from Research to Reality

Workplace Safety

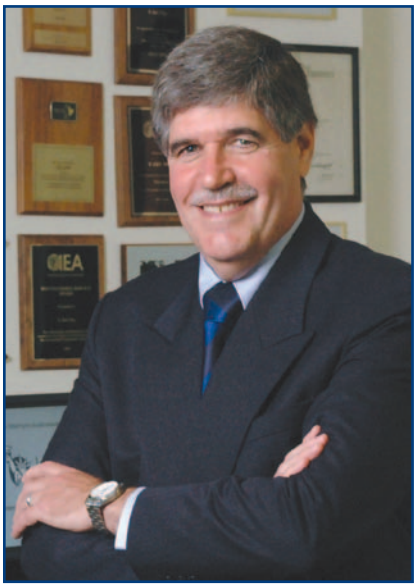
New Research Directions

LIBERTY MUTUAL RESEARCH INSTITUTE FOR SAFETY

SCIENTIFIC UPDATE

Liberty Mutual

Letter from the Director



Dear Readers

The great physicist Albert Einstein once stated that real advances in science depend upon the ability "to raise new questions, new possibilities, to regard old problems from a new angle." In line with this philosophy, the Research Institute strives to continuously devise new ways to examine the age-old problems of occupational injury and disability. This issue of Scientific Update is devoted to sharing some of the Institute's exciting new research directions which promote our core mission: to advance scientific knowledge in workplace and highway safety and work disability.

Over the past year, we have begun to build investigative capacity in the areas of occupational demography, sociotechnical systems analysis, pain self-management, and the study of work-related shoulder injuries (see pp. 4–6). We believe that gaining a better understanding in each of these areas of research has the potential to significantly improve workplace safety in the U.S. and worldwide. By expanding the scope of our scientific inquiry and research interests, we hope to discover important and novel approaches to help people live safer, more secure lives.

Also included in this issue are the 2011 Liberty Mutual Workplace Safety Index (see pp. 7–8) as well as a compilation of recent Institute news, publications, and upcoming conference presentations (see pp. 9–11).

We hope that you enjoy reading about our endeavors. As always, we welcome your questions and feedback.

Ian Noy, Ph.D.
Vice President and Director

INSIDE *this Edition:*

Volume 14 | Number 3

The Science of Safety

New Horizons in Occupational Injury Research

On March 25, 1911, the tragic Triangle Shirtwaist Factory fire in New York City claimed the lives of 146 workers. In the wake of this disaster, U.S. state governments and employee groups mobilized to address unsafe work conditions that had become widespread since the beginning of the Industrial Revolution. These early efforts spurred the creation of safety legislation, standards, and professional organizations dedicated to improving worker safety. They also provided an impetus for safety research aimed at reducing work-related injuries and illnesses.

The ensuing years of research led to the development of a Risk Management Model used to help protect workers from existing hazards. The model provides a framework for identifying hazards, determining causes and mechanisms of injury, and developing and evaluating interventions. "The approach offered by the Risk Management Model is essentially reactive – meaning hazards are dealt with in direct response to injury," explains Liberty Mutual Research Institute Director Ian Noy, Ph.D. In recent years, however, as safety experts have incorporated new knowledge, the model has expanded to include a preventive dimension that integrates safety into an organization's overall human resource and risk management strategy.

As risk management strategies have improved, workplace fatalities and injuries have declined. For example, between 1994 and 2003, occupational fatalities declined by nearly 30 percent in industrialized countries (Eurostat, 2005). Similarly, serious work-related injuries in the U.S. dropped by 33 percent over the same period (BLS, Table R70, 1994, 2003). "Despite declining fatality and injury frequencies, the magnitude of the occupational injury problem remains unacceptably high," cautions Dr. Noy, citing BLS estimates of one million severe occupational injuries and nearly 5,000 work-related deaths annually in the U.S. "Furthermore, our own Workplace Safety Index (see p. 7) indicates that workplace injuries represent a huge burden for businesses at over $50 billion in annual direct costs," he adds. "Although traditional research approaches have helped address many existing problems, clearly, we must not rest on our laurels."

