

Institute Insider

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

At the forefront of Human Factors since 1950 Volume 11, No. 3, Autumn, 2008



Ohio State Establishes Distribution Ergonomics Research Group

In August, **Carolyn Sommerich** and **Steve Lavender** were awarded a \$50,000 grant by the Material Handling Industry of America (MHIA), to create a research group focused on distribution ergonomics.

This is MHIA's first-ever direct funding of research in material handling and logistics. The research grant is provided by MHIA through its College Industry Council on Material Handling Education (CICMHE).

The aims of the Research Center will be to:

- Develop and evaluate ergonomic methods, tools, and processes that will allow distribution center employees to work more safely and efficiently; and
- Create partnerships between regional DCs and material handling equipment manufacturers, to assist the DCs in becoming "workplaces of excellence," which properly use ergonomics and lean engineering principles.

"MHIA is proud to support this important research, which will contribute significantly to the body of knowledge on ways to improve the safety and productivity of warehouses and distribution centers," said Daniel Quinn, Material Handling Industry Vice Chairman for Education Planning & Professional Development. "Going forward, MHIA is anxious to support research such as this, which will benefit the safety and productivity of factories and warehouses in the United States."

Information about the Material Handling Institute of American can be found on-line (www.mhia.org).

To learn more about this Research Center, please contact either Carolyn Sommerich (614-292-9965; sommerich.1@osu.edu) or Steve Lavender (614-292-9980; lavender.1@osu.edu).



Sommerich



Lavender

Institute Members Featured in Human Factors' Best Papers

The *Human Factors* journal recently published its book, *Best of Human Factors: Thirty Classic Contributions to Human Factors/Ergonomics Science and Engineering*. It contains 30 of the best papers published in the journal's 50-year history of publication.

These exemplary papers (chosen from nearly 2,800) are categorized into one of three broad areas: Application; Methodology; and Theory. They represent the most highly cited and valued articles, as viewed by a representative sample of readers. Six of the papers in this collection won the prestigious HFES Jerome H. Ely Award for best paper in a volume year.



In addition, two of these 30 articles were written by members of the Institute for Ergonomics. They are:

How in the World Did We Ever Get Into That Mode? Mode Error and Awareness in Supervisory Control (Applications: Automation)

Nadine B Sarter and **David D Woods**, published in 1995 (Volume 37, Issue 1)

A Three-Dimensional Motion Model of Loads on the Lumbar Spine: 1. Model Structure (Theory: Biomechanics)

William S Marras and **Carolyn M Sommerich**, published in 1991 (Volume 33, Issue 2)

This book, edited by Nancy J Cooke and Eduardo Salas, can be purchased on the HFES web site (www.hfes.org/Publications).

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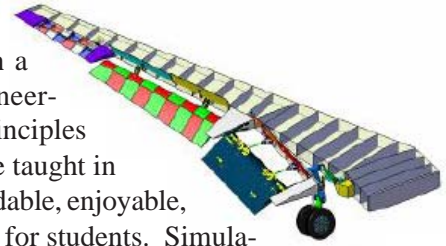
Dr. Jay Wilkins
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Computer-Aided Engineering Symposium Held

On October 20th, engineering faculty, research staff, and students attended a free presentation to learn how professors at Ohio State are using new simulation products for education and research.

MSC Software (www.mscsoftware.com) provides virtual product development tools and detailed digital models to simulate product performance. Current MSC products include MD Nastran, Patran, Marc, Adams, and Easy5.

By including MSC software in a professors' engineering curricula, principles and theory can be taught in a more understandable, enjoyable, and relevant way for students. Simulation also enables engineers to go beyond static design (CAD) for form and fit, to rapidly develop high-quality, innovative products in the virtual world so they function as intended in the real world.



This symposium also highlighted two of MSC's newest ventures. Their *University Program* aims to meet the needs of students, professors, and industry. Its primary goal is to help university students obtain desirable jobs with MSC's best-in-class customer companies, who seek to hire talented engineers proficient with MSC's industrial-strength, enterprise simulation software.

MSC's *SimEnterprise™* is a simulation platform that enables MSC Software and its partners to efficiently deliver best-in-class technologies in the form of services to simulation applications architected for the SimEnterprise framework.

