

Institute Insider



Volume 13, Number 3

Autumn 2010

The Newsletter of the Institute for Ergonomics at The Ohio State University
At the forefront of Human Factors since 1950

Dr. Charles Billings 1929 - 2010

The Institute for Ergonomics lost a highly respected member and friend when Dr. Charles "Charlie" Billings passed away on August 30th, 2010.

During his 60-year career, Dr. Billings worked as a physician, flight surgeon, and teacher. For the past 17 years, he also was an Emeritus Professor at Ohio State, where he worked on cognitive systems engineering and human factors research.

Dr. Billings earned international recognition for his expertise in aviation medicine and human factors. His research has been highlighted in scores of professional publications, books, and lectures. He earned many honors, including president of the Aerospace Medical Association,



Fellow of the Royal Aeronautical Society, and two-time NASA Leadership Award designee. He served as a consultant on the United Aircraft Corporation Apollo Project and lectured at prestigious institutions around the world.

Born in Boston, Dr. Billings studied at the Eastman School of Music, Wesleyan University; Ohio

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Marras and Allread Receive OSHA Training Grant

In September 2010, Institute members **William Marras** and **Gary Allread** received a one-year, \$200,000 Susan Harwood Targeted Topic Training Grant from the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA).

Hotel housekeepers perform a wide variety of tasks that expose them to numerous injury risk factors. This grant will allow Dr. Marras and Dr. Allread to sensitize

both the housekeepers and their managers to musculoskeletal disorder risks in their workplaces and teach them how to use ergonomics principles to make housekeeping tasks safer and easier to perform.

This training will be provided to more than 1,000 housekeeping employees throughout OSHA Region V and will target young workers, minorities, and

(continued on page 3)

New Books by Institute Members

Behind Human Error

Second Edition

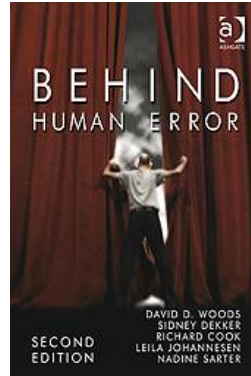
David D. Woods, Sidney Dekker (Lund University), Richard Cook (, University of Chicago), Leila Johannesen (IBM, Silicon Valley Lab), and Nadine Sarter (University of Michigan)

Book Summary

Human error is cited over and over as a cause of incidents and accidents. The result is a widespread perception of a "human error problem", and solutions are thought to lie in changing the people or their role in the system. For example, we should reduce the human role with more automation, or regiment human behavior by stricter monitoring, rules or procedures. But in practice, things have proved not to be this simple. The label "human error" is prejudicial and hides much more than it reveals about how a system functions or malfunctions.

This book takes you behind the human error label. Divided into five parts, it begins by summarizing the most significant research results. Part 2 explores how systems thinking has radically changed our understanding of how accidents occur. Part 3 explains the role of cognitive system factors - bringing knowledge to bear, changing mindset as situations and priorities change, and managing goal conflicts - in operating safely at the sharp end of systems. Part 4 studies how the clumsy use of computer technology can increase the potential for erroneous actions and assessments in many different fields of practice. And Part 5 tells how the hindsight bias always enters into attributions of error, so that what we label human error actually is the result of a social and psychological judgment process by stakeholders in the system in question to focus on only a facet of a set of interacting contributors.

If you think you have a human error problem, recognize that the label itself is no explanation and no guide to countermeasures. The potential for constructive change, for progress on safety, lies behind the human error label.



Ashgate (www.ashgate.com).
ISBN: 978-0-7546-7834-2
Price: \$95 U.S.

Macro cognition Metrics and Scenarios: Design and Evaluation for Real-World Teams

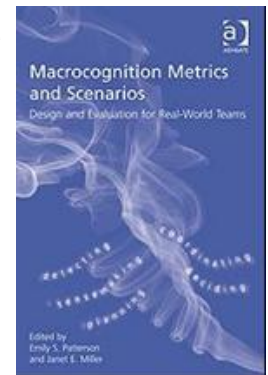
Edited by **Emily S. Patterson** and Janet E. Miller (Air Force Research Laboratory)

Book Summary

Macro cognition Metrics and Scenarios: Design and Evaluation for Real-World Teams translates advances by scientific leaders in the relatively new area of macro cognition into a format that will support immediate use by members of the software testing and evaluation community for large-scale systems as well as trainers of real-world teams.