Dr. Noy believes the key to further progress lies in looking beyond traditional research approaches to study occupational safety issues in bold and innovative ways. "We need to address fundamental challenges associated with new technologies, emerging industries, and the ever-changing workforce. We can achieve this by adapting principles of resilience engineering, safety management systems, and human-systems integration to address latent or emerging risks as opposed to reacting to injuries after-the-fact," he continues. "From a research perspective, this means developing theories and principles in areas that have not been adequately explored within the occupational safety domain, such as team dynamics, organizational attributes, situational variables, multi-task factors, and workforce diversity."

Accordingly, the Liberty Mutual Research Institute for Safety is expanding its research scope to explore new directions of inquiry and building capacity in areas such as occupational demographics, human systems integration, and safety climate research (see pp. 3–5). "By augmenting our traditional areas of research with several new streams, we hope to take occupational injury research to the next level," says Dr. Noy. "Only through such innovation can we address the safety challenges that have emerged since the Triangle Shirtwaist Factory fire first brought workplace safety into the public health arena 100 years ago, as well as those that will arise in the years to come."

Institute Forges New Investigative Paths

Advancing Safety Research

Throughout its 57-year history, the Liberty Mutual Research Institute for Safety has been recognized for its work in advancing the science of workplace and highway safety and disability. In order to further enhance its scientific contributions and impact, the Institute is pursuing several new research directions in areas of emerging interest. These new investigative paths will add value to existing research, promote a higher degree of cross-disciplinary exchange among the four Centers, and better position the Institute to meet the needs of an ever-changing, increasingly complex injury risk environment. Below is an overview of several of the new research areas in which the Institute has begun to establish itself and lay the groundwork for future research.

The Changing Nature of the Workplace

Center for Injury Epidemiology

The Institute's Center for Injury Epidemiology (CIE) is forging new paths to examine the changing nature of the workforce and the impact of change on workplace safety.

"Work and work-related injuries occur within a broad context of societal, technological, economic, and other factors that are constantly fluctuating," says CIE Director Theodore Courtney, M.S., C.S.P. Mr. Courtney cites increasing numbers of older workers, foreign-born workers, telecommuters, and workers holding multiple jobs as examples of recent trends within the U.S. workforce. "At the same time, changes in technology and global and national economies have also impacted the work environment," he continues. "These changes in the milieu of surrounding societal and other demographic and economic factors can have potentially adverse consequences for work and the work environment. Despite this, few have investigated the consequences of such changes on occupational safety."

In order to address this research gap, the CIE is developing capacity for demographic research on work and the workforce while paying particular attention to trends over time. "We are trying to look at how the workplace is changing – to better capture that change as it is occurring – and to begin to think about the implications of such change on workplace safety," explains Mr. Courtney. This approach involves analyses of trends in the working population, the nature and setting of work, the diversification of the work model, and the influence of technology. "By integrating the different components of workplace change, we can gain important insights and better inform our occupational safety research strategy," notes Mr. Courtney. "In the long run, this new capability will contribute to understanding and even

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anticipating the manner in which change influences the risk of injury."

Sociotechnical Systems Analysis
Center for Behavioral Sciences

The Center for Behavioral Sciences (CBS) is exploring an emerging approach to the scientific study of workplace safety and injury prevention known as Sociotechnical Systems Analysis. "Simply put, this approach focuses on examining the ways in which organizational and technical systems interact to provide an environment that either promotes or inhibits worker safety," explains CBS Director Marvin Dainoff, Ph.D.

Sociotechnical Systems Analysis examines human performance against a backdrop of other system elements such as technology (hardware and software), policies and procedures, social culture, and environment. To illustrate, Dr. Dainoff refers to a real-world situation in which an oil refinery introduced a computer-based maintenance request system that workers viewed as onerous. As a result, refinery workers submitted far fewer maintenance requests. The problem eventually contributed to a serious accident resulting in worker fatalities. In this case, a technical 'solution' was introduced into a social system in which many workers disliked computers, did not use them at work or home, and did not receive sufficient training in their use. "These are the types of situations that Sociotechnical Systems Analysis can shed light on. By de-emphasizing human error as a primary focus of safety-related inquiry, it instead shifts our attention to the systemic social and technical factors that enable human error to occur in the first place," notes Dr. Dainoff.

