journal; and chair of the yearly eCM conference. He has published more than 80 papers and 10 book chapters and has edited two books.

Laura Suggs, PhD, is the T.U. Taylor Professor in and associate chair of the biomedical engineering department at the University of Texas at Austin. She earned her undergraduate degrees at UT Austin and her PhD in chemical engineering with a concentration in biomaterials and tissue engineering at Rice University in 1998. Following an industrial position as a senior scientist and a research associate position at the University of Minnesota, she returned to Texas to join the faculty of the University of Texas at Austin in 2004. She has been the recipient of an American Heart Association Beginning Grant-in-Aid and Grant-in-Aid; NSF ADVANCE Fellowship; NSF CAREER award; and she was recently elected to the American Institute for Medical and Biologic Engineering. She has received funding from the American Heart Association, the Welch Foundation, National Institutes of Health and the Department of Defense. She has served as an associate editor for Annals of Biomedical Engineering, the Journal of Materials Chemistry Part B, and has served on the governing board of the Society for Biomaterials. Her education portfolio includes Engineering Biomaterials, Tissue Engineering, Cell Engineering and Senior Design Projects. These efforts have earned her the National Instruments Teaching Excellence Award and the ASEE Gulf Southwest Section Young Faculty Award.

Workshop Presenter Biographies

Marcas Bamman, PhD, FACSM, is a professor in the Department of Cell, Developmental, and Integrative Biology at the University of Alabama at Birmingham.

Exercise profoundly impacts the integrity and function of every major organ system and is therefore considered the only pluripotent form of medicine available. To maximize impact on disease progression, prevention (i.e., risk factor mitigation), and rehabilitation, the state of the art in research is a focus on dose-response trials to provide the evidence base that yields optimal prescriptions in a disease-specific and population-specific manner. The University of Alabama at Birmingham Center for Exercise Medicine is among the nation's leaders in this effort, with significant emphasis on exercise as an effective form of regenerative medicine to restore the function of cells, tissues, and whole organ systems that have suffered the consequences of aging, disease, damage, or congenital defects. The Center is currently leading clinical and translational research in aging, Parkinson's disease, multiple sclerosis, ALS, spinal cord injury, epilepsy, head and neck cancer, heart failure, osteoarthritis, HIV frailty, and postsurgical rehabilitation (i.e., following total joint replacement and organ transplantation).

Marcus Bamman has directed several exercise clinical trials including randomized dose-response trials focused on aging, and he is currently the overall principal investigator (PI) of five, multisite randomized exercise trials focused on molecular transducers of exercise-induced health benefits, total joint arthroplasty rehabilitation, aging with mobility impairment, Parkinson's disease (Curry Foundation), and epigenetic determinants of exercise responsiveness. All of his human studies are biologically driven, centered on cellular/molecular analyses of biospecimens and primary stem cells coupled with thorough in vivo phenotyping in healthy and diseased 19–83 year olds to better understand mechanisms of exercise-induced improvements in neuromuscular function and muscle mass/quality in the face of atrophy and dysfunction in acute (e.g., surgery, trauma, disuse, burn) or chronic (e.g., Parkinson's, arthritis, cancer, spinal cord injury) conditions. Bamman has served on more than 35 federal review panels and National Institutes of Health (NIH) study sections, including a four-year term serving the NIH/Center for Scientific Review Skeletal Muscle and Exercise Physiology study section.

Linda J. Noble-Haeusslein, PhD, is a professor in the Departments of Neurology and Psychology at the University of Texas at Austin. She directs a laboratory that focuses on the pathobiology of traumatic injury to the developing brain and spinal cord injury with the goals of defining early mechanisms underlying cell injury and applying that knowledge to the development of candidate therapeutics for brain- and spinal-cord injured patients. She has been funded by the National Institutes of Health (NIH) for more than 25 years, has served on study sections for NIH, has chaired two regular NIH study sections and currently chairs the NIH/National Institutes of Neurological Disorders and Stroke/NSDA study section. In addition, she has participated in three Institute of Medicine committees on traumatic brain injury. Noble-Haeusslein directs a new graduate-level course on traumatic brain and spinal cord injuries, which exposes students to translational research, focusing on the clinical problems; the underlying cellular and molecular substrates that contribute to neurological impairments; and cutting-edge research directed toward supporting recovery, including regenerative rehabilitation.