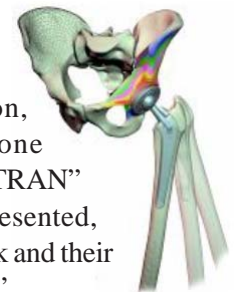
This symposium featured four presentations:

- **Dr. William Marras** discussed, "MSC Software and the Biodynamics Laboratory"

- Dr. Herman Shen spoke on, "Aerospace Engineering Capstone Design Courses' Use of MSC NASTRAN"

- Dr. Ashok Krishnamurthy presented, "Ohio Supercomputer Center's Work and their Customers' Use of MSC Software"

- MSC Software's Jim Ryan provided a glimpse of future products and helpful resources for MSC Software.



The symposium was held at the Center for Occupational Health in Automotive Manufacturing (COHAM), on The Ohio State University's West Campus.

IN THE NEWS



Ohio State's **Center for Resilience** has marked its fourth year of operation. It is an interdisciplinary research center, dedicated to improving the resilience of industrial systems and the environments in which they operate.



Executive Director, **Joseph Fiksel** and Research Director **Bhavik Bakshi** have joined forces with a network of engineers, scientists, and business scholars at OSU, as well as collaborating institutions, to leverage over \$20 million in ongoing research programs. The Center's newly redesigned website can be viewed at www.resilience.osu.edu.



Congratulations to Pratik D Jha and Michael Balint (Lockheed Martin Transportation & Security Solutions), **Philip J Smith**, & Ian Crook (ISA Software) for winning the Best Conference Proceedings Paper at the 53rd Annual Meeting of the Air Traffic Control Association (Washington DC, Nov 2nd-5th). Their paper was titled, "Regional Air Traffic Flow Management."



Smith



Research by Institute alumna **Jenny Watts-Perotti** was profiled in the September 19th issue of *Fortune* magazine. The article, "The Evolution of Work," reported on research recently conducted by Watts Perotti and other ethno-graphers from Xerox's Innovation Group.



Watts-Perotti

As an ethnographer (a social scientist who studies people in their natural habitats), Jenny examines how people who work alone connect with other people. By studying how people collaborate across a global company, Watts Perotti and her colleagues at Xerox hope to improve employees' work habits and efficiency.

Jenny completed her PhD under advisor David Woods.



Carolyn Sommerich and **Steve Lavender** have been awarded two grants from NIOSH, the National Institute for Occupational Safety and Health. Each of these research studies is funded for three years.

The first grant will help Sommerich and Lavender continue their work developing a novel model of carpal tunnel syndrome. This research is being conducted with Dr. John Buford, Associate Professor of Physical Therapy at Ohio State.

The second NIOSH grant is a collaboration with OSU's Department of Design and its Radiologic Sciences and Therapy division. Its aim is to work with radiologic technologists to develop ergonomic interventions that will reduce their exposures to risk factors for work-related musculoskeletal discomfort, pain, and other disorders.



At the September HFES Annual Meeting, two Institute members were approved to be part of the 2008-2009 HFES Domain and Committee Leadership.



Philip J Smith was named the Meetings Domain Leader.

William S Marras was named the IEA Representatives Committee Chair of the Outreach Domain.



Biodynamics Lab Hosts Visiting Scholar

This past summer, **Ahmed Farrag**, a Physical Therapist from Egypt, began as a visiting scholar at Ohio State. He is working with Dr. William Marras in the Biodynamics Lab.



Ahmed is an assistant lecturer on the faculty in the Department of Physical Therapy at Cairo University. He also works as a Co-Director of that university's Motion Analysis Lab.

Ahmed has both a Bachelors and Masters degree in Physical Therapy, where he researched 3D motion analyses. Ahmed believes biomechanics and ergonomics are strongly related to physical therapy. Because his focus is rehabilitation, he hopes to gain here a better appreciation as to how the injury/disability occurred, so it can more successfully be treated or prevented.

The goal Ahmed has during his visit is to finish his PhD dissertation, where he will be studying the relationship between lack of knowledge about the load handled and trunk mechanics during lifting tasks.

Ahmed will call OSU home for at least one year, which may be extended for a second year. He can be contacted at 614-292-2016 or farrag.2@osu.edu.

Upcoming Conferences

World Usability Day

November 13th 2008 The Ohio State University

The Usability Professionals' Association will host a World Usability Day event on November 13th in Ohio State's Science and Engineering Library, Room 060.



