

# 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. 1, Winter, 2002



## Labor Secretary Urged to Move Forward on Ergonomics

A group of Democratic and Republican senators have again urged Labor Secretary Elaine Chao to formally address workplace musculoskeletal disorders. Those signing a letter to Secretary Chao included Ted Kennedy (D-Ma), Tom Harkin (D-Ia), Arlen Specter (R-Pa), Joseph Lieberman (D-Co), and Paul Wellstone (D-Mn).

Chao has stated that the Labor Department would "pursue a comprehensive approach" to ergonomics, but the senators noted that a plan was not released this past fall and that no plans have been announced for 2002. Also, the regulatory agenda recently released from the Labor Department made no mention of activity on the ergonomics front.

The senators have requested that Chao's staff brief them on the Department's ergonomics plan, but the department has not yet responded to this request.

There has been speculation within OSHA that an announcement will soon be made regarding the Bush Administration's plan for addressing ergonomics and workplace injuries.

Look for further details in upcoming issues of the *Insider*.

## Landmark Study Uncovers Causes for Recurring Back Injury

In the first study of its kind, researchers affiliated with the Institute for Ergonomics believe they have found an important factor in recurring back injury—our natural tendency to avoid using hurt muscles.

The findings, which appeared in the December 1<sup>st</sup> issue of the journal *Spine*, point to new forms of physical therapy and new safety standards for physical labor in the workplace. This work could potentially affect the incidence of severe back injury and reduce the millions of dollars in health costs and lost workdays created by these injuries every year.

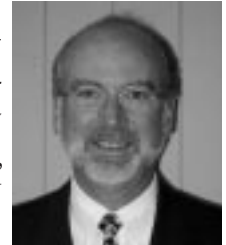


*Continued on page 7*

## Vision Problems and Computer Use is Topic of Upcoming Lecture

James Sheedy, Associate Professor at the OSU College of Optometry, will be the Institute's Winter Quarter guest speaker.

Dr. Sheedy will discuss *Solving Vision and Eye Problems of Computer Workers* on Friday, February 8<sup>th</sup>, 2002, from 10:45 a.m. - 12 noon, in Room 263 Dreese Labs (OSU main campus).



Because vision and eye problems are the most frequent health-related problem among computer users, and they often impact work performance, Dr. Sheedy will discuss proper computer workplace design and the type of eye care needed for users. He will discuss how to troubleshoot the most common environmental problems, such as lighting, reflections, display quality, and workstation layout.

Although aspects of the work environment can cause or contribute to eye problems, more frequently the individual needs good eye care. Due to the high visual demands of computer work and the uncommon viewing distance and location of the computer display, specialized eye care and "computer glasses" are often the best solution. Dr. Sheedy will present means of providing such eye care.

This seminar is free and open to the public. No registration is required. For more information, contact the Institute, at 614-292-4565. ❖

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**Dr. Tom Rockwell** was profiled in the May/June 2001 issue of *TR [Transportation Research] News*. The article included a summary of Dr. Rockwell's achievements over the past 40 years, as a pioneer in the study of vision and driver responses during vehicle operation. The article also highlighted Dr. Rockwell's insights regarding how new automotive technologies have changed driver workload.



On October 13<sup>th</sup>, **Dr. Charles Billings** received the Forrest M. and Pamela Bird Award from the Civil Aviation Medical Association, at its annual scientific meeting in Atlanta. The award was given for "Exceptional contributions to the safety of civil aviation through original research" and recognized Dr. Billings' lifetime contributions to civil aviation medicine. The Association is the leading organization of civil aviation medical examiners in the United States. Congratulations!



*Cognitive Engineering in the Aviation Domain*, edited by **Nadine Sarter** and Rene' Amalberti, is now available in paperback through Lawrence Erlbaum Associates (ISBN 0-8058-2316-6). More information can be found at [www.erlbaum.com](http://www.erlbaum.com).

## Graduate Student Update

Two new students have begun working in the Cognitive Systems Engineering Lab. Please welcome them!

**Justin Grossman**

([grossman.47@osu.edu](mailto:grossman.47@osu.edu))

Advisor: David Woods

Hometown: Grove City, Ohio



**Bill Hess**

([hess.65@osu.edu](mailto:hess.65@osu.edu))

Advisor: Nadine Sarter

Hometown: Coldwater, Ohio



## On the Move



*Side Effects from Introducing Bar Coding in Medication Administration* was the topic of an invited presentation given by **Emily Patterson** to the Harvard Risk Management Foundation, in Boston, Massachusetts (August 20<sup>th</sup>, 2001).



