

# Institute Insider

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

At the forefront of Human Factors since 1950 Volume 5, No. 3, Autumn, 2002



## Institute Welcomes New Faculty, Visiting Professors

The Institute is pleased to announce the arrival of **Dr. Steven Lavender**, who has joined the Department of Industrial, Welding & Systems Engineering, as an Associate Professor. This is a joint appointment with the OSU Department of Orthopaedics.

In 1990, Dr. Lavender earned his Ph.D. from The Ohio State University, in Industrial Engineering. For the past 12 years, he worked as a research scientist in the Department of Orthopedic Surgery, at Rush-Presbyterian-St. Luke's Medical Center in Chicago. In this position, Steve made many significant contributions to the scientific basis for ergonomics. While at Rush, he also developed LiftTrainer.



**Lavender**

LiftTrainer is a behaviorally oriented approach to improving lifting techniques. By using a combination of biofeedback, biomechanical analysis tools, and one-on-one coaching, the LiftTrainer protocol guides individuals towards lifting behaviors that lower the forward bending, lateral bending, and twisting moments (i.e., stressors) that act on the spine while maintaining desired productively levels.

At OSU, Dr. Lavender is the Director of the Orthopaedic Ergonomics Laboratory. The goal of the research conducted in this laboratory is to improve the physical interaction between workers, their work, and the work environment. As such, the work in this lab focuses on the body's biomechanical response to a variety of occupational tasks, potential workplace interventions, and the development of models predictive of musculoskeletal injury development and recovery.

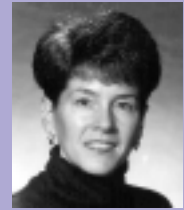
Steve is a member of the Human Factors and Ergonomics Society, the Institute of Industrial Engineers, the American Society of Biomechanics, and the Orthopaedic Research Society, and he also is a Certified Professional Ergonomist. In addition, Steve has published dozens of peer-review journal articles.

Dr. Lavender can be reached at 614-292-9980 or [lavender.1@osu.edu](mailto:lavender.1@osu.edu).

*continued on page 6*

## Speaker to Discuss the Impact of Frequent Computer Use

As part of the Institute's continuing Guest Lecture Series, **Dr. Carolyn Sommerich** will be the Autumn quarter speaker. She will be discussing the use of desktop computers, laptops, and computer monitors, and their impact on worker comfort, productivity, and body biomechanics.



**Sommerich**

The lecture will take place **Tuesday, November 19<sup>th</sup>**, from 11 a.m. until 12 noon, in room 263 Drees Labs (2015 Neil Ave.), on The Ohio State University main campus.

Dr. Sommerich has recently joined the Institute, having accepted the position of Associate Professor in the OSU Department of Industrial, Welding, & Systems Engineering. She has published research on the effects of notebook computer configurations, ergonomic evaluations of computer workstations, the biomechanics of hand-intensive tasks, and ergonomic interventions in dental hygiene work.

For more information about this upcoming talk, contact the Institute for Ergonomics, at 614-292-4565 or [ergonomics@osu.edu](mailto:ergonomics@osu.edu).

## In This Issue . . .

1. *In the News* -- Recent Awards . . . . . 2
2. *On the Move* -- Institute Member Activities . . . . . 3
3. *Effects of New Computer Monitor Design* . . . . . 4
4. *Publish or Perish* -- Recent Publications . . . . . 4
5. *Activity at the HFES Conference* . . . . . 5
6. *New Ergonomics Graduate Students* . . . . 6

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## IN THE NEWS



**Dr. Charles Billings** was honored by the Aerospace Human Factors Association, with the 2002 Henry L. Taylor Founders Award, for “outstanding contributions to the field of aerospace human factors.”



**Billings**

This award was sponsored by the Institute of Aviation at the University of Illinois and was given at the annual meeting of the Aerospace Medical Association in Montreal, Canada (May, 2002).

In 1997, Dr. Billings published *Aviation Automation: The Search for a Human-Centered Approach*, which, according to AHFA’s President Scott Shappell, is still “considered the definitive volume on human factors issues in aviation automation.”

Dr. Billings can be reached, via e-mail, at [ChasBill@ix.netcom.com](mailto:ChasBill@ix.netcom.com).



**Dr. David Woods** received the 2002 Jack A. Kraft Innovator Award from the Human Factors and Ergonomics Society, for advancing cognitive engineering and its application to safer systems.