Noble-Haeusslein's research interests focus on traumatic brain and spinal cord injuries often resulting in permanent disabilities that can profoundly affect the quality of life. The extent of functional recovery after either traumatic brain or spinal cord injury is a consequence of the initial mechanical destruction of tissue and of secondary factors that collectively contribute to additional tissue damage. The challenge is to carefully define these factors, determine the time course of their expression, and develop therapeutic interventions that target their temporal window of expression. To address these complex objectives, the Noble-Haeusslein laboratory has developed and characterized reproducible models of traumatic brain and spinal cord injuries in the rodent that accurately mimic the human condition. These models are being used to define those substrates that govern recovery, with the long-term goal of developing therapeutics that are specifically tailored for patients with brain and spinal cord injuries.

Faculty Disclosure

All individuals in a position to control the content of this education activity are required to disclose all relevant financial relationships with any proprietary entity producing, marketing, reselling, or distributing health care goods or services used on or consumed by patients.

The following information was disclosed:

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Disclaimer Statement

No other planners, members of the planning committee, speakers, presenters, authors, content reviewers and/or anyone else in a position to control the content of this education activity have relevant financial relationships to disclose.

Poster Titles and Authors

1. "3D Magnetic Hyaluronic Acid Hydrogels to Modulate Expressions of Mechanosensitive Ion Channels for Pain Relief"
   Abstract submitted by Andy Kah Ping Tay, Stanford University

2. "A Novel Model of Soft Tissue Manipulation in Rodents with Induced Low Back Pain Attenuates Inflammation and Improves Function"
   Abstract submitted by Alanna Fennimore, Indiana University

3. "A Role for Endogenous Neural Precursors in the Vascular Response to Focal Cortical Infarcts"
   Abstract submitted by Michael Williamson, University of Texas at Austin

4. "AAV Delivery of α-Klotho: Gene Therapy as a Strategy to Counteract Sarcopenia"
   Abstract submitted by Abish Pius, University of Pittsburgh

5. "Administration of α-Klotho Systemically Enhances Skeletal Muscle Regeneration"
   Abstract submitted by Zachary Clemens, University of Pittsburgh

6. "Autologous Micro-Fragmented Adipose Tissue Injection under Ultrasound Guidance for Chronic, Recalcitrant Shoulder Pain in Manual Wheelchair Users with Spinal Cord Injury"
   Abstract submitted by Trevor Dyson-Hudson, Kessler Foundation

7. "Changes in Supraspinatus Tendon Signal Intensity after Micro-fragmented, Autologous Adipose Tissue Treatment in a Wheelchair User with Paraplegia: A Case Study"
   Abstract submitted by Nathan Hogaboom, Kessler Foundation

8. "Combining a Peripheral Nerve Matrix Derived Hydrogel and Post-Surgical Therapy for Improving Functional Recovery Following Nerve Reconstruction"
   Abstract submitted by Tyler Meder, University of Pittsburgh

9. "Combining Traditional Medicine, Regenerative Treatment and Current Technology to Optimize Care of Patients with Chronic Obstructive Pulmonary Disease"
   Abstract submitted by Melissa Rubio, Lung Health Institute

10. "Early Increase in Voluntary Running Activity Was Associated with a Slower Rate of Cartilage Degeneration in Rats following Medial Meniscal Transection"
    Abstract submitted by Liang-Ching Tsai, Georgia State University

11. "Effectiveness of Mesenchymal Stem Cells for Treating Patients with Knee Osteoarthritis: A Meta-analysis Toward the Establishment of Effective Regenerative Rehabilitation"
    Abstract submitted by Hirotaka Iijima, Keio University

12. "Effectiveness of Rehabilitation after Cell Transplantation for Peripheral Nerve Regeneration: Protocol for a Systematic Review"
    Abstract submitted by Hideki Kawai, Kyoto University

13. "Effects of the Combined Therapy of Rehabilitation with Cell Therapy on Motor Functional Recovery after Cerebral Infarction: A Systematic Review"
    Abstract submitted by Naoko Kubo, Kyoto University

14. "Exosomes Carrying Klotho: A Potential Biomarker for Developing Customized Rehabilitation Protocols"
    Abstract submitted by Amrita Sahu, University of Pittsburgh

15. "Exposure of Muscle Stem Cells to a Stiff Microenvironment Drives an 'Aged' Mitochondrial Phenotype"
    Abstract submitted by Hikaru Mamiya, University of Pittsburgh

16. "Functional Rehabilitation of Neural Networks Following Moderate-to-Severe Traumatic Brain Injury Using a Combination of Biomaterials and Electric Stimulation Methods"
    Abstract submitted by Charles-Francois Latchoumane, University of Georgia

17. "Functional Seated Vertical Traction for Rehydration Promotion in Lumbar Intervertebral Discs: A Three-phase Pilot Study"
    Abstract submitted by Marit Johnson, South Dakota School of Mines and Technology