**Emily Patterson** presented the poster, *Proactively Identifying Side Effects by Observing the Introduction of New Technology* at the VA/QuIC Summit on Effective Practices to Improve Patient Safety (September 5<sup>th</sup>-7<sup>th</sup>, Washington DC).



At the annual conference of the Association of Occupational Health Professionals in Healthcare, **Gary Allread** conducted a workshop on *How to Establish an Effective Ergonomics Program* and also spoke to attendees regarding *Ergonomics in the Healthcare Industry* (October 10<sup>th</sup>-11<sup>th</sup>, 2001, Pittsburgh, Pennsylvania).



**Nadine Sarter** has joined the Editorial Boards of the *International Journal of Cognitive Field Research* and the *International Journal of Aviation Psychology*.



**Gary Allread** lectured on *Costly Mistakes: How to Address Ergonomic Hazards and Risks* at the 11<sup>th</sup> Annual Ohio OSHA Conference in Columbus, Ohio (October 31st, 2001).



**Emily Patterson**, along with P.M. Gorman, J.T. Malin, L. Militello, and S. Sawyer, led a panel session titled, *Help and Hindrance: Impact of Automation on Experts Collaborating in High Stakes Settings*, at the 2001 Americal Medical Informatics Association Conference in Washington, D.C. (November 3<sup>rd</sup>-7<sup>th</sup>, 2001). Emily also spoke there on the topic, *Automation Surprises and Context Rifts*.



**Nadine Sarter** and her graduate students are working with two ISE undergraduate students on their honors theses. *Jim Mitchell* is studying the effects of cell phone use while driving. *Brad Derflinger* is analyzing reports from the Aviation Safety Reporting System, to identify successful and poor error explanations and recovery strategies on modern flight decks. Look for summaries of this research in upcoming issues of the *Insider*.



## Where Are They Now



This column profiles past graduates from the Human Factors/Ergonomics program at Ohio State

**Katie Lehman** received her Masters degree in December 1993, under advisor William Marras. Katie chose this program because of her interest in ergonomics as it relates to product design. Since graduation, Katie has pursued a career in designing products to match humans' capabilities and needs, both from a physical and a cognitive perspective.



Katie now resides in Raleigh, North Carolina (which seems to be the southern gathering spot for many of Bill's former students). However, she is a newcomer to Raleigh, having moved there in June 2001. Prior to that she worked for eight years in Atlanta, for NCR Corporation. As Manager of Ergonomics and Hardware Usability at NCR, Katie determined ergonomics

requirements for scanners, displays, keyboards, kiosks, and ATMs, and she consulted with numerous retailers around the world. She is proud of a research project that she and a colleague performed at the University of Nijmegen, in the Netherlands, the results of which were ultimately responsible for changing European retail ergonomics legislation.

Katie left NCR in the fall of 2000, to join a small Human Factors consulting company, HFI, where she performed software user-interface design work for clients. She enjoyed the change and the challenge of applying human factors principles to software design, but because of the economic downturn, the company closed its Atlanta office in March 2001.

The layoff turned out to be a blessing in disguise, as Katie has since landed a great job in North Carolina. (This just happens to be where her boyfriend Terry lives.) She is currently employed as a user-interface designer for the SAS Institute in Cary. In this position she works with Marketing to gather product requirements and designs web- and Windows-based query and reporting intelligence applications for business.

Katie and Terry enjoy hiking with her golden retriever, Minda, and his yellow lab, Jake, and watching all the Ohio sports they can. Katie stays active by running and playing soccer and volleyball, and she also dabbles in watercolor and drawing.

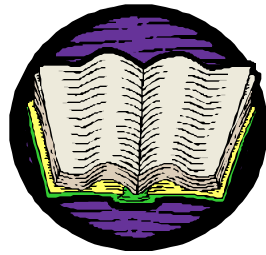
Katie can be reached at [Katie.Lehman@sas.com](mailto:Katie.Lehman@sas.com).



# PUBLISH

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The recent publications written by Institute members include:



**Biomechanical Aspects of Work-Related Musculoskeletal Disorders.** 2001. R.G. Radwin, W.S. Marras, and S.A. Lavender. *Theoretical Issues in Ergonomic Science*. 1-61.