Besides being an exciting new area of research in its own right, Sociotechnical Systems Analysis is also providing new perspectives on the Institute's existing research areas. For example, CBS researchers are applying sociotechnical analyses in a large-scale study of safety climate involving eight trucking and two utility companies (see *Scientific Update*, Vol. 14, No. 2). "While the vast majority of safety climate research has focused on social-psychological factors, we are taking a broader view of organizational determinants and examining the ways in which factors such as leadership, communication, and team structure interact with technology to influence the safety of work practices," asserts Dr. Dainoff.

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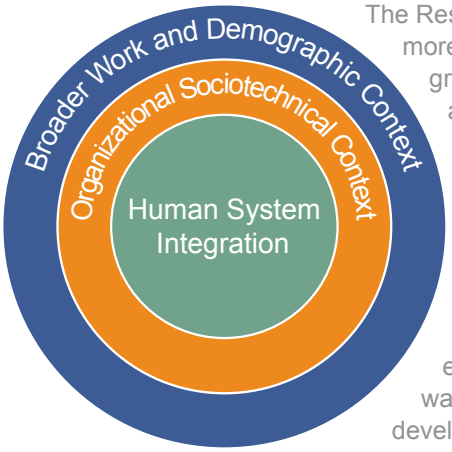
New Research Institute Initiatives



The Research Institute's expansion into more contextual research (e.g. demographics and sociotechnical systems analysis) is illustrated in the diagram at left. Here, human-systems integration refers to the process of addressing human-related concerns throughout the system life-cycle. Researchers focus on defining human needs, capabilities, and limitations in relation to other system elements (such as hardware, software, environment, training, etc.) and developing strategies for resolving trade-offs. These analyses must occur within an organizational sociotechnical context and are subject to influences of the broader work and occupational demographic context.

> Our goal is to develop ... a workplace-based pain self-management program that workers find effective in reducing problems they encounter on the job...

"Sociotechnical Systems Analysis holds great promise for improving workplace safety," concludes Dr. Dainoff. "Ultimately, we intend to carry out a set of research projects within a Sociotechnical Systems Analysis framework that will build upon and complement our existing research programs."

Worker Pain Self-Management
Center for Disability Research

The Center for Disability Research (CDR) is taking strides to better understand how workers can manage the impact of chronic musculoskeletal conditions on work, and thus have less discomfort, greater productivity, and lower risk for injury and disability on the job.

More than a third of all U.S. workers have a chronic health condition that can impact their ability to work and may contribute to increased risk for work disability and prolonged work absence. In some cases, workers self-manage their pain and continue to work successfully, despite their chronic conditions. "Right now, the research on effective pain self-management strategies is at an early stage; we don't really know what works best and for whom. But we can learn a lot from those who have chronic pain and are able to successfully stay at work and maintain their productivity without adversely affecting their health," explains CDR Director Glenn Pransky, M.D.

This new research stream builds upon the findings of a recent CDR study in which 38 workers with persistent or recurring low back pain participated in focus groups and shared information on common problems and pain coping strategies. Respondents indicated a variety of strategies that they used to stay productive and safe on the job, while minimizing the impact of their pain. "Based on the study findings, we know that the key elements of an intervention should include ways to reduce pain and discomfort, making informed decisions about activities and care, communicating effectively in the workplace, and dealing with feelings and concerns about symptoms and work ability," says Dr. Pransky.

The CDR is currently using these findings to develop a five-week intervention program to help workers suffering from low back pain. "Our goal is to develop and refine a workplace-based pain self-management program that workers find effective in reducing problems they encounter on the job, and that supports their desire to continue active employment," notes Dr. Pransky. Researchers are also exploring the potential role of an employer-focused intervention that would complement the worker-centered program.

Work-Related Shoulder Injuries
Center for Physical Ergonomics

The Bureau of Labor Statistics recorded more than 87,000 occupational injury and illness cases involving the shoulder in 2010 (BLS, 2011). Such statistics highlight a need for research into the underlying causes of work-related shoulder problems. The Center for Physical Ergonomics (CPE), with its staff of highly qualified scientists and a recently updated biomechanics laboratory, is well-positioned for experimental studies in this area.