Schedule

- 4:00 PM Columbus Community Mobility Planning Presentation
- 4:30 PM OSU Transportation Panel Discussion, "Making Transportation Easy: What is being done to make transportation easier?"
- 5:30 PM Professional networking/reception, sponsored by the Columbus, Ohio Usability Professionals' Association (COUPA) Chapter
- 6:15 PM Featured Speaker: **Keith Tatum**, Sr User Experience Strategist and Principal of Slingthought, discussing "Today's Mobile Workforce-Working Collaboratively with Virtual Teams"
- 7:15 PM COUPA Chapter Meeting
- 8:00 PM Event wrap-up

Applied Ergonomics Conference

March 23rd - 26th, 2009 Reno, Nevada

This conference, geared towards practitioners, offers educational sessions that present the latest ergonomics solutions and resources, and the opportunity to interact with hundreds of practitioners in the field.

The conference also offers the prestigious Ergo Cup® awards, where teams of ergonomists demonstrate practical solutions for real-world ergonomics issues.

Visit www.iienet2.org/Ergo/Conference for more information, including the conference schedule and registration form.



15th International Symposium on Aviation Psychology (ISAP)

April 27th-30th, 2009 Dayton, Ohio

Participation at the ISAP will allow you to:

- Learn about the latest research on human performance problems and opportunities within aviation systems;
- Envision design solutions that best utilize human capabilities for creating safe and efficient aviation systems; and
- Network with other scientists, research sponsors, and operators in an effort to bridge the gap between research and application.

Although the symposium is aerospace oriented, conference organizers welcome anyone with basic or applied interests in any domain to the extent that generalizations from or to the aviation domain are relevant.

The conference's Keynote Speaker is **Dr. Christopher D. Wickens**. Dr. Wickens is Professor Emeritus and former Head of the Human Factors Division at the University of Illinois, Urbana-Champaign.

Call for Proposals

Proposals currently are being sought for posters, papers, sessions, panels, and workshops.

Any topic related to the field of aviation psychology is welcomed. Topics on human performance problems and opportunities within the aviation systems, and design solutions that best utilize human capabilities



for creating safe and efficient aviation systems are all appropriate.

Any basic or applied research domain that generalizes from or to the aviation domain would be welcomed as well.

The deadline for proposals is November 14th, 2008. Instructions for submission can be found at www.wright.edu/isap. For more information, contact Michael Vidulich or Pamela Tsang (Technical Program Co-Chairs), at isap_technical@wright.edu.

Graduate Student News

Shilo Anders successfully finished her PhD requirements, under the direction of advisor David Woods. Her dissertation involved, "Projecting Trajectories of Functional Use for a New Technology: The Electronic ICU." The abstract of this research is printed on page 7.



In addition, a paper based on a portion of Shilo's dissertation won the best student paper award from the Health Care Technical Group of HFES. Congratulations!

Since graduation, Shilo has become a Post-Doctoral Fellow in the Biomedical Informatics Department at Vanderbilt University's National Library of Medicine. This is a two-year position where, where she will be doing medical technology research.

Shilo's mailing address is now 6786 Sonya Drive, Nashville, TN 37209. She can be reached via email at shilo.anders@vanderbilt.edu or anderssh@hotmail.com.



Sahika Vatan Korkmaz won the Best Student Paper Award in the Education Technical Group at this year's Human Factors and Ergonomics Society's annual meeting in New York City. Her research focused on, "A Pilot Test of Participatory Ergonomics and Technology Teams among High School Teachers." The abstract from this effort can be read on page 7. Keep up the good work!



News from the OSU Student HFES Chapter

OSU's Human Factors and Ergonomics Society Student Chapter is busy with several activities for the 2008-2009 school year. These include:



- **College of Engineering's Annual Activities Fair** (October 30th, 2008). Chapter members staffed a booth and spoke with interested students about how they can use their engineering backgrounds to pursue careers in cognitive engineering and biomechanics.

- **Group Meeting.** The Chapter's first meeting was held the week of October 27th. Officers discussed the events that will take place during the year. These will include: ergonomics-related presentations from a wide variety of speakers; hands-on learning activities; and "field trips" to businesses who apply ergonomics in their day-to-day operations.



Congratulations go to 2007-2008 officers, **Kim Vandlen** and **Dawn Chandler**. With the help of other members, Kim and Dawn worked to achieve a "Silver Status" Chapter designation from the HFES. This accomplishment was based on the number and variety of Chapter activities during last year.



Join our HFES Student Chapter! Your involvement in the Chapter is welcomed. Please bring your ideas and energy. More information about our Chapter can be found on our web site, <http://hfes.org.ohio-state.edu>.