18. "Hoxa10 Regulates Skeletal Muscle Regeneration in a Body-Region-Specific Manner"
    Abstract submitted by Kiyoshi Yoshioka, Nagasaki University

Poster Titles and Authors, continued

19. "Immuno-Regulatory Roles of Cyclic Loading that Promotes Skeletal Muscle Regeneration"
    Abstract submitted by Bo Ri Seo, Harvard University

20. "Immunomodulation of the Eye Microenvironment Using a Corneal Wound Model"
    Abstract submitted by Elizabeth Wicks, University of Mississippi School of Medicine

21. "In Vitro Trauma Induces TDP-43 Proteopathy and Exacerbates Motor Neuron Degeneration in ALS Patient iPSC-Derived Motor Neurons"
    Abstract submitted by Maria Jose Quezada Valladares, Northwestern University

22. "Inducing Robust Forelimb Recovery with Optogenetic Spinal Stimulation in a Rat Model of Chronic Cervical Spinal Cord Injury"
    Abstract submitted by Sarah Mondello, University of Washington

23."Low Intensity Vibrations Augment Proliferation and Differentiation in Aging Mesenchymal Stem Cells"
    Abstract submitted by Gunes Uzer, Boise State University

24. "Markerless Mobility Assessment Techniques Toward an Establishment of Outcome Measures of Regenerative Rehabilitation for Knee Osteoarthritis"
    Abstract submitted by Hirotaka Iijima, Keio University

25. "Minimally-Invasive Muscle Embedding (MIME) Generates Donor-Derived Muscle Fibers that have Multiple Sarcomeres and Nuclear Domains in Series"
    Abstract submitted by Andrea Eaton, Wayne State University

26. "Patellofemoral Osteoarthritis Progression Related with Gait Kinematics Changes in Rat with Destabilized Medial Meniscus"
    Abstract submitted by Akihiro Nakahata, Kyoto University

27. "Rapid Musculoskeletal Assessment: An Application to the Sit-to-Stand Action"
    Abstract submitted by Robert Matthew, University of California at Berkeley

28. "Reduction of Magnesium Degradation-Induced Biomineralization using Matrix GLA Protein"
    Abstract submitted by Dandan Hong, University of Pittsburgh

29. "Rehabilitation After Osteochondral Autograft Transplantation: A Single Case Report"
    Abstract submitted by Hirotaka Iijima, Keio University

30. "Spatially Patterned Nanofibrillar Scaffolds and Rehabilitative Exercise Enhance Vascularization and Innervation to Injured Muscle"
    Abstract submitted by Ngan Huang, Stanford University

31. "Sub-Additive Effects of Cell and Physical Therapy in a Rodent Model of Stroke"
    Abstract submitted by Jeffrey Moorhead Jr., University of Pittsburgh

32. "The Assessment Devices for Sit-to-Stand Task in Stroke Patient"
    Abstract submitted by Jumpei Yokota, Kyoto Unversity

33. "The Correlation of Kinematic Changes with Histomorphometric Data in the Rat Sciatic Nerve Crush Injury Model"
    Abstract submitted by Tianshu Wang, Kyoto University

34. "The Effect of In Vitro Electromechanical Stimulations of iPSC-Derived Myotubes on Skeletal Muscle Maturation"
    Abstract submitted by Maryam Fayazi, University of Washington

35. "Therapeutic Efficacy of Encapsulated Human Mesenchymal Stem Cells on Osteoarthritis"
    Abstract submitted by Jay McKinney, Georgia Institute of Technology and Emory University

36. "Transcutaneous Spinal Stimulation with Intensive Exercise Improving Functional Mobility in Chronic Incomplete Cervical Spinal Cord Injury"
    Abstract submitted by Soshi Samejima, University of Washington

37. "Ultrasound Therapy Suppresses Inflammatory Gene Expression in an Injured Peripheral Nerve after Sciatic Nerve Crush Injury in Rats"
    Abstract submitted by Akira Ito, Kyoto University

38. "Zinc Oxide Nanoparticles: Potential Applications and Safety Issues in Tissue Repair"
    Abstract submitted by Anju Manuja, Indian Council of Agricultural Research-National Research Centre on Equines

Travel Awards

Thanks to the generous support of the Alliance for Regenerative Rehabilitation Research and Training Program, the International Consortium on Regenerative Rehabilitation, and R13 grant 2R13HD085724-04, we were able to provide registration and/or travel funds to 17 attendees.

These awards are made to provide opportunities for graduate students, medical fellows and residents, postdoctoral fellows, rehabilitation clinicians, and junior investigators to participate in the Seventh Annual Symposium on Regenerative Rehabilitation.