**Richard Jagacinski** and John Flach have recently completed the textbook, *Control Theory for Humans* (published by Erlbaum). This book provides a tutorial introduction to behavioral applications of control theory. Control theory describes the information one should be sensitive to and the pattern of influence that one should exert on a dynamic system in order to achieve some goal. Topics include varieties of control theory (e.g., classical, optimal, fuzzy, adaptive, and learning control), as well as perception and decision-making in dynamic contexts. The authors also discuss some of the implications of control theory for how experiments can be conducted in the behavioral sciences.

To find out more information about this textbook, contact Dr. Jagacinski, at [jagacinski.1@osu.edu](mailto:jagacinski.1@osu.edu).

# On the Move



**William Marras** was invited to present the talk, *Towards the Development of a Cumulative Trauma Metric for Occupationally Related Musculoskeletal Disorders*, at the World Congress on Biomechanics, which was held in Calgary, Canada (August 5<sup>th</sup>-9<sup>th</sup>, 2002).



**David Woods** gave two talks recently at the following conferences:

- Plenary Address: *Steering the Reverberations of Technology Change on Fields of Practice: Laws that Govern Cognitive Work*, at the annual meeting of the Cognitive Science Society (Fairfax, Virginia, August 10<sup>th</sup>, 2002); and
- Keynote Address: *Psycho-Technology Thematic Track*, at the annual meeting of the American Psychological Association (Chicago, Illinois, August 24<sup>th</sup>, 2002).

The basis for each of these addresses is a set of "Laws that Govern Cognitive Work," which is now available in multiple formats on CD or at <http://csel.eng.ohio-state.edu/laws>.

**Gary Allread** presented the talks, *Ergonomics at Work: Applications and Regulations* at the Safety & Health Day, sponsored by the Black Swamp Safety Council (Archbold, Ohio, September 17<sup>th</sup>, 2002), and *Ergonomics: Applications, Benefits, and Recent Regulatory Activity*, at the local chapter of the National Safety Council (Columbus, Ohio, September 18<sup>th</sup>, 2002).

**David Woods** was an invited contributor to the *Workshop on Improving Medical Device Safety: Supporting Resilience and Innovation in Healthcare Organizations* at the Third 'Clambake' Conference on Human Error, which was convened by the Developing Center for Patient Safety at the University of Chicago and the Food and Drug Administration (Chicago, Illinois, September 19<sup>th</sup>-22<sup>nd</sup>, 2002).

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**Carolyn Sommerich** has been elected to be an At-Large Executive Council Member with the Human Factors & Ergonomics Society. This three-year term began in October, 2002.

**Sue Ferguson** presented the talk, *Watch Your Back: Lifting Guidelines to Reduce Recurring Back Injuries* at the Ohio Bureau of Workers' Compensation "Workers' Comp University" one-day seminars. These workshops were held around Ohio, and Dr. Ferguson gave this talk in Cambridge, Cincinnati, Cleveland, Columbus, Dayton, Toledo, and Youngstown (September-October, 2002).

**Tom Rockwell** has been appointed to two National Academy of Sciences/Transportation Research Board (NAS/TRB) committees--one to review the Federal Railroad Administration's research and development program, and the other to review the National Highway Traffic Safety Administration's Intelligent Research Initiative.



**Rockwell**

**David Woods** has joined the Committee on Aerospace Research and Technology for Vision 2050.

In September, 2002, **William Marras** and colleagues Dr. Kermit Davis (University of Cincinnati) and Dr. Waldemar Karwowski (University of Louisville) were awarded a four-year contract to study, "Neuro-Fuzzy Prediction of Spine Loads in Response to Risk Factors." This amount of this research grant, sponsored by the National Institute for Occupational Safety and Health (NIOSH), was \$1.4 million.

**William Marras** and Dr. Kevin Granata (University of Virginia) were awarded a NIOSH grant to study "Spinal Loads and Stability During Pushing." This four-year contract began in September, 2002, and Dr. Marras' portion of this award is \$600,000.

**David Woods** is now a member of the National Research Council, Aeronautics and Space Engineering board. His term, which began in September 2002, will run until November 2003.

**David Woods** has been invited to be committee member for the joint National Academy of Engineering/Institute of Medicine panel to study "Engineering the Delivery of Health Care: Priorities For Application and Research." The 14-month project is schedule to be completed in December, 2003.

## Newer Design of Close-Up Computer Monitors Increases Ease of Use

Eyeglasses with built-in computer monitors could soon be a reasonable alternative to reading text from a traditional computer screen, according to new research conducted here at The Ohio State University.

Participants in a recent study rated the comfort and performance of these so-called “near-eye” displays as comparable to that of traditional computer monitors. Near-eye displays are like eyeglasses, but with a monitor built into the lenses.