"Painful and often disabling shoulder conditions are common in the population, and we know from the scientific literature that occupational physical loading increases the risk of clinical shoulder disorders," states CPE Director Nils Fallentin, PhD. "Despite this knowledge and the magnitude of the problem, the existing information on workplace risk factors is limited and our ability to accurately predict critical shoulder loads during different work tasks is poor."

The overall aim of the CPE shoulder research program is to improve understanding of tissue tolerance to occupational shoulder loads and to contribute to the establishment of evidence-based threshold limit values for exposure. To achieve these goals, the CPE has established a network of connections with other leading research institutions who share a common interest in the prevention of prolonged, painful, and disabling work-related shoulder injuries. "Using our combined knowledge and data, we hope to develop tools that can be used by practitioners to identify and correct critical shoulder loads in the workplace," concludes Dr. Fallentin.

Research to Reality

2011 Workplace Safety Index

10 Leading Causes of Disabling Workplace Injuries

According to the 2011 Liberty Mutual Workplace Safety Index, the most disabling workplace injuries and illnesses in 2009 amounted to $50.1 billion in direct U.S. workers compensation costs. After adjusting for inflation, this year's costs decreased 6.5 percent from 2008.

The annual Workplace Safety Index identifies the top causes of serious non-fatal workplace injuries based on information from Liberty Mutual workers compensation insurance claims, the U.S. Bureau of Labor Statistics (BLS), and the National Academy of Social Insurance. Using injury-event definitions developed by the BLS, researchers collect data about injuries that cause the employee to miss six or more days from work, and rank those injuries by total workers compensation costs. The latest Workplace Safety Index provides statistics for injuries that occurred in 2009, the most recent year for which data are available.

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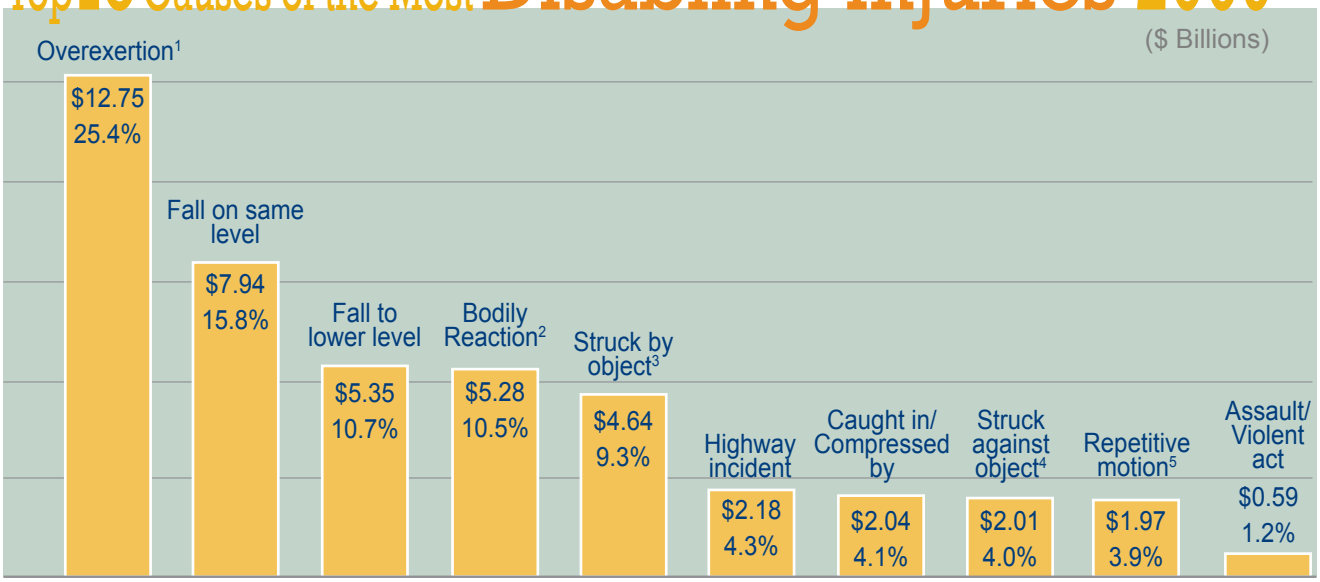
Top 10 Causes of the Most Disabling Injuries 2009