Dues. Membership into the Chapter costs just \$15 for the school year. Fees are now due. A membership form can be found on-line, at <http://hfes.org.ohio-state.edu/join.htm>.



Apply Now for the 2009 ASSE Foundation Scholarship Award Program

The American Society of Safety Engineers has announced its scholarship offerings for 2009.

More than 40 graduate and undergraduate awards are available for full-time students who are pursuing a degree in occupational



safety and health or a closely related field. U.S. citizenship is required for a few of these awards, and special restrictions apply for others.

The application deadline is December 1st, 2008, and award notifications will be sent out in April, 2009. A scholarship application, and FAQs, can be found at <http://asse.org/foundation/scholarships/scholarships.php>.

PUBLISH or perish

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



Beyond "Communication Failure" (editorial)
Emily S Patterson, 2008, *Annals of Emergency Medicine*,
August 26th.

A Critical Review of a Pivotal Scientific Contribution: Liles
and Associates 24 Years Later
William S Marras, 2008, *Human Factors*, 50(3):393-396.

Managing Arrivals in Super-Dense Operations: Guidance
based on a Cognitive Walkthrough
Philip J Smith, Amy Spencer, M Evans, J Krozel, A Andre,
2008, *Proceedings of the 27th Digital Avionics Systems
Conference*, Minneapolis, MN, October 26th-30th.

Structuring Flexibility: The Potential Good, Bad, and
Ugly in Standardisation of Handovers (editorial)
Emily S Patterson, 2008, *Quality and Safety in Healthcare*,
17(1):4-5

Patient Care Technology and Safety
G Powell-Cope, AL Nelson, **Emily S Patterson**, 2008, in RG
Hughes (ed), *Patient Safety and Quality: An Evidence-
Based Handbook for Nurses*, Rockville, MD, Agency for
Healthcare Research and Quality. (available on-line, at
www.ahrq.gov/qual/nurses/hdbk/docs/PowellG_PCTS.pdf)

Supporting Macrocognition in Health Care: Improving
Clinical Reminders
LG Militello, **Emily S Patterson**, JJ Saleem, **Shilo Anders**, S
Asch, 2008, in JM Schraagen, LG Militello, T Ormerod, R
Lipshitz (ed), *Naturalistic Decision Making and
Macrocognition*, Aldershot, England: Ashgate, 203-220.

Voice Loops: Engineering Overhearing to Aid Team Coordination
Emily S Patterson, J Watts-Perotti, David D Woods, 2008, in
C Nemeth (ed), *Healthcare Team Communication*, Hamp-
shire, UK: Ashgate, 79-85.

Institute Member Involvement at the 52nd Annual Human Factors and Ergonomics Conference (New York City, September 22nd - 26th, 2008)

Lectures

Box Weight or Lift Rate: Which Factor Matters More During
Lifting? -- S Kotowski (U Cincinnati), KG Davis (U Cincinnati),
William S Marras

Comparing the Effects of Two Controller Algorithms on
DC Torque Tool Operators -- **Monica Johnson, Kim Vandlen**,
E Hutter (OSU), R Gahlot (OSU), **Wei-Ting Yen, S Kommini (OSU)**,
Carolyn Sommerich

Cultivating Resilience in Urban Firefighting: Supporting
Skill Acquisition Through Scenario Design -- **Martin Voshell**,
S Trent (US Military Academy), **Brian Prue, Lisa Fern**

Insights From Applying "Rigor Metric" to Health Care
Incident Investigations -- **Emily S Patterson, Stephanie McNee**,
Daniel Zelik, David D Woods

A Pilot Test of Participatory Ergonomics and Technology
Teams Among High School Teachers -- **Sahika Vatan
Korkmaz, Carolyn M Sommerich, Steven A Lavender**

Playback Technique Using a Temporally Sequenced
Cognitive Artifact for Knowledge Elicitation -- JE Miller (US
Air Force Research Lab), **Emily S Patterson**

Prevalence of Low Back Disorder in Furniture Distribution
Centers -- **Sue Ferguson, Deborah Burr, W Gary Allread, Sato
Ashida, Kaori Fujishiro, C Heaney (Stanford), William S Marras**

Shifts in Functions of a New Technology Over Time: An
Analysis of Logged Electronic Intensive Care Unit
Interventions -- **Shilo Anders, Emily S Patterson, David D
Woods, S Schweikhart (OSU)**

Survey Response Comparisons Between Student and
Teacher Participants in a Mobile Instructional Technology
Program in a High School Setting -- **Carolyn M Sommerich**,
Sahika Vatan Korkmaz