Macro cognition is defined as how activity in real-world teams is adapted to the complex demands of a setting with high consequences for failure. The primary distinction between macro cognition and prior research is that the primary unit for measurement is a real-world team coordinating their activity, rather than individuals processing information, the predominant model for cognition for decades.

This book provides an overview of the theoretical foundations of macro cognition, describes a set of exciting new macrocognitive metrics, and provides guidance on using the metrics in the context of different approaches to evaluation and measurement of real-world teams.



Ashgate (www.ashgate.com).
ISBN: 978-0-7546-7578-5
Price: \$90 U.S.



A list of useful HF/E books and journals, compiled from a recent survey of HFES technical groups, can be found at www.hfes.org/Web/EducationalResources/publishedmaterials.html.

IN THE NEWS



Tae Hoon Kim, **Richard Jagacinski**, and **Steve Lavender** presented, "Age-Related Differences in the Coordinative Structure of the Golf Swing," at the 2010 Cognitive Aging Conference in Atlanta, GA (April 17th, April 2010).



Jagacinski

Based on Tae Hoon's recently completed dissertation, this lectured discussed the comparisons of 40- and 80-yard iron shots by 20- and 60-year-old golfers.



Lavender

The older golfers exhibited approximately equal overall speed of their swings as the younger golfers. However, the older golfers exhibited different rhythmic coordination between the upper and lower body force patterns. This indicates compensation for age-related physiological slowing and increased timing variability.

For more information on this research, contact Tae Hoon Kim (kim.1564@osu.edu).

Carolyn Sommerich was given the Chaffin Award for the Best Roundtable Presentation in Ergonomics, at the 2010 American Industrial Hygiene Conference and Exposition (Denver CO, May 22nd-27th).



On October 6th, **William Darling**, Director of Assistive Technology of Ohio (www.atohio.org), discussed his organization at the 42nd annual Professionals, Advocates, Resources (PAR) Convention in Dublin, OH. AAT Ohio has been partnering with the Fairfield County (Ohio) Board of Developmental Disabilities to find creative ways to infuse assistive technology into the services provided by the county board. The goal of the partnership is to improve service delivery and increase developmental functioning for daily participants.



The Chaffin Award is named for Dr. Don B. Chaffin. He is Professor Emeritus of Industrial & Operations Engineering and Biomedical Engineering at the University of Michigan

Training Grant *(continued from page 1)*

those having limited English language skills.

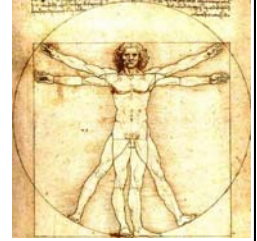
Out of nearly 170 grant applications received, Marras and Allread's award was one of 16 granted to nonprofit and community/faith-based groups, employer associations, labor unions, joint labor/management associations, and colleges and universities from around the U.S.

The Susan Harwood Targeted Topic Training Grant Program was named in

honor of the late Susan Harwood, a former director of the Office of Risk Assessment in OSHA's health.

This grant program is an important part of OSHA's efforts to provide employees in high-risk industries with training about job hazards and their rights. It also provides employers with crucial information about unsafe working conditions, mitigation strategies, and their responsibilities under the Occupational Safety and Health Act of 1970.

The latest *Professional Society News*



Upcoming Conferences

AIHce 2011
Portland, OR
May 14th - 19th, 2011

**33rd Annual
Conference of the
Cognitive Science
Society**
Boston, MA
July 20th - 23rd, 2011

HFES Annual Meeting
Las Vegas, NV
Sept 19th - 23rd, 2011

Ergonomics Design Award Call for Nominations

The Institute of Ergonomics & Human Factors (formerly the Ergonomics Society) is seeking nominations for its Ergonomics Design Award.

The award is open to any individual or team of designers and/or ergonomists who can demonstrate the application of ergonomics to the highest standard in a project, product, or design. Award categories include a product that has been designed using ergonomics principles, an industrial or



commercial application of ergonomics, an application of ergonomics in the built environment, and an inclusive design project.

The closing date for nominations is November 30, 2010. For more info, visit www.ergonomics.org.uk/awards/ergonomics-design-award.



2011 Applied Ergonomics Conference

Registration is now open for next year's Applied Ergonomics Conference. The 2011 conference will be held March 21st - 24th at the Hilton Orlando.