[1]Overexertion – Injuries from excessive lifting, pushing, pulling, holding, carrying, throwing
[2]Bodily reaction – Injuries from bending, climbing, reaching, standing, sitting, slipping or tripping without falling
[3]Struck by object – Such as a tool falling on a worker from above
[4]Struck against object – Such as a worker walking into a door
[5]Repetitive motion – Injuries due to repeated stress or strain

> Overall, the top 10 cause categories comprised 89.3 percent of the entire cost burden of disabling work-related injuries in 2009.

Top Five Injury Causes – 2009

The top five injury causes – *overexertion*, *fall on same level*, *fall to lower level*, *bodily reaction*, and *struck by object* – accounted for 71.7 percent of the total 2009 cost burden. *Overexertion* maintained its first-place rank. This event category, which includes injuries related to lifting, pushing, pulling, holding, carrying, or throwing, cost businesses $12.75 billion in direct costs and accounted for more than a quarter of the overall national burden. *Fall on same level* ranked second as a leading cause of disabling injury. With direct costs of $7.94 billion, this category accounted for 15.8 percent of the total injury burden. *Fall to lower level* ranked third at $5.35 billion in costs. *Bodily reaction*, which includes injuries resulting from free bodily motion such as bending, climbing, reaching, standing, sitting, and slipping or tripping without falling, ranked fourth at $5.28 billion. *Struck by object* took the fifth-place ranking at $4.64 billion.

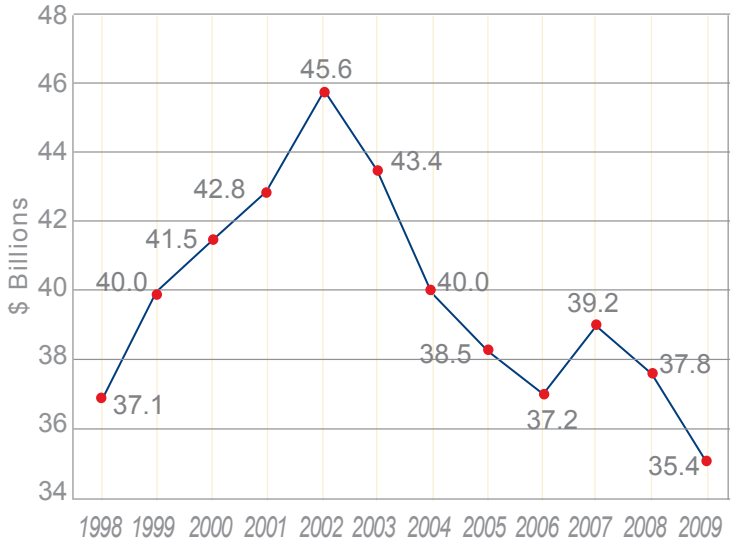
Remaining Injury Causes – 2009

The remaining five injury causes in the top 10 each accounted for less than 5.0 percent of the direct cost of disabling injuries in 2009. *Highway incident* represented 4.3 percent of the total injury burden at $2.18 billion; *caught in/compressed by* (injuries resulting from workers being caught in or compressed by equipment or objects) accounted for 4.1 percent of the total injury burden at $2.04 billion; *struck against object* accounted for 4.0 percent at $2.01 billion; *repetitive motion*, with related injuries, accounted for 3.9 percent of the cost burden at $1.97 billion; and *assault/violent act* accounted for 1.2 percent at $0.59 billion.

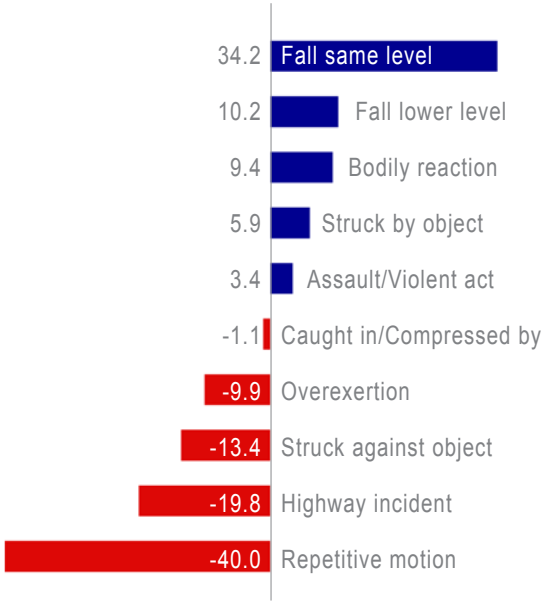
Overall, the top 10 cause categories comprised 89.3 percent of the entire cost burden of disabling work-related injuries in 2009.

