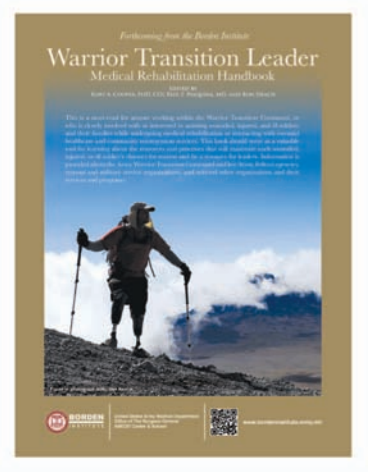
HERL Newsletter

VOLUME 10, NO. 2 · NOVEMBER 2011 · *News from the* HUMAN ENGINEERING RESEARCH LABORATORIES

Wounded Warrior Handbook published

The Borden Institute of the U.S. Army Medical Institute has announced the publication of the *Warrior Transition Leader Medical Rehabilitation Handbook*, edited by HERL director Rory A. Cooper, PhD; COL Paul F. Pasquina, MD, and Ron Drach. This book is targeted toward helping Army leaders of all levels to assist wounded, injured, and ill Soldiers and their families while undergoing medical rehabilitation or interacting with essential healthcare and community reintegration services. It is Dr. Cooper's second book for the Borden Institute, following 2009's *Care of the Combat Amputee*.



This book is meant to serve as a tool for learning about the resources and processes that will maximize each wounded, injured, or ill Soldier's chances for success and be a resource for leaders. Information is provided about the Army Warrior Transition Command and key Army, federal agencies, veteran and military service organizations, and selected other organizations and their services and programs. Accessible information about essential principles, practices, and definitions in medical rehabilitation are included. Also presented are several vignettes on Soldiers who have successfully adapted to their impairments to lead remarkable lives as Soldiers or Army Veterans. Although geared toward nonmedical personnel working with wounded, injured, and ill Soldiers, the book has material of interest to a much broader audience.

On Friday, November 18, HERL
(Continued on p. 10)

HERL Investigators Part of Team That Succeeds with Brain-Controlled Robotic Hand

History was made on October 10 when Tim Hemmes reached out and touched his girlfriend's hand. It doesn't sound like a big deal, except that Hemmes was paralyzed in a motorcycle accident seven years ago. He was using nothing but his thoughts to control a robotic arm and hand.

It was a major success for a project involving HERL medical director Michael Boninger, MD and HERL Investigators Jennifer Collinger and Doug Weber.

The robotic arm, designed at the Johns Hopkins University Applied Physics Laboratory, is controlled by a grid of electrodes placed on the surface of the brain. To move the hand left, Hemmes imagined flexing his thumb, and moving it right required imagining bending his elbow. Other mental associations triggered different movements.

The success of the first trial bodes well for the future of such brain-computer interfaces (BCI), said Dr. Boninger. "[It] reinforces the great potential BCI technology holds for not only helping spinal
(Continued on p. 10)

Tim Hemmes high-fives his girlfriend, Katie Schaffer.
Image courtesy UPMC

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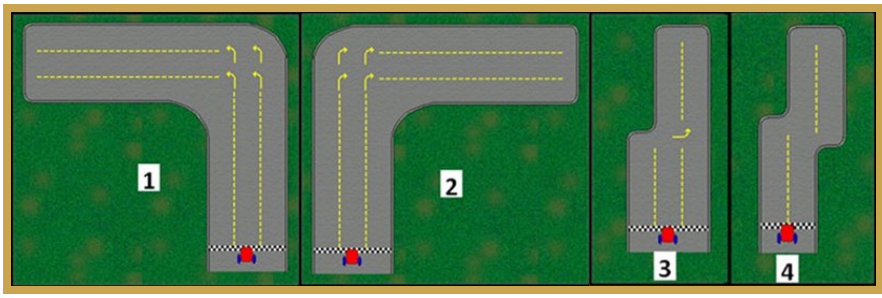
CURRENT RESEARCH ABSTRACTS

Comparison of Virtual Wheelchair Driving Performance of People with TBI using an Isometric and a Conventional Joystick

Mahajan H, Spaeth DM, Dicianno BE, Collins DM, Boninger ML, Cooper RA

Full article published in *Archives of Physical Medicine and Rehabilitation,* pp. 1298-1304, Vol. 92, November 2011.