Utilization of a Hybrid Neuro-Fuzzy Engine to Predict Trunk
Muscle Activity for Sagittal Lifting -- K Davis (U Cincinnati),
Y Hou (U Louisville), **William Marras**, W Karwowski (U
Central Florida), J Zurada (U Louisville), S Kotowski (U
Cincinnati)

Invited Symposium

Dynamics of Reciprocal Collaborative Trust in Sensitive
Information Repositories -- B Gerke (OSU), **Emily S Patterson**

US-Brazil Cognitive Systems Engineering Exchange
Program -- S Guerlain (U Virginia), **David Woods, Jose Orlando
Gomes**

Panels

Cognitive Engineering Approaches to Safety in Health
Care -- A Bisantz (SUNY Buffalo), **Emily Patterson, S
Guerlain (U Virginia), J Seagull (U Maryland), C Nemeth (U
Chicago), T Fairbanks (U Rochester)**



Research Corner



This issue of the *Insider* summarizes recently conducted research

Projecting Trajectories of Functional Use for a New Technology: The Electronic ICU

Shiloh Anders, Dissertation (2008)

Abstract

There are an increasing number of new technological innovations emerging and being fielded in the market, especially medical technologies. Studies of these new technologies should consider trajectories of change and adaptation as new systems and capabilities are introduced and mature. Within the literature is a variety of technology adoption, evolution and radical change models; one widely cited view of technology adoption is Rogers' diffusion of innovation, which has been used to empirically examine attempts to inject new technologies into various domains.

Rogers' diffusion of innovation accounts for success stories of technology adoption; however, it is limited for technologies that are rejected by intended users, require significant tailoring, or are used for unexpected functions. This research takes a cognitive systems engineering perspective to reinvigorate the study of the impact of new technology in complex, socio-technical settings, by focusing on the intersections of the domain, artifacts (e.g. tools and technologies), and practitioners.

A case study of a specific new technology was conducted using a triangulation of ethnographic methods—observations, interviews, and log analysis. The emerging telemedicine example studied in this research is the electronic intensive care unit (e-ICU). The e-ICU was implemented in a single hospital in 2000; it was not subsequently expanded to other hospital systems until years later and since then has seen increased usage around hospital systems.

The study summarizes the current e-ICU functions into three groups: access to expertise, anomaly response, and sensemaking. Additionally, intervention logs where the e-ICU nurses write down every time a discourse occurs between the e-ICU and ICU were examined. The intervention log analysis lends support to the hypothesis that these functions and additional functions of the e-ICU are changing over time. Finally, the interviews provide a survey of additional functions that other e-ICUs across the country.

Previous research utilizes these methods to identify patterns in how expert practitioners interact with computerized support to achieve domain-specific objectives, making no projections about potential trajectories of adaptation through use that may occur over the longer term. This research is novel in that the findings form the foundation of a proposed, expanded, theoretical framework of trajectories and indicators of technology change.



This research is anticipated to have theoretical as well as applied contributions. First, an enhanced theoretical framework should better enable companies to predict the impacts of new technologies in emerging markets by providing possible trajectories and associated indicators. Thus, these projections may be further explored in future research as to how technology may be steered into more productive trajectories, and how to mitigate the negative "side effects" associated with particular trajectories. The research suggests that the ability to project possible trajectories in order to aid in selecting among alternatives and managing post-conditions of change can be done based on the pattern base built up through cognitive systems engineering and the proposed theoretical framework.

A Pilot Test of Participatory Ergonomics and Technology Teams among High School Teachers

Sahika Vatan Korkmaz

Abstract

The promise and potential of Information Technology (IT) to improve education in educational environments is offset by potential for problems that can stem from an unhealthy information ecology.

The long-term goal of this line of research was to improve teachers' effectiveness with IT and incorporating IT into their curriculum. This goal was addressed in this research through a participatory approach that employed an action research model. The specific aim was establishing small groups of

teachers to meet weekly to engage in collaborative exploration of the use of IT in their classrooms and assessing progress of their learning.

Teachers' team evaluation surveys indicated that a majority of Participatory Ergonomics and Technology Team members were satisfied with their participation and the quality of the teams. Team member teachers' perception about their own computer proficiency and their belief about the usefulness of IT statistically increased from pre- to post-intervention.

It is possible to conclude that this approach is a viable method that may have positive effects on supporting teacher collegiality and improving teachers' use of IT.