“The problems with near-eye devices range from motion sickness to the device’s weight to poor image resolution,” said James Sheedy, a study co-author and an associate professor of Optometry. “But the design of such devices is improving, and the subjects in our study found the function and usefulness of the near-eye display similar to that of a regular computer screen.”



Sheedy

The research appears in a recent issue of the journal *Optometry and Vision Science*. Sheedy, who is also director of the Computer Vision Clinic, conducted the study with Neil Bergstrom, the vice president of business development at Iridigm Display Corp. in San Francisco, which provided support for the study.

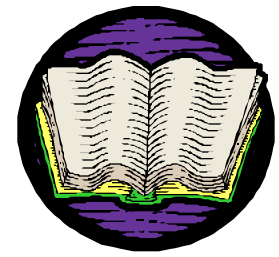
The researchers asked 22 subjects to participate in a reading experiment and a separate movement experiment. The subjects used five different displays to complete the tasks in the reading experiment: a hand-held monocular vision display with an attached cover for the non-viewing eye; a binocular vision display with a holder that wrapped around the subject’s head; hard copy with printed text; a flat panel computer screen; and a screen on a hand-held computer.

The participants were asked to perform four trials each of three different reading tasks: the first had subjects reading four separate paragraphs of about 325 words in length and answering multiple-choice questions at the end of each passage. The second task involved counting the occurrences of an assigned letter in a paragraph of nonsense words. In the final reading experiment, subjects were instructed to find three out

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## PUBLISH

or perish



The recent publications written by Institute members include:

**A Rose by any Other Name...Would Probably be Given an Acronym.** 2002. R.R. Hoffman, K.M. Ford, P.J. Feltovich, D.D Woods, G. Klein, and A. Feltovich. *IEEE Intelligent Systems*, July/August: 72-79.



**Effects of Posture on Dynamic Back Loading During a Cable Lifting Task.** 2002. S. Gallagher, W.S. Marras, and K.G. Davis. *Ergonomics*, 45(5):380-398.



**Female and Male Trunk Geometry: Size and Prediction of the Spine Loading Trunk Muscles Derived from MRI.** 2001. W.S. Marras, M.J. Jorgensen, K.P. Granta, and B. Wiand. *Clinical Biomechanics*, 16:38-46.



**Grip Force and Muscle Activity Differences due to Glove Type.** 2002. K. Kovacs, R. Splittstoesser, A. Maronitis, and W.S. Marras. *AIHA Journal*, 63(3):269-274.



**Quantification of Trunk Motion in Response to Complex Platform Perturbations while Holding Weights in an Upright Posture.** 2001. M. Parnianpour, K. Ghosh, K. Barin, and W.S. Marras. *Biomedical Engineering, Applications, Basis and Communications*, 13(1):33-46.



**Spinal Loading when Lifting from Industrial Storage Bins.** 2002. S.A. Ferguson, L. Gaudes-MacLaren, W.S. Marras, T.R. Waters, and K.G. Davis. *Ergonomics*, 6:399-414.



**The Squidgy: An Order of Magnitude Display.** 2002. M. Howard and D.D Woods. *Proceedings of the Eleventh European Conference on Cognitive Ergonomics (ECCE-11)*, Catania, Sicily, September 9<sup>th</sup>-11<sup>th</sup>, 2002.



**Steering the Reverberations of Technology Change on Fields of Practice: Laws that Govern Cognitive Work.** 2002. D.D. Woods. *Proceedings of the 24th Annual Meeting of the Cognitive Science Society*, August 10<sup>th</sup>, 2002.



## Institute Activity at the Annual HFES Conference

Members of the Institute for Ergonomics participated in several activities at the Human Factors and Ergonomics Conference, held September 30<sup>th</sup> - October 4<sup>th</sup> in Baltimore, Maryland. Institute members are recognized below in boldface.

### **Workshops**

*Practical Electromyography for Ergonomists*  
Moshe Solomonow, **William S. Marras**, Richard V. Baratta

### **Lectures**

*Asynchronous Communications to Support the Distributed Work in the National Airspace System*  
**Roger J. Chapman, Philip J. Smith**

*Can Quantitative Measures of Performance when Training Lifting Techniques Identify Those at Risk for Low Back Disorder?*  
**Steven A. Lavender**, Eric P. Lorenz, Gunnar B.J. Andersson

*Creating Patient Safety with Organizational Learning: A Case-Based Learning Intervention at a Public and Private Hospital*  
Amanda Eisenlohr, Marta L. Render, **Emily S. Patterson**

*The Effect of a Variable Lumbar Erector Spinae Sagittal Plane Moment Arm on Predicted Spinal Loading*  
Michael J. Jorgensen, **William S. Marras**, Thomas R. Waters

