Institute *Insider*

The Newsletter of the Institute for Ergonomics at The Ohio State University

At the forefront of Human Factors since 1950 Volume 9, No. 3, Autumn, 2006

Institute for Collaborative Innovation: Final Show Highlights

The interdisciplinary initiative at Ohio State University, **Converging Perspectives on Data** (CPoD), pursues innovative solutions to data overload problems in information analysis and comprehension tasks.

This past summer, interdisciplinary teams of faculty and graduate students participated in the Institute for Collaborative Innovation (ICI), a unique immersion experience. At their Final Show on August 21st, they presented how the teams advanced the state-of-the-art in addressing challenges in inferential analysis exacerbated by data overload conditions.

Attendees first were welcomed and introduced to the motivation for exploring the specific theme for the summer institute--Improving and rendering observable the rigor of a process behind an analytic conclusion.

The attendees then started the "ride" with a multi-media presentation of the uniting near-future setting: Angola in 2011, which includes a number of compelling security and intelligence concerns.

Attendees then proceeded to Angola, where it was described how agents in the field were aided in meeting their objectives by:

• Avoiding false diversity in analytic interpretations ("*groupthink*") through the use of open collaboration environments;

continued on page 6

Dr. David Woods (l.) discusses data overload issues with a fellow participant at the ICI Final Show.

James Sheedy becomes Dean

Dr. James Sheedy, formerly with the College of Optometry at The Ohio State University, is now the head of Pacific University's College of Optometry.

Sheedy

A faculty member in OSU's College of Optometry, Dr. Sheedy also was the director of the Vision Ergonomics Research Center. Before his tenure here, he was on the optometry faculty at the University of California, Berkeley. He also has been in private practice and has held several positions in the optometry-related industry. Dr. Sheedy completed his undergraduate degree at Wayne State University and earned his OD and PhD at Ohio State.

The mission of the Vision Ergonomics Research Center is to use scientific methods to understand the effects of vision and visual environment upon human performance and comfort, and to apply this knowledge to improve vision performance in the workplace. This Center, which was founded by Dr. Sheedy and is currently supported with funding from Microsoft Corporation, has been transferred to Pacific University.

Dr. Sheedy can now be reached at jsheedy@pacificu.edu. Congratulations and good luck, Jim!

In *This* Issue . . .

World Usability Day Networking Meeting

Tuesday, November 14th, 2006

HUMAN FACTORS and ERGONOMICS SOCIETY

Due to the success of last year's event, an interactive networking meeting will be held again, at LexisNexis, near Dayton, Ohio. Sponsored by LexisNexis and the Tri-State Chapter of HFES, participants and attendees are invited for this evening event of brief demonstrations, panel sessions, and networking.

People from area universities, companies, and organizations are invited to showcase products, prototypes, research findings, and design concepts to other professionals and colleagues from the area.

Three workshops will be held earlier that day:

Cognitive Work Analysis for Design (Gavan Lintern--General Dynamics, 10 am-4 pm, limited enrollment)

Field Working the Data: How Do We Analyze Ethnography and Build Cases for Design? (Peter Jones--Redesign Research, 2:30-4:30 pm, limited enrollment)

Converging Perspectives on Data (CPoD) - Final Show (Emily Patterson--The Ohio State University, 2:15-4:45 pm, no enrollment limit)

Do you wish to attend? If so, RSVP to Tonya Johnson (tonya.shaner@lexisnexis.com or 937-865-6800, ext. 54420) by **Friday, November 10th. There is no registration fee**. More information is available at www.worldusabilityday.org.

New IWSE Web Site

Ohio State's Industrial, Welding, & Systems Engineering Department has greatly expanded their website.

Check it out, at: www-iwse.eng.ohio-state.edu.

One new feature of the site is an alumni registry. If you are a graduate of the program, please join the list. You can also look up other graduates and keep apprised of what they have been doing since graduation.

IN THE NEWS

William Marras gave the Keynote Address, "Low Back Disorder Risk During Patient Handling," at the HealthCare Ergonomics Conference (Portland, OR, June 28th, 2006). This presentation assessed the epidemiologic and biomechanical evidence associated with studies evaluating low back pain risk during patient handling. The mechanisms of low back pain and the mechanical factors associated with alternative approaches to patient handling were reviewed. In addition, the results of a large-scale intervention study for patient handling, and potential future areas of exploration, were discussed.