Many people with TBI experience long term sensory, cognitive, and motor changes that limit their independent mobility. In order to ensure these individuals are independent with their personal mobility, their mobility devices and controls must be appropriately tuned for their needs and they must receive sufficient training with the controls. The objective of this study is to compare wheelchair driving performance in a simulator using a conventional joystick and an isometric joystick. Subjects with TBI drove a virtual wheelchair within four tasks, in two driving orientations (forward and reverse) and with five repetitions each. A total of forty driving trials were completed for each of the two joysticks. After controlling for driving speed, participants were able to complete the driving tasks faster with an isometric joystick than while using a conventional movement joystick. Compared to the conventional joystick, an isometric joystick used for driving in forward direction showed fewer driving errors. During reverse driving, the conventional joystick performed better. The customizable isometric joystick seems to be a promising interface for driving a powered wheelchair for individuals with TBI.



Driving Tasks

Task 1: Left turn along hallway.
Task 2: Right turn along hallway.
Task 3: Drive straight along hallway. and enter an elevator.
Task 4: Maneuver in a tight office area.

Hand and Shoulder Joint Kinetic Analysis of Three Types of Sitting-Pivot Wheelchair Transfers

Koontz AM, Kankipati P, Lin J, Cooper RA, Boninger ML

Full article published in *Clinical Biomechanics,* pp. 923-929, Vol. 26, No. 9, November 2011.

Background: Performing independent sitting pivot transfers (SPTs) taxes the upper extremities (UEs) over the long run which in turn affects quality of life. Limited research is available on upper limb joint loading with respect to sitting-pivot wheelchair transfers (SPTs). The objective of this study was to investigate differences in shoulder, elbow and hand kinetics while performing three different SPTs that varied in terms of hand and trunk positioning.

Methods: Fourteen unimpaired individuals (8 male and 6 female) performed three variations of SPTs in a random order from a wheelchair to a level tub bench. Two transfers involved a forward flexed trunk (Head-Hips technique-HH) and the third with the trunk remaining upright. The two transfers involving a HH technique required two different leading hand initial positions. Motion analysis equipment recorded upper body movements and force sensors recorded hand reaction forces. Three components of shoulder and elbow joint and hand kinetics were computed for the lift phase of the transfer.

Findings: Overall there was an 8 percent body weight (% Body Weight= Force divided by persons body weight) reduction in vertical forces at the trailing hand (i.e. arm behind during move to new location) averaged over the HH techniques compared to the TU transfer technique. At the leading hand (i.e. hand reaching to the new surface), the vertical forces were reduced by 6.5% BW using the HH-A technique compared to the forces generated using HH-I (23.69% BW) and TU (24.77% BW) techniques. While both the HH techniques reduced superiorly directed forces at the shoulder, shoulder moments were significantly higher than that experienced when executing the TU transfer technique.

Interpretation: Varying the hand placement and trunk positioning during transfers changes the load distribution across all upper limb joints. The results of this study may be useful for determining a technique that best suits an individual and one that helps preserve upper limb function over time.

Grand Opening:
Many VIPs attend HERL ribbon cutting

On August 1, 2011, a select group of men and women assembled in a line on the fourth floor of the Bakery Square technology building at 6425 Penn Avenue in Pittsburgh, each brandishing a pair of scissors. As the crowd applauded, a red ribbon was cut - and a new chapter of the Human Engineering Research Laboratories began.

The 28,000 square foot laboratory, office, and shop space at Bakery Square was officially opened for business in front of about 150 people from HERL, the University of Pittsburgh, the VA, the Paralyzed Veterans of America, and Walnut Capital. Guests mingling before and after the ceremonies enjoyed cake and punch, and were able to view various HERL project demonstrations.

Dr. Rory Cooper, HERL Director, was Master of Ceremonies, and introduced each speaker:

- Dr. Michael Boninger, HERL Medical Director;
- Mr. Bill Lawson, President, Paralyzed Veterans of America;
- Dr. Clifford E. Brubaker, Dean, School of Health and Rehabilitation Sciences, University of Pittsburgh;
- Brigadier General Michael Gould;
- Ms. Terry Gerigk-Wolf, Director, VA Pittsburgh Healthcare System;
- Mr. Michael Moreland, Director, VA Healthcare VISN 4;
- Mr. Alan Smith, Staff, Congressman Mike Doyle's Office.

Following brief remarks by each speaker, a blessing was offered by Army Chaplain Lieutenant Colonel Douglas Etter, and the speakers lined up to cut the ribbon and officially open the new HERL space.