This conference is attended by ergonomics practitioners from around the world, to share best practices with others in ergonomics, healthcare, safety, human resources, & risk management.

Keynote speakers include Dr. John Howard, Director of the National Institute for Occupational Safety & Health, and Kathy Kilmer, Director of Industrial Engineering for Walt Disney Parks & Resorts.

Discounts apply for students and those who register by January 14th 2011. Visit www.iienet.org/Ergo/Conference/Default.aspx to learn more.



Ten Reasons to Attend the Applied Ergonomics Conference

1. More than 60 educational sessions presented by industry leaders; these qualify for Continuing Education Units, Professional Development Hours, and various other certifications
2. Master tracks on specific ergo topics
3. Keynote presentations on the future direction of ergonomics
4. Pre-conference workshops
5. Roundtable sessions
6. The popular ErgoCup® competition
7. A bustling Exhibit Hall
8. Numerous facility tours
9. Networking opportunities to make new contacts and exchange ideas
10. Official exam site for the Board of Certification in Professional Ergonomics



PUBLISH or PERISH

Force and Tactile Feedback in Preloaded Cantilever Snap-fits under Manual Assembly

L. Rusli, A. Luscher, and **Carolyn M. Sommerich**

2010, *International Journal of Industrial Ergonomics*, 40(6):618-628

Neurologically Intact Survival in a Porcine Model of Cardiac Arrest: Manual Cardiopulmonary Resuscitation vs. LifeBelt® Cardiopulmonary Resuscitation

ST Youngquist, JT Niemann, **W Gary Allread**, T Heyming and JP Rosborough

2010, *Prehospital Emergency Care*, 14(3):324-328

Quantitative Biomechanical Workplace Exposure Measures: Distribution Centers

William S. Marras, Steven A. Lavender, Sue A. Ferguson, Riley E. Splittstoesser, and Gang Yang

2010, *Journal of Electromyography and Kinesiology*, 20(5):813-822

The Economic Impact of Integrating Ergonomics Within an Automotive Production Facility

W. Gary Allread and **William S. Marras**

September, 2010, in Rouse, W.B. (ed.), *The Economics of Human Systems Integration: Valuation of Investments in People's Training and Education, Safety and Health, and Work Productivity*

Hoboken, NJ: John Wiley & Sons, Inc

John Wiley & Sons (www.wiley.com).
ISBN: 978-0-470-48676-4
Price: \$110.00 U.S.



These are the latest publications authored by Institute members (indicated in boldface font)

Institute Member Activities at 2010 HFES Conference

Lectures

Design and Development of a Torque Tool Testing Rig That Simulates Human Operator-Tool-Task Interactions

Haluk Ay and Anthony Luscher (Ohio State), and **Carolyn Sommerich**

Developing Ergonomic Interventions to Reduce Musculoskeletal Disorders in Grocery Distribution Centers

Steven A. Lavender, **Carolyn M. Sommerich**, **Monica R. Johnson**, and **Zaid Radin**

Participatory Ergonomics Applied to Mammographers' Work

Carolyn M. Sommerich, **Steven A. Lavender**, Elizabeth Sanders (Ohio State), Sabrina Lamar, Kevin Evans (Ohio State), Sharon Joines (North Carolina State University), and **Wei-Ting Yen**

Teaching Healthy Computing Skills to High School Students via Participatory Ergonomics

Sahika Vatan Korkmaz and **Carolyn M. Sommerich**

Understanding Factors that Affect the Adoption of Ergonomic Interventions Among EMS Workers

Monica R. Johnson, **Steven A. Lavender**, **J. Mac Crawford**, Paul Reichelt (University of Illinois at Chicago), and Antonio Fernandez (Ohio State Univ.)

Panels

A Portfolio of Human Factors Guidance for NextGen

Panelists: Valerie Gawron (MITRE Corp), Paul Krois (FAA), Nadine Sarter (University of Michigan), **Philip J. Smith**, Christopher Wickens (Alion Science and Technology), and Tanya Yuditsky (FAA)



Graduate Student News

New Students

The new Graduate Studies Coordinator for the Department of Integrated Systems Engineering is Ms. Kristen Johnson. She can be reached at johnson.4445@osu.edu or 614-292-6841.