Congratulations to our travel award recipients!

International Awardees

Alice Gualerzi
Fondazione Don Carlo Gnocchi
Milan, Italy

Rukia Ikeda
Kyoto University
Kyoto, Japan

Hideki Kawai
Kyoto University
Kyoto, Japan

Naoko Kubo
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Kyoto, Japan

Anju Manuja
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Kyoto University
Kyoto, Japan

Ryosuke Tsuchimochi
Kyoto University
Kyoto, Japan

Naoki Yamada
Jikei University School of Medicine
Tokyo, Japan

Kiyoshi Yoshioka
Nagasaki University
Nagasaki City, Japan

U.S. Awardees

Alanna Fennimore
Indiana University
Indianapolis, Ind.

Charles-Francois Latchoumane
University of Georgia
Athens, Ga.

Hikaru Mamiya
University of Pittsburgh
Pittsburgh, Pa.

Jeffrey Moorhead, Jr.
University of Pittsburgh
Pittsburgh, Pa.

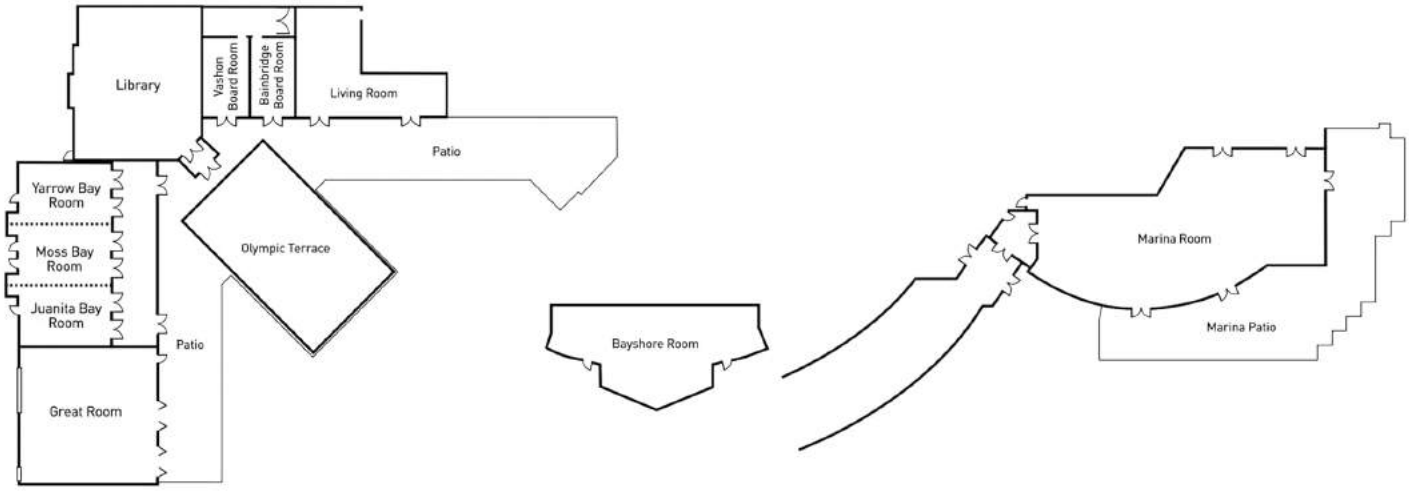
Amrita Sahu
University of Pittsburgh
Pittsburgh, Pa.

Liang-Ching Tsai
Georgia State University
Atlanta, Ga.

Gunes Uzer
Boise State University
Boise, Idaho

Michael Williamson
University of Texas at Austin
Austin, Texas

Hotel Map


Library
Vashon Board Room
Bainbridge Board Room
Living Room
Patio
Yarrow Bay Room
Moss Bay Room
Juanita Bay Room
Olympic Terrace
Patio
Great Room
Bayshore Room
Marina Room
Marina Patio


SAVE
THE DATE
FOR THE
EIGHTH ANNUAL
INTERNATIONAL
REGENERATIVE
REHABILITATION
SYMPOSIUM AT THE
UNIVERSITY OF VIRGINIA
OCTOBER 24-26, 2019

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AR³T

Alliance for Regenerative Rehabilitation Research and Training

The Alliance for Regenerative Rehabilitation Research and Training (AR³T), an NIH-funded resource center, supports the expansion of scientific knowledge, expertise and methodologies across the fields of regenerative medicine and rehabilitation through education, training, research support and funding opportunities.

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- Training Courses
- Annual Symposium
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RESEARCH

- Pilot Funding Program
- Expert Consultations
- Sabbatical Experiences
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