Following the ceremony, each speaker was presented with a commemorative gold-handled pair of scissors with the occasion and date inscribed on it. One pair of scissors, along with a section of ribbon, is now on display in the HERL lobby.

Would you like to see HERL's new space? Visitors are welcome! To schedule a tour, give us a call at 412-822-3700, or email the newsletter editor at mil72@pitt.edu.

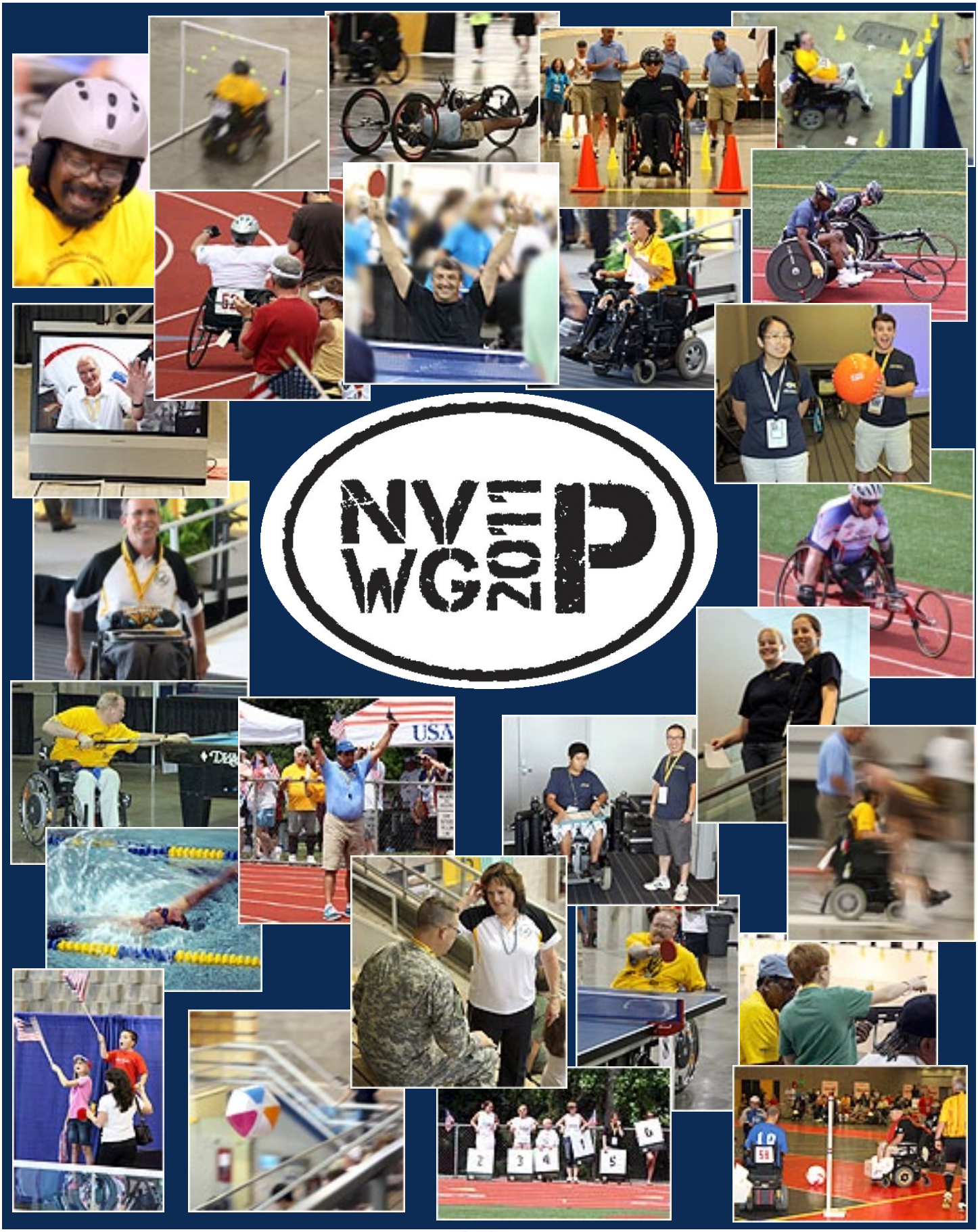
Left: *Angelamaria Scott and Pittsburgh Steelers legend Rocky Bleier.*

Below: *Bill Lawson and Dr. Cooper.*

Left: *LTC(P) Doug Etter giving the blessing.*

Right: *Ribbon cutting.*

Below: *Dr. Brubaker, BG Gould, LTC(C) Etter, Mr. Smith, Mr. Moreland, Rocky Bleier, Dr. Boninger, Ms. Wolf, VAPHS Deputy Director John Gennaro, and Mr. Lawson.*


NVP
WG 2011
USA

The 2011 National Veterans Wheelchair Games in Pittsburgh: Where Heroes Became Legends

Like the Roman legions of old, they came; they saw; they conquered - and Pittsburgh responded.