Emma Alder

alder.12@buckeyemail.osu.edu

Advisor: Carolyn Sommerich
Hometown: Athens, OH

Emma earned a B.A. in Psychology from New York's Ithaca College. While at Ohio State, her focus will be on Occupational Safety and Ergonomics. She is interested in how changes in the design of work environments improve employee well-being and how psychology intersects with the ergonomics decisions made by engineers

He pastimes include cooking and watching or reading science fiction.



Zach Huber

huber.251@buckeyemail.osu.edu

Advisor: William Marras

Hometown: Holland, MI

Zach did his undergraduate degree at Hope College in Holland, MI, where he majored in Psychology. During his graduate studies here at Ohio State, he will be working in the Biodynamics Lab.

Zach enjoys all types of outdoor activities. He particularly likes sports and has played tennis for most of his life.



Bryan Hennessey

hennessey.32@buckeyemail.osu.edu

Advisor: Carolyn Sommerich
Hometown: Olmsted Falls, OH

Brian received his B.S. in Engineering Management (with a Manufacturing specialty) from Miami University in Oxford, OH. During his studies at OSU he hopes to his specialized skills in Ergonomics/ Human Factors.

Bryan is a big sports fan, and he loves to play any and all sports, especially golf.



Gelver Vergeldedios

vergeldedios.1@buckeyemail.osu.edu

Advisor: Carolyn Sommerich

Hometown: Mayfield, OH (with time spent in Rockville, MD and Henderson, NV)

Gelver's Bachelor's degree is from the University of Dayton (OH), where he majored in Industrial Engineering and minored in Quality Engineering. Gelver hopes to gain more in-depth knowledge of Occupational Safety and Ergonomics during his time here at OSU. This interest stems from his understanding of its importance during his co-op experiences with Parker Hannifin and Battelle Memorial Institute.

Gelver spends his free time bowling.



Heath Monat

heathmonat@gmail.com

Advisor: William Marras
Hometown: Canton, Ohio

Heath graduated in June, with a BS in mechanical engineering from Ohio State. He will be working on a Masters degree, also in mechanical engineering, while conducting research in the Biodynamics Laboratory.

When he is not studying, Heath enjoys doing genealogical research.



Graduate Student News

BWC Internship Opportunities

The Ohio Bureau of Workers' Compensation (BWC) is again offering opportunities to undergraduate or graduate students interested in occupational safety & health. Positions involve part-time work (15 hours) through the school year, which may be extended to full-time during the summer of 2011. Both positions are located at the BWC offices in Pickerington, OH. The pay rate will depend on the student's grade level.

Interested student should provide a resume and indicate if a specific position is of interest. Submit info to:

Carol Morrison
Manager, Business Development & Management
Ohio BWC, Div. of Safety & Hygiene
Email: carol.m.1@bwc.state.oh.us
Phone: 614-644-8225

Position 1 Data Analysis Intern

Job Duties (in order of importance)

- Develop experimental designs to analyze workers' compensation data for the evaluation of occupational safety and health hazards and intervention methods.
- Use sampling procedures, determine health and safety parameters by gathering data, determining type and size of a sample group and develop a reporting form.
- Use various databases, analyze research data using descriptive statistics, basic inferential tests, and, where necessary, advanced statistical procedures.
- Review, summarize, synthesize and apply state-of-the-art information to evaluate and develop occupational safety and health intervention methods.
- Conduct benchmarking research relative to general safety research and in applying intervention technology for private and public employers and agencies.
- Interface and work with technical experts at the BWC, as well as other agencies (i.e. NIOSH) in safety research projects.

Desirable Characteristics

- Knowledge of basic statistics
- Coursework in occupational health and safety
- Experience with large databases
- Ability to: write research papers; gather, collate & classify info about data, people or things; cooperate with co-workers on group projects.

Minimum Qualifications

- Undergraduate or graduate student in biostatistics, statistics, mathematics, public health, computer science, or comparable field, with at least a semester of statistics.
- Competent using Microsoft Word, Excel, and Access.

Position 2 Business Development & Management Intern

Job Description

- Develop case studies using data from grant program participants.
- Develop and update best practice documents based on safety grant data.
- Run data reports (e.g., injury data, production data, quality data, operations descriptions, turnover reports) in the safety grant database.
- Research and analyze claim/employer data.
- Develop industry reports and revise current reports.
- Assist other units within DSH with day to day activities including data research and analysis, literature search and review.