**Localized Oxygen Use of Healthy and Low Back Pain Individuals During Controlled Trunk Movements.** 2001. K.M. Kovacs, W.S. Marras, A.S. Litsky, P. Gupta, and S.A. Ferguson. *Journal of Spinal Disorders*. 14(2):150-158.



**Shift Changes, Updates, and the On-Call Model in Space Shuttle Mission Control.** 2001. E.S. Patterson and D.D. Woods. *Computer Supported Cooperative Work: The Journal of Collaborative Computing*. 10(3-4):317-346.



**Spine Biomechanics, Government Regulation, and Prevention of Occupational Low Back Pain.** 2001. W.S. Marras. *The Spine Journal*. 1(3):163-165.



**Spine Loading Characteristics of Patients with Low Back Pain Compared with Asymptomatic Individuals.** 2001. W.S. Marras, K.G. Davis, S.A. Ferguson, B.R. Lucas, and P. Gupta. *Spine*. 26(23):2566-2574.



**Usability Test of Bar Code Medication Administration (BCMA).** E.S. Patterson, M. Rogers, A. Eisenlohr, P. Ebright, and M.L. Render. 2002. *Proceedings of the VA Health Services Research 2002 Annual Meeting: Improving Access and Outcomes*. 13-15 February, Washington DC.



**Usability Test Findings and Recommendations: Bar Code Medication Administration (BCMA). V1.0 and V2.0.** 2001. E.S. Patterson, M.L. Render, and M.L. Rogers. Institute for Ergonomics/Cognitive Systems Engineering Laboratory Report. ERGO-CSEL 01-TR-06. The Ohio State University, Columbus OH.



## New Industrial Lumbar Motion Monitor Now Available

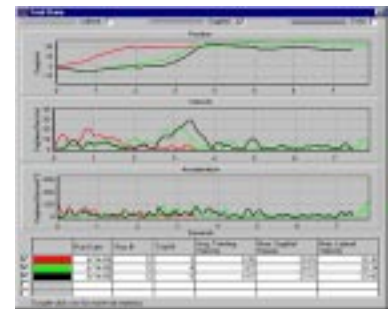
The Institute has teamed with Biomec Inc. ([www.Biomec.com](http://www.Biomec.com)) and NexGenErgonomics to design, develop, and market the next generation Lumbar Motion Monitor.

The new LMM has an “all-in-one” design; that is, a single LMM unit is adjustable to the appropriate size for monitoring individuals of varying heights. In addition, a single set of harnesses also is adjustable to individuals of differing sizes. This greatly reduces the amount of equipment needed to take to and evaluate industrial work sites.



The LMM uses digital telemetry to transmit data from it to the user's computer.

Data collection and analysis has been made simpler using the new, Windows-based Lumbar Pro-Soft 2.0 software.



For details about the LMM and accompanying software,

contact NexGenErgonomics (Phone: 514-685-8593; Web site: [www.nexgenergo.com](http://www.nexgenergo.com)).

## Call for Proposals

The Human Factors and Ergonomics Society has asked for submissions to its 46<sup>th</sup> Annual Meeting, which will be held in Pittsburgh, Pennsylvania September 23<sup>rd</sup> - 27<sup>th</sup>, 2002. The theme for this year's meeting is *Bridging Fundamentals and New Opportunities*.

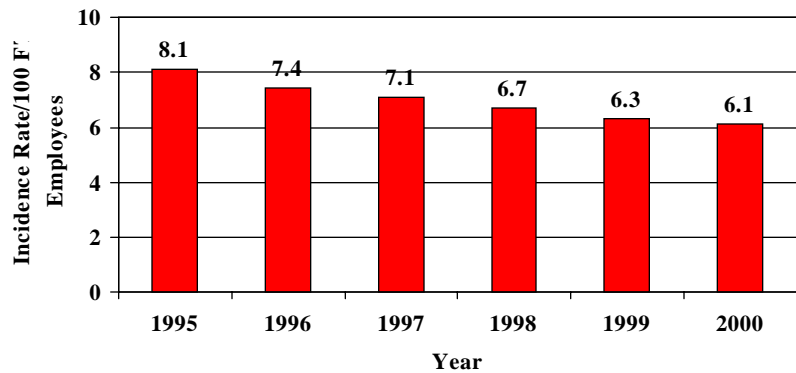
Proposals for all types of presentations (lectures, posters, demonstrations) are due by **February 20<sup>th</sup>**. These proposals can be submitted electronically. For details, visit the Human Factors web site, [www.hfes.org](http://www.hfes.org).