*The Effect of Personality Type on Assembly Time and Wrist Kinematics during a Laboratory Task*  
Naomi F. Glasscock, Gary A. Mirka, **Carolyn M. Sommerich**, Katherine W. Klein

*Effects of Load and Posture on the Recruitment of Trunk Muscles*  
**Sean Gallagher, William S. Marras**, Kermit G. Davis

*Identification of Measures Sensitive to Fatigue Development Associated with Low-Level Exertions of the Neck Musculature and the Effects of Age*  
Sharon Joines, **Carolyn M. Sommerich**, Gary A. Mirka, James R. Wilson, Samuel Moon

*Modeling Error Recovery in Dynamic Collaborative Domains*

**Mark I. Nikolic, Nadine B. Sarter**

*Relative Contribution of Workplace Factors and Individual Characteristics in the Development of Spine Loads*

Kermit G. Davis, **William S. Marras**, Thomas R. Waters

*The Remote Perception Problem*

**James S. Tittle, Axel Roesler, David D. Woods**

*Repeating Human Performance Themes in Five Health Care Adverse Events*

**Emily S. Patterson**, Marta L. Render, Patricia R. Ebright

*A Survey of Desktop and Notebook Computer Use by Professionals*

**Carolyn M. Sommerich**

*ViewTracks: User Control of Viewpoint in 3D Virtual Displays*

**James S. Tittle, Axel Roesler, David D. Woods**

### **Panels**

*Behind the Curtain: The Cognitive Tasks Behind the Visualizations*

**David D. Woods**, Kevin Bennett, William C. Elm, Ann M. Bisantz, Robert Eggleston

*The Etiquette Perspective for Human-Automation Relationships*

Raja Parasuraman, **Emily S. Patterson**, Kevin M. Corker, Thomas B. Sheridan

*GUTs or No GUTs (Grand Unified Theories): Does/Can/Should Cognitive Engineering Have GUTs?*

**David D. Woods**, Gary Klein, Robert Hoffman, John Flach, Peter Hancock

*Methodological Approaches to Research and Musculoskeletal Complaints and Injuries*

Krystyna Gielo-Perczak, Waldemar Karwowski, Shrawan Kumar, **William S. Marras**

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## New Faculty and Visiting Professors

*continued from page 1*

**Donna Byron** has joined the faculty of the Department of Computer and Information Science, as an Assistant Professor. She earned her Ph.D. from the University of Rochester in September, 2002.

Dr. Byron's research goal is to build software that can improve the understanding of human languages. This technology can be used as an interface to computer applications (e.g., a spoken interface to a scheduling system) or as the data used by an application (e.g., translating documents from one language to another).

She is currently focusing on the problem of interpreting referring expressions, such as noun phrases and pronouns, as this is a central problem for language understanding that currently has no satisfactory solution. While at the University of Rochester, Dr. Byron investigated several new techniques for computing the meaning of referring expressions. Here at Ohio State, she plans to extend that work while applying Natural Language Processing (NLP) technology to the new domains of natural language interaction in virtual environments and wearable devices to assist people with language disabilities.

Dr. Byron can be reached at 614-292-6370 or [dbyron@cis.ohio-state.edu](mailto:dbyron@cis.ohio-state.edu).

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**Katsuyuki Shibata** is a visiting (assistant) professor from the School of Health Sciences, Faculty of Medicine, at Kanazawa University (Kanazawa, Japan). He is be working with William Marras in the Biodynamics Laboratory and will be here through July, 2003. Katsuyuki can be reached at 614-292-2016 or via e-mail ([mrkatsuyuki@aol.com](mailto:mrkatsuyuki@aol.com)).



**Shibata**

**Dr. Jose Orlando Gomes** is visiting the Institute through 2003. Dr. Gomes is a Professor of Human Factors and Ergonomics, from the Industrial Engineering Department, Polytechnic School, at the Federal University of Rio de Janeiro, Brazil. While at OSU, he will be working on cognitive engineering, computer-supported cooperature work, and human error research projects with David Woods and Emily Patterson.



**Gomes**

Dr. Gomes earned his Ph.D. from the Federal University of Rio de Janeiro ([www.coppe.ufrj.br](http://www.coppe.ufrj.br)) and the Conservatoire National des Arts et Metiers in Paris ([www.cnam.fr](http://www.cnam.fr)).

While at Ohio State, Dr. Gomes can be reached at 614-247-7965 or [gomes.7@osu.edu](mailto:gomes.7@osu.edu).