Minimum Qualifications

- Be enrolled in an undergraduate- or graduate-level program, preferably related to occupational health & safety, industrial/mechanical engineering, or industrial hygiene. Candidates with ergonomics training are preferred.
- Knowledge of basic statistics.
- Experience with large databases.
- Ability to: write research papers; gather, collate & classify information about data, people or things; cooperate with co-workers on group projects.
- Competent using Microsoft Word, Excel, and Access.

Bureau of Workers' Compensation



With more than \$22 billion in assets, the Ohio BWC is the largest exclusive state-fund workers' compensation system in the U.S.

Graduate Student News

Accomplishments and Activities

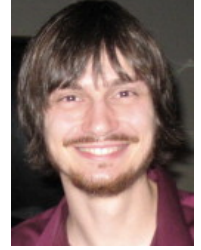
Congratulations to **Alex Morison**, who successfully defended dissertation and graduated at Ohio State's Summer 2010 commencement. The abstract from his research, "Perspective Control: Technology to Solve the Multiple Feeds Problem in Sensor Systems," can be found on page 9.



Now a Research Scientist working in Ohio State's Department of Integrated Systems Engineering, Dr. Morison's research focuses on managing data overload in sensor systems and developing new technologies for extending human perception in next generation human-sensor systems. This work is being supported by Air Force research labs.

Dr. Morison can be reached via email, at morison.6@osu.edu.

Riley Splittstoesser was the 3rd-place winner for Best Scientific Poster Presentation for his research, "Immune Responses to Personality and Cognitive Load During Repetitive Lifting," at the 9th Annual Doctoral Colloquium. Co-sponsored by the Council of Industrial Engineering Academic Department Heads (CIEADH) and the Institute of Industrial Engineers (IIE), this event took place in Cancún, Mexico (June 5th, 2010).



On October 5th, **Alicia Borgman** presented the paper, "Integrated Management of Airport Surface and Airspace Constraints for Departures: An Operational Sequence," at the 29th Digital Avionics Systems Conference (DASC), which was held in Salt Lake City, UT. Her co-authors were **Philip J Smith**, Mark Evans, Roger Beatty, Ken Durham, **Charles Billings**, Eric Wiley, and **Amy Spencer**.



Alicia Borgman also exhibited a poster at HCI Aero, the International Conference on Human-Computer Interaction in Aeronautics, at Cape Canaveral, FL (Nov. 3rd, 2010). The poster, "Integrating Airspace and Surface Constraints in Pre-departure Traffic Planning and Management," was co-authored by Philip J. Smith, Roger Beatty, Charles Billings, Mark Evans and Ken Durham.

Check out the Web Sites of Ohio State's Ergonomics Laboratories

Biodynamics Laboratory
<http://biodynamics.osu.edu>

Center for Occupational Health in Automotive Manufacturing (COHAM)
<http://coham.osu.edu/>

Cognitive Systems Engineering Laboratory
<http://csel.eng.ohio-state.edu/>

Engineering Laboratory for Human Factors/Ergonomics/Safety
http://ise.osu.edu/ISEFaculty/sommerich/eng_lab_for_HFES.html

Orthopaedic Ergonomics Laboratory
<http://ortho.osu.edu/research/facilities/ergonomics/>

Research Corner

Quantitative Biomechanical Workplace Exposure Measures: Distribution Centers

William S. Marras, Steven A. Lavender, Sue A. Ferguson, Riley E. Splittstoesser, Gang Yang

J. Electromyography & Kinesiology
20(5):813-822, 2010

Abstract

Physical work exposure characteristics assessed in most previous epidemiologic studies have been described mostly in gross categorical terms (e.g. heavy work, lifting and forceful movements, etc.) and have resulted in relatively moderate associations with low back pain risk. We hypothesized that it was necessary to characterize work demands in a much more quantitative fashion so that the precise biomechanically meaningful measures of exposure were available for risk analysis.

In this study, we used sophisticated instrumentation to continuously document 390 physical exposures during lifting (in four types of distribution centers) throughout work. This study profiles these exposures and shows how these exposures vary as a function of the type of distribution center and compares the exposures to (previously documented) manufacturing exposures.

Static load and load moment measures were found to greatly under-represent true (dynamic) load and load moment exposures to workers. Lift durations averaged 11–12% of the cycle time in distribution environments.

This study indicates that distribution workers are commonly exposed to greater extreme loads and move much more rapidly than manufacturing employees. The information provided here can serve as a basis for low back pain risk assessments.