## Workplace Injury & Illness Rates Reach Historic Lows

On December 18<sup>th</sup>, 2001, the Bureau of Labor Statistics released its 2000 Injury & Illness data. The injury & illness rate, of 6.1 cases in private industry per 100 full-time workers per year, is the lowest rate since BLS began reporting these data in the early 1970s. U.S. Secretary of Labor Elaine L. Chao stated, "This data shows that our nation's workplaces continue to become safer and healthier each year."

"We must keep improving upon this positive trend in workplace injury and illness rates, through proper enforcement of health and safety standards, as well as OSHA's model compliance assistance program," said Secretary Chao. ❖



### Institute Hosts Holiday Gathering

Institute Co-Directors Phil Smith and Bill Marras, along with Institute faculty members David Woods and Nadine Sarter, were pleased to sponsor a holiday dinner at Figlio restaurant in Grandview on December 9<sup>th</sup>. About 60 faculty and staff members, graduate students, and business associates who collaborate with the Institute, attended, along with their significant others. ❖



**Candi McCain and husband Kenny**



**Erich Theado, fiancée Mia Litzinger, and Bill Marras**



**Amy Spencer and husband Erik Stump**



**Kermit Davis**



**John McGuirl**

**Phil Smith and Jill Marras**



## Details of Ergonomics Certification

The Institute has received many questions recently on the topic of ergonomics credentials. This article provides a summary of how those who practice ergonomics can become certified in this field.



**History.** Only in the past decade has there existed a credentialing organization that provided accreditation in ergonomics. The Board of Certification in Professional Ergonomics (BCPE) was established in 1990. It is a nonprofit corporation that examines and certifies those who work in the ergonomics and human factors field. BCPE certifies *practitioners* of ergonomics, rather than researchers or those studying ergonomics theory.

An *ergonomics practitioner* is one who has: (1) a mastery of ergonomics knowledge; (2) a command of the methods used by ergonomists when designing products, systems, jobs, and environments; and (3) applied their knowledge to analyze, design, test, and evaluate these products, systems and environments.

**Certification Levels and Requirements.** The highest certification possible is as a *Certified Professional Ergonomist/Certified Human Factors Professional* (CPE/CHFP). The criteria for certification as a CPE/CHFP are:

- A master’s degree in ergonomics/human factors, or an equivalent educational background in the life sciences, engineering sciences, and behavioral sciences, to comprise a professional level of ergonomic education;
- Four years of full-time professional practice as an ergonomics practitioner, emphasizing design involvement; and
- A passing score on the BCPE CPE/CHFP written examination.

The *Associate Ergonomics Professional/Associate Human Factors Professional* (AEP/AHFP) is awarded to individuals who have met the educational but not the work experience criteria for CPE/CHFP certification. One with an AEP/AHFP certificate is considered an “ergonomist in training” who has five years to complete four years of full-time practice and shift to becoming a CPE/CHFP. Criteria for certification as a AEP/AHFP are:

- Must meet the education requirement for CPE/CHFP certification;
- A passing score on Part I (“Basic Knowledge”) of the CPE/CHFP examination; and
- Currently working toward fulfilling the BCPE requirement of four years practical experience as a human factors and ergonomics professional.

Note: One who has graduated from a human factors/ergonomics degree program accredited by an IEA Federated Society (e.g., HFES) is not required to take Part I of the exam. (The AEP/AHFP designation will be granted upon review of the individual’s official transcript.)

The *Certified Ergonomics Associate* (CEA) designation is granted to individuals who use commonly accepted ergonomics analysis tools but do not solve more complex and unique ergonomics problems. The criteria for CEA certification are:

- A bachelor’s degree from an accredited university;
- At least 200 contact hours of ergonomics training;
- Two years of full-time practice in ergonomics; and
- A passing score on the CEA written examination.