## Graduate Student Update

Please welcome these students who are new to our ergonomics graduate programs:



**Jen Bower**

([bower.87@osu.edu](mailto:bower.87@osu.edu))

Advisor: Philip J. Smith

Hometown: Watsonstown, PA

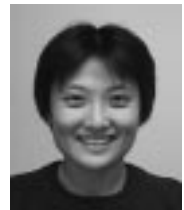


**Anne-Marie Chany**

([amli77@yahoo.com](mailto:amli77@yahoo.com))

Advisor: William S. Marras

Hometown: Strongsville, Ohio



**Chrissy Liu**

([Liu.382@osu.edu](mailto:Liu.382@osu.edu))

Advisor: Philip J. Smith

Hometown: Beijing, P.R. China



**Julia Parakkat**

([parakkat.1@osu.edu](mailto:parakkat.1@osu.edu))

Advisor: William S. Marras

Hometown: Lexington, Kentucky



**Gang Yang**

([yang.370@osu.edu](mailto:yang.370@osu.edu))

Advisor: William S. Marras

Hometown: Beijing, P.R. China

## Newer Design of Computer Monitors

*continued from page 4*

of four occurrences of an assigned three-letter word on a spreadsheet filled with various three-letter words.

The researchers measured how long it took subjects to complete each reading task using the respective visual display. After using each type of display, subjects were asked if they had experienced any of the following symptoms, and to what degree: headache, eyestrain, sore or irritated eyes, blurry vision, dizziness, nausea, disorientation, neck ache or backache.

Results showed that the performance of the monocular vision display was comparable to the performance of the flat panel screen and hard copy text.

“To our surprise, the reading tasks were completed faster with the monocular display than with the binocular display,” said Sheedy. “This may have had to do with how each display fit the user, or the design of the respective device.”

However, subjects complained about eyestrain more with the monocular display than with any other displays.

Performance speeds with the binocular display were about 5-7% slower than for the other displays. Sheedy suspects that this slower speed may have something to do with how the image is aligned along the line of sight in each lens.

The image displayed by a near-eye device may appear to be much farther--up to 6 feet away--from the viewer than an image on a typical computer monitor. The seemingly greater distance makes for easier viewing, Sheedy said. But the image size in a near-eye display is about the size of an average computer screen.

“Traditional displays are constrained by their physical size and are usually about 20 to 30 inches from the eyes,” he said.

The second experiment assessed the risk for motion-related symptoms while wearing the binocular head display.

Seated subjects were asked to rotate their heads several times to the left and right, and again up and down. They performed the same task while standing. They were also asked to rotate their head while sitting and standing.

“Motion-related symptoms were a large problem in previous studies,” Sheedy said. “Participants didn’t have

much problem with motion sickness in this study, probably due in part to the nature of the tasks they were asked to perform.

“Most of the previous studies on near-eye displays used video movement or virtual reality tasks that created movement on the virtual display. These kinds of tasks are more likely to cause queasiness.”

Nor were the participants in the current study fully immersed in the image. That is, neither the monocular nor binocular displays blocked the user’s peripheral vision, so he could focus on the image in front of him and still see his surroundings.

“Being able to see the real environment while wearing a display gives the user a visual reference that can help lessen confusion when the eye sees the image move,” Sheedy said. “For most of the common uses, the user wouldn’t want to be fully immersed in the virtual environment.”

Although several prototypes exist, near-eye displays have yet to become common. It’s only a matter of time before they do, Sheedy said. He doesn’t see such devices becoming a commodity in the office, but he does predict that they’ll find a place in business and industry.

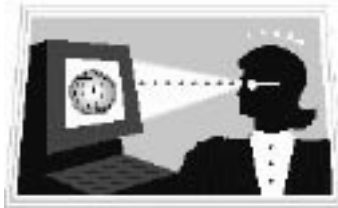
“From a remote location, a warehouse worker stocking orders can use a wearable display to look up accounts,” he said. “A traveling salesperson can pull up email messages, addresses and other vital information en route to his destination.”

A user can plug his display into a hand-held computer and see a full-size page, or surf the web from his cell phone and see the entire site, rather than a fraction of the information.

“These portable displays give a viewer complete privacy when viewing a document,” Sheedy said. “That goes for confidential documents, email, web pages and so on.”

Dr. Jim Sheedy can be reached at 614-247-7632, or [sheedy.2@osu.edu](mailto:sheedy.2@osu.edu).

*Written by Holly Wagner (614-292-8310; [wagner.235@osu.edu](mailto:wagner.235@osu.edu)).*



Autumn, 2002

The Newsletter of the  
Institute for Ergonomics



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