Perspective Control: Technology to Solve the Multiple Feeds Problem in Sensor Systems

Alex Morison

Dissertation Abstract

The recent explosion of sensing capability has influenced many domains, such as medical care, public safety, and national defense. Along with the new capabilities have come new opportunities for providing tele-medicine at a distance, providing surveillance of a large physical area, and to perform reconnaissance in hostile environments.

In many, if not all, of these systems performance has not kept up with the perceived opportunities these capabilities embody. Instead, generic challenges have emerged that appear fundamental to human-sensor systems. One such challenge, the multiple feeds problem, refers to the difficulty or inability of human-sensor system users and decision makers to integrate the diversity of sensor feeds that have been instantiated through these sensor systems. This challenge emerges from the lack of adequate system design for the coordination of the multiple perspectives these sensor systems represent.

The Perspective Control approach addresses the multiple feeds problem through Perspective Control; a method of controlling point-of-view. In the Perspective Control approach, sensors are considered generic points-of-observation that conform to a spherical coordinate system. A user is able to control a sensor by expressing a desired view direction through a novel input device called a Perspective Controller, which also embodies a spherical coordinate system. This device not only provides a method for controlling a single sensor but also a method for navigating between sensors. In navigating between sensors the layout of the sensor network is perceived directly (i.e., a form of extending perception).

The ability of Perspective Control to solve the multiple feeds problem is established through an operational engineering demonstration that utilizes user controlled viewpoint to control a network of video cameras. This demonstration is embedded in a video surveillance context utilizing a network of pan-and tilt-capable video cameras.

At the heart of the Perspective Control engineering demonstration is the Perspective Control apparatus which is a working prototype designed and built based on constraints of a generic point-of-observation. In addition to the Perspective Controller, the engineering demonstration leverages an indoor, video camera surveillance network and a 3-D virtual environment. Perspective Control is one potential approach for solving the multiple feeds problem.

Dr. Charles Billings 1929-2010

Dr. Charles Billings *(continued from page 1)*

State University (where he received a Master of Science) and New York University (earning a Doctor of Medicine). He was drafted into the Air Force and attended the USAF School of Aviation Medicine, becoming a squadron flight surgeon. Later, he received graduate training in aviation and occupational medicine at OSU and taught here for 15 years. After joining NASA, he became chief of Aviation Safety Research and was later selected a Fellow and Chief Scientist before retiring. His numerous honors include President of the Aerospace Medical Association, a Fellow of the Royal Aeronautical Society, and a two-time NASA leadership award designee.

His love of whippets commenced when the family returned to the US with Fly.



Dr. Billings had broad interests in civil aviation and passenger health in air travel, researching such topics as the effects of alcohol on pilot performance. He also was principal initiator of the NASA Air Safety Reporting System (ASRS), which has since formed the basis of similar safety systems in 11 nations. He was a Fellow of the Royal Aeronautical Society and an Associate Fellow in the American Institute of Aeronautics and Astronautics, and an Emeritus member of the International Academy of Aviation and Space Medicine.

Remembrances

Dr. Billings was a wonderful human being, and a truly respected leader. For a short time, I was honored to share an office with him. At that time, a Center of Excellence for Patient Safety was planned for funding. During a question-and-answer session, a representative from the granting agency, Association for Healthcare Research and Quality, said that an example of the kind of well-respected person to be on the Board of such a center would be Dr. Billings. Immediately the phone started ringing off the hook! Of course, every single group applying for the Center had now decided to ask Dr. Billings to serve on their Board. True to form, he turned down all of the offers so that he could serve as a reviewer of the proposals (an uncompensated service) without a conflict of interest, since he wanted to do his part to shape the future of patient safety reform initiatives.

Emily Patterson, PhD

Assistant Professor
OSU School of Allied Medical
Professions

Charlie and I supported each other in our research programs during the late 50's and 60's. Charlie provided guidance for our driving research studies. I was a subject in his high altitude studies and his research on alcohol and flying.

He was unselfish in support of our testing of human subjects. Together we received a USPHS grant for the training of graduate students in Law, Engineering and Medicine for transportation accident prevention research.

He was a good friend, excellent pilot, creative educator, brilliant colleague and able administrator.

Keep your airspeed up, Charlie, as you complete the last leg of your flight to heaven and Lillian.

Tom Rockwell, PhD

Professor Emeritus
OSU Department of Integrated
Systems Engineering

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