For five days in the heart of downtown Pittsburgh, more than 500 athletes captured the spirit of intensity, strength, and determination.

The Human Engineering Research Laboratories were proud to be there and to be part of it all. HERL Director Dr. Rory Cooper played many roles for the Pittsburgh Games. He competed in many of the swimming categories and came away with five gold medals. He was also a part of the dais team, along with other military and local VIPs, that handed out medals and congratulated all winning athletes. But even beyond that, Dr. Cooper was invaluable as the local organizing committee chair in bringing the Games to Pittsburgh and coordinating events.

Other people from HERL contributed in other ways. Many volunteered with the WePay system that was set up for athletes' meals. Others helped set up and referee various events, or cheered in the crowds. But HERL as a whole was mostly represented by our research team. We had five research projects during the Games, and our Veteran volunteers helped immeasurably with our research. Thank you to all who participated!

This year, our research consisted of:

- Participitory Evaluation of Assistive Technologies (bringing users of wheelchairs together in focus groups);
- Evaluation of Sports Participation on Psychosocial Outcomes in Individuals with Disabilities (a questionnaire);
- Ultrasound as a Tool to Evaluate Fatigue (ultrasound testing);
- Assessing the Risk of Vibration Exposure During Wheelchair Propulsion (data-logging);
- Computer-Based and Virtual Assessments of Power Wheelchair Mobility (a virtual reality project performed with a computer-generated environment).

Events at the 2011 National Veterans Wheelchair Games:

9-Ball
Air Guns
Archery
Basketball
Bowling
Handcycling
Field Events
Motor Rally
Power Soccer
Quad Rugby
Slalom
Softball
Swimming
Table Tennis
Track
Trapshooting
Weightlifting

Medal Count for VISN 4 Teams

Team	Athletes	Gold	Silver	Bronze
Altoona	4	2	3	6
Butler	2	2	1	1
Clarksburg	2	4	-	-
Erie	4	5	-	2
Lebanon	3	-	4	-
Philadelphia	9	13	2	6
Pittsburgh	28	32	17	13
Wilkes-Barre	2	1	1	1
Wilmington	4	3	1	4

SCENES FROM THE

Lobby

Lobby

Clinical Research Laboratory

Clinical Research Laboratory

Machine Shop

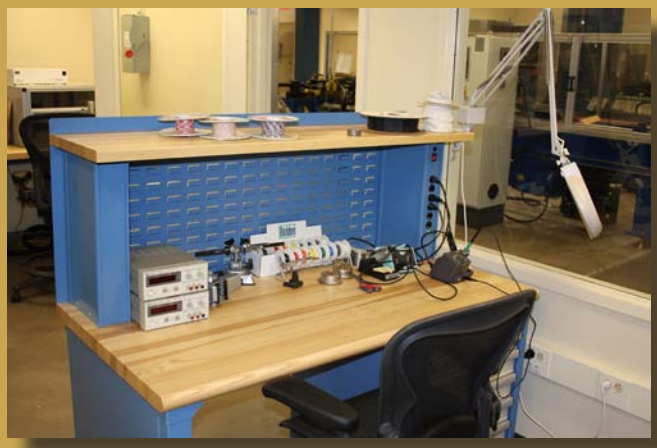
Machine Shop

E NEW HERL SPACE

Conference Room

Office Hallway

Machine Shop



Machine Shop

Machine Shop

Machine Shop

HERL's Website Gets a Makeover

If you haven't visited the HERL website recently, you're in for a surprise! In collaboration with the University of Pittsburgh Marketing Communications web team, we completely redesigned and reorganized our website - which went "live" just a few days after we moved to Bakery Square.

We believe the new website design is easier to navigate and use than our previous design. It's simpler to find news and events, and we have special areas for newsletters and videos. We hope it's also more visually interesting!