Real Growth Trends 1998 to 2009

The overall real (inflation-adjusted) direct costs of disabling workplace injuries decreased 4.6 percent between 1998 and 2009. However, *fall on same level*, *fall to lower level*, *bodily reaction*, *struck by object*, and *assault/violent act*, increased by 34.2, 10.2, 9.4, 5.9, and 3.4 percent, respectively (see below). During this same period, the real cost of disabling *caught in/compressed by* injuries decreased 1.1 percent; *overexertion* injuries decreased 9.9 percent; and *struck against object*, *highway incident*, and *repetitive motion* also showed cost declines, dropping 13.4, 19.8, and 40.0 percent, respectively.



Real (Inflation-Adjusted) Cost of the Most Disabling Injuries 1998–2009



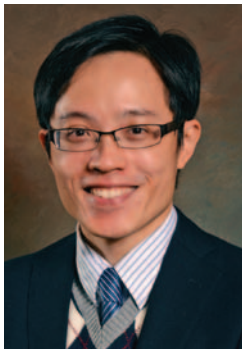
Real Growth Trends 1998–2009

(Percent change by category)

In the NEWS

Demographer Joins Institute Staff

The Research Institute recently welcomed Tin-Chi Lin, Ph.D., as a research scientist with the Center for Injury Epidemiology staff. In this position, he will lead and contribute to studies that seek to increase understanding of the causes and distribution of workplace injuries. Specifically, Dr. Lin's research focuses on the changing nature of work and workforce demographics that impact occupational injury and workplace safety.



Dr. Lin

"I am excited to join the Research Institute," says Dr. Lin. "The Institute has been a leading contributor to injury research internationally. I look forward to collaborating with my Institute colleagues and conducting investigations that seek to better understand the context of work and the work environment and improve the safety and health of workers."

Trained as a demographer, Dr. Lin brings a strong background in quantitative methods to the Institute. He holds a Ph.D. degree in Population and Public Policy from the Woodrow Wilson School of Public and International Affairs, Princeton University (Princeton, NJ), an M.S. in applied mathematics from the University of Illinois (Urbana, IL), and a B.A. in economics and B.S. in mathematics from the National Taiwan University (Taipei, Taiwan). He is a member of the Population Association of America and the American Public Health Association.

"We are delighted to have Tin-Chi join our Center and the Institute," says Theodore Courtney, M.S., C.S.P., director of the Center for Injury Epidemiology. "He brings an additional dimension to our current and future research in injury assessment, prevention, and control as well as the entirely new dimension of work demography to our program. With his strong mathematics, economics, and demography credentials and perspectives, we look forward to his scientific contributions."

IEA/Liberty Mutual Medal Awarded

An Ireland-based research team that conducted a study on improving aircraft maintenance won the 2011 IEA/Liberty Mutual Medal in Occupational Safety and Ergonomics. Selected by the International Ergonomics Association (IEA), the winning research paper presented a case study for identifying aircraft maintenance hazards and its implications for improving safety and preventing accidents. The researchers will receive the award at the 18th World Congress on Ergonomics held in Recife, Brazil from February 12–16, 2012.

The winning researchers include Marie Ward, Ph.D., Nick McDonald, Ph.D., and Rabea Morrison, Dipl. Psych., of the Aerospace Psychology Research Group (APRG), School of Psychology, Trinity College (Dublin), along with Des Gaynor, M.A., and Tony Nugent of Trinity aeroTec (Dublin). The winning paper, "A Performance Improvement Case Study in Aircraft Maintenance and Its Implications for Hazard Identification," was published in the journal *Ergonomics* (Vol. 53, No. 2, pp. 247–267, 2010).