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Emily Patterson and **David Woods** received a $137,000 grant from the Air Force Research Laboratory Human Effectiveness Directorate, to study "Commander's Predictive Environment (CPE) Metrics & Measurements (M2) Assessment." This two-year project began in May, 2006.

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Stuart Zweben received a special award from the Computing Research Association board to recognize his outstanding service to the computing research community, with particular attention drawn to the CRA Taulbee Survey, in which he takes a leadership role. The Taulbee Survey is the principal source of information on enrollment, production, and employment of PhDs in computer science and computer engineering. It also provides North America salary and demographic data for faculty in these areas.

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On September 8th, 2006, **Emily Patterson** gave the keynote presentation to the Accreditation Council on Graduate Medical Education (ACGME) Design Conference on Improvement and Innovation in the Learning Environment (Rosemont, IL). Emily spoke on "Adapting Learning from Other Industries."

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Stuart Zweben (Computer Science and Engineering) is now the Associate Dean for Academic Affairs and Administration in the College of Engineering. He also has been elected Chair-elect of the Computing Accreditation Commission of ABET for 2006-07.

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Biodynamics Lab Work Featured on "News In Engineering" Cover

Research being conducted by **Dr. William Marras** and Research Engineer **Greg Knapik** was featured as the cover story in the Autumn 2006 issue of OSU's "News in Engineering."

In this College of Engineering publication, Dr. Marras summarized the spine modeling work he has conducted over the past 24 years, as well as new functions of this model, which predicts how spinal surgery (e.g., fused vertebrae, artifical discs) will progress decades after treatment.

Graduate Student News

New Students

Matthieu Branlat

(branlat.3@osu.edu)
Advisor: David D. Woods
Hometown: Reunion Island, France

Matthiew has begun his PhD work here at Ohio State. In 1999 he received a Master's degree in Computer/Information Science, and he is now finishing a second Master's in Ergonomics from the Conservatoire National des Arts et Métiers in Paris, France. His research interests include human error and the developmental aspects of work, such as how humans learn during their professional life and how they reach expertise.

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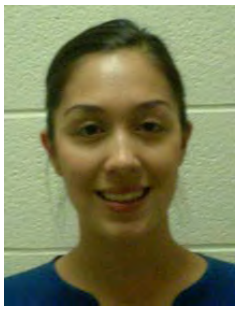
Lisa Fern



(fern.5@osu.edu)
Advisor: David D. Woods
Hometown: Calgary, Alberta, Canada

In pursuing a Master's degree, Lisa will be studying cognitive systems engineering. She would like to explore many domains, including health care, aviation, robots, emergency response, and military applications. Lisa earned a Bachelor's degree in Psychology from the University of Calgary.

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Alex Morison

(morison.6@osu.edu)
Advisor: David D. Woods
Hometown: Pittsburgh, PA

Alex is pursing a PhD. His undergraduate work was done at Case Western Reserve University. Alex's research interests include human-sensor coordination (i.e., integrating diverse feeds).

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Kim Mosley

(mosley.69@osu.edu)
Advisor: William S. Marras
Hometown: Hillsdale, MI

Kim received her Bachelor's degree at Hope College (Holland, MI), majoring in Mechanical Engineering. Her work in the Biodynamics Laboratory currently is focusing on biomechanical modeling and patient handling.

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Brian Prue

(prue.3@osu.edu)
Advisor: David D. Woods
Hometown: Willimantic, CT

Brian's undergraduate work in neuroscience was done at Skidmore College. His cognitive engineering research is on distributed systems and autonomous agents, specifically using robots.

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Michael Smith

(smith.5652@osu.edu)
Advisor: David D. Woods
Hometown: Tampa, FL

A PhD student in the OSU Cognitive Engineering program, Michael brings his experience in health care, training systems, and consumer products. His research interests are decision making and distributed cognitive work. Michael previously received a Bachelor's degree in Psychology from New College of Florida and a Master's degree in Ergonomics from the University of Miami.

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Miruna Tecuci

(tecuci.1@osu.edu)
Advisor: Philip J. Smith
Hometown: Romania; Fairfax, VA

Earlier this year, Miruna received a Computer Science degree from the University of Virginia School of Engineering and Applied Sciences. She is now working towards a PhD in Cognitive Engineering, where her focus is Human-Computer Interaction. She ultimately would like to do usability studies and be a teacher.

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In October, 2006, **Sahika Vatan Korkmaz** passed her PhD candidacy exam. Her advisor is Dr. Carolyn Sommerich. Congratulations, Sahika!