One side effect of our move to Bakery Square is a change in our website hosting - the site is now being hosted by Pitt, with a corresponding change to our web address - you can now reach us on the web at **http://www.herl.pitt.edu/** (or just **http://herl.pitt.edu/**). Unfortunately, that means any old bookmarks you have may no longer work. On the bright side, however, we've made sure that our old address - **http://www.herlpitt.org/** - will *always* take you to the front page of our current site. So even if you can't remember our new web address, using the old address will work just as well.

If you have any thoughts on our new site - or even if you just can't find a page you used to use - please contact me! Email me at **mil72@pitt.edu** ... or read on!

From the Editor's Messy Desk

Find Us on Facebook!

Now there's another way you can communicate with us - the new HERL Facebook page at:

http://www.facebook.com/herlpitt

(You can also search for us under "Human Engineering Research Laboratories.") It's a brand new way that we'd like to use to talk with you. On our page, you'll find up-to-the-minute news updates, interesting links, photo galleries, volunteer opportunities, expos we'll appear at, and much more. Of course, you can also leave messages and links for us on our Wall if you have a Facebook account.

If you like what HERL is doing and you have a Facebook account, I personally encourage you to "Like" our page. In the new social media frontier, more "Likes" means more clout, and the more people who will see us. We really want to get the word out about HERL any way we can. It helps us recruit volunteers, gather funding, and attract the world's best students.

Of course, we also want to use our Facebook page to hear from you! So please help us spread the word - on Facebook!

HERL Hosts White House Jobs Meeting

On October 11, 2011, HERL hosted the Veterans and Small Business Listening and Action Session with members of the President's Council on Jobs and Competitiveness. The Council was created to provide non-partisan advice to the President on continuing to strengthen the Nation's economy and ensure the competitiveness of the United States and on ways to create jobs, opportunity, and prosperity for the American people. It is made up of members appointed by the President from among distinguished citizens outside the Federal Government, including citizens chosen to serve as representatives of the various sectors of the economy to offer the diverse perspectives of the private sector, employers, and workers on how the Federal Government can best foster growth, competitiveness, innovation, and job creation.

Among those attending were Fred Hochberg, Chair, Export-Import Bank; Richard Parsons, Chairman, Citigroup, Inc.; Matthew Rose, Chairman and CEO, BNSF Railway; Ellen Kullman, Chair and CEO, DuPont; and Darlene Miller, President and CEO, Permac Industries. Attendees from HERL were Dr. Rory Cooper, Dr. Michael Boninger, Dr. Brad Dicianno, Dr. Jon Pearlman, Rosemarie Cooper, and Mary Goldberg.

A gallery of photos from the session can be found at ***http://is.gd/HERL_WhiteHouseJobsCouncil****.*

Left, from top: *HERL Medical Director* ***Dr. Michael Boninger*** *and HERL Director* ***Dr. Rory Cooper****; Dr. Cooper and Export-Import Bank Chair* ***Fred Hochberg****; President's Council on Jobs and Competitiveness Executive Director* ***Don Graves*** *and Dr. Boninger; HERL Associate Medical Director* ***Dr. Brad Dicianno*** *and HERL Associate Director of Engineering* ***Dr. Jon Pearlman****.*

Below: *Permac Industries President/CEO* ***Darlene Miller****, DuPont Chair/CEO* ***Ellen Kullman****, Dr. Cooper, Fred Hochberg, and Citigroup Chairman* ***Richard Parsons****.*

Autobiography from Attila Domos

Attila Domos, a musician, athlete, wheelchair user, and HERL research participant, wrote a book in late 2010 telling his life story. *Because You Shouldn't Be Afraid to Chase Your Dreams* documents Attila's triumph over tremendous challenges, first starting with his childhood in Romania and then later adjusting to life in the United States after emigrating from Austria at age twelve. About ten years later, Attila formed a rock band, Big Bad Wolf, which became quite popular in Pittsburgh and western Pennsylvania. On the very night Big Bad Wolf signed a recording contract, an unexpected tragedy struck: Attila suffered a fall from a ladder that left him paralyzed. In the years that followed, Attila saw the disintegration of his band, record contract, and many relationships.