The study's objective was to develop an improvement system within one hangar of a large aircraft base maintenance company. The challenge was to improve efficiency (process and cost) and customer satisfaction, while at the same time ensuring quality and safety and the ability to replicate this in the organization's other hangars. The study was part of an international research initiative, Human Integration into the Lifecycle of Aviation Systems (HILAS 2005–2009), which was funded by the European Commission and involved 40 partners from across the aviation industry and academia.

"Organizations find it extremely difficult to change their operations to better support people performing their work," says Dr. Ward. "To know what to change, we need to understand not only what is meant to happen, but what normally happens, and then we

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need to be able to implement the change." Researchers used a model developed by APRG called the Operational Process Model (OPM) to better understand base maintenance and identify ways to improve the system. "The model was important for three reasons," Dr. Ward explains. "First, it led to a shared understanding of the maintenance check and to suggestions to coordinate better check management. It was also helpful in resolving individual blockers to understand their context in the larger check system. Lastly, it ensured that suggestions for resolving blockers did not negatively impact another area."

The study findings showed that a comprehensive and realistic model of organizational systems may provide an active organizational memory of the normal operating system which can help identify and prevent aviation industry hazards. "This study was a key step in proving the effectiveness of the methods and tools we have developed for aviation and other industries to use," says Dr. Ward. "It's brilliant to receive this award and the recognition for our work. We are grateful to Liberty Mutual, the editors of *Ergonomics* for nominating our paper, and to the international panel of ergonomists who deemed the work worthy of this prestigious award."

The Research Institute and the IEA present the annual Medal in Occupational Safety and Ergonomics to recognize outstanding original research leading to the reduction of work-related injuries and/or to the advancement of theory, understanding, and development of occupational safety research. The Medal is awarded to the authors of an original scientific paper that meets criteria for innovation and impact. For more information about the Medal and past winners, visit www.libertymutual.com/researchinstitute.

Harvard Post-Doctoral Fellow to Contribute to Safety Climate Research

Lauren Ann Murphy, Ph.D., recently began working at the Research Institute under the joint Liberty Mutual Research Institute-Harvard School of Public Health post-doctoral fellowship program. The program helps new doctoral graduates develop their careers by providing fellowships in occupational injury and disability research.

Dr. Murphy is collaborating with the Institute's Center for Behavioral Sciences on a large-scale safety climate field investigation. The study examines how co-workers' shared perceptions of their company's safety priorities influence their individual behaviors and outcomes. The investigation focuses on lone mobile workers, specifically truck drivers and utility workers, who typically work independently and drive alone for long durations. During her tenure, Dr. Murphy will collaborate with Institute scientists to complete the investigation and develop a manuscript for publication. She will also work with researchers on new and ongoing investigations.

Dr. Murphy previously visited the Research Institute in 2008 as a safety research fellow under the Institute's joint safety fellowship program with the American Society of Safety Engineers Foundation (ASSEF). During that time, she collaborated on a literature review and conceptualization of social modelling on safety behavior. The results of her work were accepted for publication in *Theoretical Issues in Ergonomics Science*. Following her term as an ASSEF safety fellow, Dr. Murphy returned to the Institute during her doctoral program to work as a contract research assistant from February 2010 to January 2011.

"The Research Institute fosters a collaborative and interdisciplinary environment that will allow me to expand my skills as a researcher," says Dr. Murphy. "Having worked here in the past, I am thrilled to be able to re-join colleagues and friends and to learn more from an exceptional group of researchers."

Dr. Murphy

A graduate of Portland State University (Portland, OR), Dr. Murphy received her Ph.D. and M.S. degrees in Industrial/Organizational Psychology there. She is also a summa cum laude honors graduate from the University of Massachusetts (Amherst, MA), where she received a B.S. in Psychology. She has published papers in scientific journals and presented research at professional meetings. Currently, she serves as an ad hoc reviewer for *Accident Analysis and Prevention*, and she previously served as a reviewer for the journal *Theoretical Issues in Ergonomics Science*. She is a member of the Society for Industrial/Organizational Psychology, the Society for Occupational Health Psychology, and the Human Factors and Ergonomics Society.