Honda Seeks Co-Op Students in Ergonomics for Winter 2007

Honda of America Manufacturing, Inc. (HAM) has two ergonomics positions available to qualified students (Junior or above). Candidates must be enrolled in a Bachelor or Masters degree program studying ergonomics, human factors, or industrial engineering. These positions are for the January-March/May 2007 time frame.

ADM4982

Responsibilities: Assist with ergonomics research and analysis support of HAM facilities; update ergonomics sharing database of successfully implemented solutions; perform literature searches on ergonomic guideline topics; draft guidelines; collect and integrate feedback and revise guidelines; perform ergonomics analyses of production processes in Honda facilities; investigate ergonomic problems and develop/implement solutions; assist with the preparation of training materials; support plant ergonomic projects as requested.

Required Courses: At least one ergonomics course

Desired Courses: Biomechanics, Anatomy, Safety, Physiology, Industrial Engineering, Anthropometry, Statistics

ELP4992

Responsibilities: Support HAM and the East Liberty Plant (ELP) direction to reduce injuries by 90%, by assisting with ergonomics process assessments to determine cause of ergonomics-related concerns on priority processes; support North American Safety/Ergo Top 10 activities, by assisting with assessments of processes to determine high stress activities; support introduction of the CR-V, by assisting with analysis of processes related to priority parts; develop documentation of assessment results, ensuring that a flow of information is available for future projects and activities.

Required Courses: Ergonomics

Desired Courses: Human Factors, Biomechanics, Industrial Process Engineering

Candidates must apply on-line at Honda's web site, www.ohio.honda.apply2jobs.com.

Contact Brittany Lafuse for questions about these jobs. She can be reached at 937-645-8496 or brittany_lafuse@ham.honda.com.

HONDA

Medtronic Seeks Human Factors Interns

Medtronic is the world leader in medical technology, providing lifelong solutions for people with chronic disease. They offer products, therapies and services that enhance or extend peoples' lives. Medtronic's technology is used to treat conditions such as diabetes, heart disease, neurological disorders, and vascular illnesses.

Medtronic
Alleviating Pain · Restoring Health · Extending Life

Medtronic is seeking internship candidates with human factors backgrounds for a temporary internship in Minneapolis. The position will last for 9-12 months, with a preferred start date of January 2007. Interns will work with senior human factors staff members on projects both on-site and in clinical field settings.

To express interest, please reference requisition number 53171, at www.medtronic.com/employment. **All applications are due by November 3, 2006**.

Responsibilities Include:

- Support usability activities such as task analysis, requirements, user interface design, and usability testing;
- Prototyping using Microsoft desktop packages;
- Gathering and summarizing meeting input from across the organization (e.g., marketing, product planning, development, and research organizations);
- Supporting meetings and visits with internal field personnel and external customers;
- General knowledge of statistics; and
- Statistical data analysis using graphing and charting capabilities in tools such as Excel.

Minimal Requirements:

- Human factors coursework in experimental design and/or usability testing and user interface design; understanding the basics of usability testing and user interface design; and
- Working knowledge of desktop Microsoft Office tools such as Excel, PowerPoint, Word, and prototyping tools.

Preferred Requirements:

- Research experience in a laboratory or product development setting; and
- Strong coursework background in biomedical engineering with particular emphasis on cardiac anatomy and physiology. General knowledge of cardiac anatomy and physiology.

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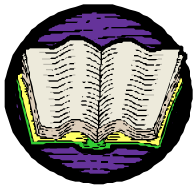

Recent publications written by Institute members (indicated in boldface font) include:

Designing Ergonomic Interventions for EMS Workers, Part I: Transporting Patients Down the Stairs

Steven A Lavender, KM Conrad, PA Reichelt, J Gacki-Smith, **Aniruddha K Kohok**, *Applied Ergonomics*, 38(1): 71-81, 2007.

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The Effects of Work Experience, Lift Frequency and Exposure Duration on Low Back Muscle Oxygenation

Gang Yang, AM Chany, J Parakkat, **Deborah Burr**, **William S Marras**, *Clinical Biomechanics*, 2006 (In Press and available online: September 25th, 2006).

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An Exploratory Study of Loading and Morpho-metric Factors Associated with Specific Failure Modes in Fatigue Testing of Lumbar Motion Segments

S Gallagher, **William S Marras**, AS Litsky, **Deborah Burr**, *Clinical Biomechanics*, 21(3): 228-234, 2006.