**Contact Information.** To learn more about the BCPE, including application instructions, contact them at:

Board of Certification in Professional Ergonomics  
P.O. Box 2811  
Bellingham, WA 98227-2811 USA

Phone: 360-671-7601  
Fax: 360-671-7681  
E-mail: [BCPEHQ@bcpe.org](mailto:BCPEHQ@bcpe.org)  
Web Site: [www.bcpe.org](http://www.bcpe.org)



*“Landmark Study” Continued from page 1*

Dr. William Marras, Co-Director of the Institute, and his colleagues discovered that people tend to compensate for back injuries by using many inappropriate muscles in place of the muscles that hurt.

“People with back pain guard the injured area by using more muscles than they need to,” Marras said. “The more muscles they use, the greater the load there is on the spine.”

For instance, injured people may employ muscles in their abdomen or sides, or other, uninjured back muscles, even though these muscles are not necessary for lifting.

The study revealed that people with back injuries unknowingly inflict twice as much twisting force on their spine, and 1.5 times as much compressive force as uninjured people, when lifting the same object. Over time, greater loads on the spine lead to more serious back injuries, such as disc degeneration, which require surgery.

What’s more, lifting objects slowly, as injured people also tend to do, only intensifies the harm. “Moving slowly just increases the length of time the spine has to endure those extra forces,” Marras said.

Marras also directs OSU’s Biodynamics Laboratory, where he and his colleagues conducted this study to compare how people with and without back injuries use their muscles.

His colleagues included Dr. Sue Ferguson, a research scientist, Ben Lucas, a graduate student, and Dr. Kermit Davis, a former graduate student who is now an assistant professor of environmental health at the University of Cincinnati.

The Ohio Bureau of Workers Compensation funded this research to combat back injury—the number one reason Americans miss work, after the common cold. Across the country in 1999, more than 420,000 people missed work because of back injury. Each lost an average of 6 days on the job, according to the U.S. Bureau of Labor Statistics.

This study compared the lifting activity of 22 uninjured adults to that of 22 people who were suffering from lower back pain (LBP). The LBP participants were recruited from the practice of Dr. Purnendu Gupta, an orthopaedic surgeon formerly at Ohio State, and now at the University of Chicago.

No other studies have been able to make such a comparison, because injured people are often unwilling or unable to perform the physical exertions necessary for these tests, Marras said.

To solve this problem, the researchers created a mathematical technique to obtain needed information from the partial exertions an injured person can comfortably provide. The technique takes data from an injured person’s electromyogram (EMG), a measure of a muscle’s electrical activity, and calibrates it to provide a basis for comparison with an uninjured person’s EMG. The researchers were then able to calculate what the forces on the spine would be if an injured person

were able to exert the full power of their muscles.

For the same exertion, LBP participants used many more muscles in the back, creating much larger forces on the spine. Marras likened the forces on the spine to a seesaw: “When people apply all those extra muscles, it’s as if they’re pushing down on the short end of a seesaw, and trying to lift something on the far end,” Marras said. “They exert more force, and to little effect.”

On average, the LBP participants weighed more than their uninjured counterparts, and weight also increases force on the spine. That’s why losing weight can help people recover from back injury, Marras said.

Another route to recovery, physical therapy, may have to change to prevent recurring back injuries, he added. Typical therapy for back injury involves helping the patient regain strength. But just as important as strength is learning to use back muscles appropriately.

“After a back injury, people need to relearn how to use their muscles naturally. The timing of the muscles working together needs to return to normalcy,” Marras said.

The study suggests that this new rehabilitation strategy, combined with weight loss and a redesign of the workplace, could reduce the possibility of repeat back injuries.

The U.S. Occupational Health and Safety Administration maintains strict guidelines for preventing healthy people from becoming injured, but not for preventing injured people from becoming injured again. Marras said the guidelines for injured workers would have to be even more strict.

“There are some motions, such as bending to lift far away from the body, or lifting something off the floor, that a normal person can do once in a while without serious harm. Those are the kinds of motions an injured person should never do at all,” Marras said.

“Bottom line: you can send people back to work after a back injury, but you have to be very careful about what you have them do.”

Recurring back injuries debilitate workers, and create massive health care costs. In Ohio, for example, 16% of people with back injuries account for 80% of the total health care costs for this injury. That’s because the recurring injuries suffered by this 16% cost so much more to treat than first-time injuries. For a first-time back injury, the cost of drugs, doctor’s visits, and physical therapy can add up to as much as \$10,000. But for more severe cases—the kind that result when a person is hurt over and over again—the costs can climb as high as \$300,000, Marras said.

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The Newsletter of the  
Institute for Ergonomics



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