For more information on the Liberty Mutual Research Institute's post-doctoral fellowship programs, please visit our website at www.libertymutual.com/researchinstitute.

Conferences

18th World Congress on Ergonomics: Feb. 12–16, Recife, Brazil

• Assessing Manual Lifting Tasks Based on Segment Angle Interpolations – C.C. Chang, Ph.D., C.P.E.

• Specificity of Back Muscle Response to Submaximal Fatiguing Contractions – N. Fallentin, Ph.D., M.Sc.

• The Stochastic Distribution of Available Coefficient of Friction on Quarry Tiles for Human Locomotion – W.R. Chang, Ph.D.

• Examining the Macroergonomics and Safety Factors Among Teleworkers: Development of a Conceptual Model • New Ways of Office Work: An Overview Between the Netherlands and the USA • A Safety Climate Scale for the Trucking Industry: Development and Validation • A Work Systems Approach: Examination of Computer Task Exposures in Radiologists – M.M. Robertson, Ph.D., C.P.E.

58th Conference of the Gesellschaft für Arbeitswissenschaft: Feb. 22–24, Kassel, Germany

• The Effect of Rest Breaks on Time to Injury – A. Wirtz, Dr. phil.

Ergonomics and Human Factors: April 16–19, Blackpool, UK

• Technology and Safety Culture – L.J. Hettinger, Ph.D.

• Development and Validation of a Safety Climate Scale for the Trucking Industry – Y.H. Huang, Ph.D.

Publications

Anderson-Snyder, L., Chen, P., Finlinson, S., Krauss, A.D., and Huang, Y.H., "Safety Performance: The Mediating Role of Safety Control," *WORK: A Journal of Prevention, Assessment and Rehabilitation*, Vol. 40, No.1, pp. 99–111, 2011

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Marucci-Wellman, H., Lehto, M., and Corns, H., "A Combined Fuzzy and Naïve Bayesian Strategy Can Be Used to Assign Event Codes to Injury Narratives," *Injury Prevention*, Vol. 17, No. 6, pp. 407–414, 2011

Pransky, G., Loisel, P., and Anema, J.R., "Work Disability Prevention Research: Current and Future Prospects," *Journal of Occupational Rehabilitation*, Vol. 21, No. 3, pp. 287–292, 2011

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Wilkie, R., Cifuentes, M., and Pransky, G., "Exploring Extensions to Working Life: Job Lock and Predictors of Decreasing Work Function in Older Workers," *Disability and Rehabilitation*, Vol. 33, pp. 1719–1727, 2011

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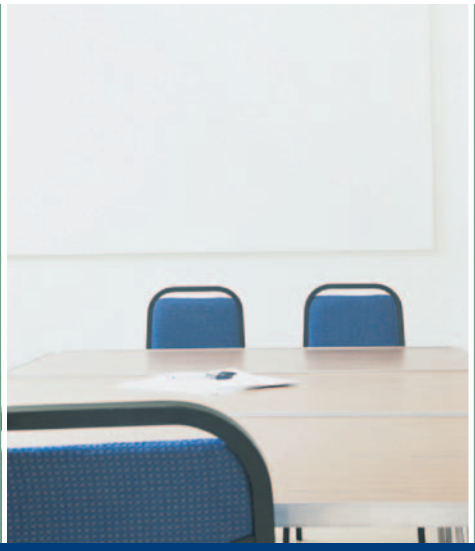

Visiting Scholar Program Seeks Applicants

The Liberty Mutual Research Institute for Safety is accepting applications for its 2012 Visiting Scholar Program. The program offers a unique collaborative opportunity for a selected senior research scientist to spend three or more months at the Research Institute collaborating on a research initiative of mutual interest. In accordance with our mission to advance scientific research, the program requires joint publication in a peer-reviewed journal and encourages a longer collaborative relationship between the Institute and the scholar's home institution.

For information on the 2012 Visiting Scholar Program and directions on how to apply, e-mail researchinstitute@libertymutual.com or visit www.libertymutual.com/researchinstitute, click on "Collaborative Programs," and download a brochure.

Applications will be accepted until the position is filled.

Liberty Mutual

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from Research to Reality

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