❖

Key Levers for Achieving Resilience in Medication Delivery with Information Technology

Emily S Patterson, **David D Woods**, EM Roth, RI Cook, RL Wears, *Journal of Patient Safety*, 2(1): 33-38, 2006.

❖

Load Spatial Pathway and Spine Loading: How does Lift Origin and Destination Influence Low Back Response?

K Davis, **William S Marras**, *Ergonomics*, 48(8): 1031-1046, 2005.

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Low-Level Exertions of the Neck Musculature: A Study of Research Methods

SB Joines, **Carolyn M Sommerich**, G Mirka, J Wilson, SD Moon, *Journal of Electromyography & Kinesiology*, 16: 485-497, 2006.

❖

The Prediction of Lumbar Spine Geometry: Method Development and Validation

N Campbell-Kyureghyan, M Jorgensen, **Deborah Burr**, **William Marras**, *Clinical Biomechanics*, 20: 455-464, 2006.

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Final Show, *continued from page 1*

• Breaking fixations on inaccurate hypotheses by having experts from different areas create mini-stories after reviewing partial data sets ("*diversity anchoring for crowd-sourcing*"); and

• Visualizing dynamic changes to considered hypotheses ("*hypothesis scrubbing*").

The show proceeded to Fort Meade, where NSA agents were aided in meeting their objectives by:

• Broadening the set of perspectives to better sample interpretations of data ("*tuned diversity search*");

• Exchanging meta-tag knowledge spaces during handoffs (improving the "r*ead-on process*" for new content areas);

• Managing diverse perspectives in a pro/con + other dimension space ("*faction display*"); and

• Increasing the ability for an audience to actively participate during a verbal briefing presentation ("*participatory process view*").

The primary objective of the event was to elicit from representatives of the OSU community, leading human factors researchers in Ohio, and intelligence analysis communities how well leverage points captured the challenges in conducting intelligence analysis under data overload. Interactive discussion occurred in a breakout session, and a catered lunch immediately following the presentations.

The CPoD is an interdisciplinary consortium of world-class researchers in Information Analysis and Comprehension. The consortium pools expertise in cognitive systems engineering, political science, design, cognitive science, field research, perception, and computer science to solve problems at the intersections of people, technology and work. The CPoD is affiliated with the Institute for Ergonomics and the Cognitive Systems Engineering Laboratory.

For more information, contact Dr. Emily Patterson, Associate Director of CPoD, at patterson.150@osu.edu.

cpod converging perspectives on data

Ohio State Active at the 2006 HFES Conference

Members of OSU's Institute for Ergonomics participated in several events at the Human Factors and Ergonomics Society's 50th Annual Meeting. It was held October 16th-20th, 2006 in San Francisco. Institute members are listed below, in boldface font.

Lectures

Developing a Nonhuman Primate Experimental Model for Studying Carpal Tunnel Syndrome

Carolyn Sommerich, **Steve Lavender**, John Buford, William Pease, **Jacob Banks**, **Sahika Korkmaz**, Stephanie Moran

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Engineering Organizational Resilience to Enhance Safety: A Progress Report on the Emergence of Resilience Engineering

David Woods

❖

Escape from Designers' Dilemma on Creeping Featurism

Dong-Seok Lee, **David Woods**, **Daniel Kidwell**

❖

Prediction of Lumbar Motion Segment Angles Using Trunk Angle and Anthropometry

Riley Splittstoesser

Invited Symposium

Structured Interdisciplinary Communication Strategies in Four ICUs: An Observational Study

Emily S. Patterson, Timothy Hofer (U of Michigan), Suzanne Brungs (VA GAPS Center), Sanjay Saint (U of Michigan), Marta L. Render (U of Cincinnati)

Discussion Panels

Evaluating the Effectiveness of a Joint Cognitive System: Metrics, Techniques, and Frameworks

David Woods, Emilie Roth (Roth Cognitive Engineering), Jennifer Fowlkes (CHI Systems), Robert Hoffman (Institute for Human & Machine Cognition)

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Human Factors Challenges in Next-Generation Air Transportation System (NGATS)

Thomas Sheridan (US Department of Transportation), **Philip J. Smith**, Paul Krois (FAA)

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Learning from Investigation: Experience with Understanding Health Care Adverse Events

Meghan Dierks (Harvard U), Yoel Donchin (Hadassah Hebrew U), **Emily S. Patterson**, Yuval Bitan (U of Chicago), Jay Crowley (US FDA), Stephanie McNee (U of Chicago), Tina Powell (Social and Scientific Systems)