Because You Shouldn't Be Afraid to Chase Your Dreams doesn't simply tell the story of what it's like to suddenly find yourself in a wheelchair at a pivotal life moment, but also describes a journey of tremendous personal growth. Through his injury, Attila became stronger than ever both physically and emotionally. After rehabilitation, he became fitter than he had ever been before his injury, excelling at power lifting and wheelchair racing. The injury also opened his eyes to who his real friends were and allowed him to clear his life of toxic relationships. Today, Attila still composes and performs music and tirelessly supports spinal cord injury research. In addition to participating in countless HERL research studies for over a decade, he also raises money for organizations such as the Spinal Cord Society and the Challenged Athlete's Foundation. Attila won the 2010 Pittsburgh Marathon's handcycling division and teamed up with the Mario Lemieux Foundation to help raise money for cancer research.

Visit Attila's website, **http://www.attiladomos.com/**, to hear some of his music, read more about his many accomplishments and goals, and order paperback and electronic copies of this book (the e-book is also available at Amazon.com). Note: *Because You Shouldn't Be Afraid to Chase Your Dreams* is intended for mature audiences. ***-Christine Heiner***

Wounded Warrior Handbook *(Continued from page 1)*

- in association with the University of Pittsburgh and the Center for Rehabilitation Science Research at the Uniformed Services University of the Health Sciences (USU) - is hosting a symposium and book signing at Sanford Auditorium at USU in Bethesda, Maryland. Topics are to include The Warrior Transition Experience, Rehabilitation Counseling, Medical Complications and Precautions, and many others. Complimentary copies of the *Warrior Transition Leader Medical Rehabilitation Handbook* will be signed by the authors and distributed to attendees.

Robotic Hand *(Continued from page 1)*

cord-injured patients become more independent, but also enhancing their physical and emotional connections with their friends and family."

The research, which was also led by Wei Wang, MD, PhD, Assistant Professor of Physical Medicine and Rehabilitation and Elizabeth Tyler-Kabara, MD, PhD, Assistant Professor of Neurologic Surgery, has received both national and international attention. Locally, the story was featured in both newspapers, and on the local news on all television channels.

HERL Medical Director Dr. Michael Boninger and Tim Hemmes. (Photo courtesy UPMC)

Awards!

HERL Director Dr. Rory Cooper

- Received the **2011 Cliff Crase Award for Professionalism** from the Paralyzed Veterans of America in August. The PVA established the award in 2007 to honor *PN* and *Sports 'N Spokes* Editor Cliff Crase.
- Received the **2011 AAAS Mentor Award** from the American Association for the Advancement of Science in November. This award goes to individuals who demonstrate extraordinary leadership to increase the participation of underrepresented groups in science and engineering fields and careers.

HERL Medical Director Dr. Michael Boninger

- Received the **2011 A. Estin Comarr Award** for exceptional spinal cord injury care from the American Paraplegia Society. Recipients of this award have achieved a significant impact on the field of spinal cord medicine and the quality of life of persons with spinal cord injuries.

HERL Graduate Researcher Shivayogi Hiremath

- Received a **Switzer Research Fellowship** from the National Institute on Disability and Rehabilitation Research. These fellowships are awarded to help the nation build future disability and rehabilitation research capacity.

THEN ...

... and NOW

Human Engineering Research Laboratories

VA Center of Excellence for Wheelchairs and Associated Rehabilitation Engineering

University of Pittsburgh NIDRR Model Center on Spinal Cord Injury

Part of Quality of Life Technology Center
A National Science Foundation Engineering Research Center

Rory A. Cooper, PhD
Director

Michael L. Boninger, MD
Medical Director

Jonathan Pearlman, PhD
Associate Director of Engineering

Alicia Koontz, PhD, RET
Associate Director for Research Capacity Building

Brad Dicianno, MD
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or call:
412-822-3663

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http://herl.pitt.edu/subscribe

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http://www.facebook.com/herlpitt

ARE YOU INTERESTED IN ASSISTIVE TECHNOLOGY RESEARCH?

The Human Engineering Research Laboratories (HERL) is recruiting individuals interested in participating in research studies for the ASSISTIVE TECHNOLOGY REGISTRY.

If you would like to be notified of research studies related to assistive technology for which you may be eligible to participate, contact The Human Engineering Research Laboratories and join the Assistive Technology Registry.

This is an informational resource and notification of a study does not obligate you to participate. You do not need to be located in, nor are you required to travel to, Pittsburgh in order to participate in research studies.

If you are at least 18 years of age, and use assistive technology (e.g. wheelchair, scooter, prosthesis, etc) please contact a Clinical Coordinator at (412) 822-3700 or herlregistry@shrs.pitt.edu.

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for more information