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Prevention of Work-Related Musculoskeletal Injuries

Barbara Silverstein (Washington State Department of Labor and Industries), Martin Cherniak (U of Connecticut Health Center), Arun Garg (U Wisconsin-Milwaukee), **Steve Lavender, William Marras**

Applied Ergonomics Conference

March 12th-15th, 2007 - Dallas, Texas

Celebrating the Past - Shaping the Future

Exceptional advances in ergonomics have been made in the past decade. The 10th Annual Applied Ergonomics Conference will celebrate these achievements, while looking at the current state-of-the-industry and how applied ergonomics can continue to excel.

This conference will feature over 20 corporations competing for the prestigious Ergo Cup awards for innovative process improvements.

Sponsored by the Institute of Industrial Engineers, this conference also offers keynote speakers, educational sessions, exhibits and plant tours. Registration is open to the public. More information can be found at www.appliedergo.org/conference.

A new event for graduate students also has been created, the **Ergonomics Student Design Competition**. Winning team members will each receive $300, and $1000 is provided to help the team attend the conference. Teams must register by **November 1st, 2006**, and there is no limit to the number of teams from a given school. Interested in forming a team? Contact Dr. Carolyn Sommerich (sommerich.1@osu.edu), and learn more at http://ergonomicsdesign.org.

The Institute is proud to be an academic co-sponsor of this conference. Ohio State faculty attending the conference receive a special registration rate.

Research Corner

This issue of the Bulletin summarizes recently published research

Three Key Levers for Achieving Resilience in Medication Delivery with Information Technology

Emily S Patterson, **David D Woods**, EM Roth, RI Cook, and RL Wears

Journal of Patient Safety, 2(1): 33-38, 2006

Over the past several years there has been an increase in interest in translating human factors knowledge and methods, primarily used in complex, event driven, socio-technical settings such as aviation, to healthcare.

In this paper, we overview the primary concepts in cognitive systems engineering that may aid in formulating interventions in a variety of diverse medical settings to reduce the likelihood of patient harm.

In order to improve resilience in medication delivery, we propose immediately incorporating three key levers: 1) scenario-based design and evaluation of interventions, 2) advanced information visualization techniques to reduce data overload in the electronic medical record, and 3) explicit consideration and documentation of asynchronous, interdisciplinary teamwork support during software requirements analysis, including a workload shifting analysis.

For long-term progress, we recommend investing in research in order to better understand technical work in healthcare, specifically task requirements in work domains and the tradeoffs and strategies that workers use to meet these demands.

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Designing Ergonomic Interventions for EMS Workers, Part I: Transporting Patients Down the Stairs

Steven A Lavender, KM Conrad, PA Reichelt, J Gacki-Smith, and **Aniruddha K Kohok**

Applied Ergonomics, 38(1): 71-81, 2007

The objective of the current work was to test ergonomic interventions aimed at reducing the magnitude of trunk muscle exertions in firefighters/paramedics (FFPs) providing emergency medical services (EMS) when transporting patients down stairs.

The interventions, developed using focus groups, were: (a) A footstrap to prevent the patient from sliding down on the backboard; (b) A change in the handle configuration on the stairchair, and two devices; (c) The "backboard wheeler;" and (d) A tank tread-like device (descent control system, DCS) for a stretcher, that changes the backboard and stretcher carrying tasks into rolling and sliding tasks.


(a)

Eleven two-person teams transported a 75 kg dummy with each intervention and its corresponding control condition down a flight of steps. Surface electromyographic data were collected from eight trunk muscles from each participant.


(b)

Results showed that the backboard footstrap reduced the erector spinae (ERS) activity for the FFP in the "leader" role by 15%, on average. The change in handle configuration on the stairchair had no effect on the variables measured. The back-board wheeler reduced the ERS activity bilaterally in the FFP in the leader role and unilaterally for the FFP in the "follower" role, by 28% and 24%, respectively. The DCS reduced the 90th percentile ERS activity for both FFPs, from 26% to 16% MVC, but increased the latissimus dorsi activity in the follower from 11% to 15% MVC. The DCS was the only intervention tested that resulted in a reduced rating of perceived exertion relative to the corresponding control condition.


(c)

In summary, the hypotheses that the proposed interventions could reduce trunk muscle loading were supported for three of the four transport interventions tested.


(d)