



Western Center for Agricultural Health and Safety • University of California, Davis

## Ag production and safety enhanced by combining human labor and new technologies

**M**echanization and automation of specialty crop production is one of the areas in which Stavros G. Vougioukas, assistant professor in UC Davis' Department



Vougioukas

of Biological and Agricultural Engineering, is intimately familiar.

Agricultural work involving human workers and labor-aiding machines working together to increase efficiency for operations such as fresh market fruit harvesting is the focus of his current research.

Vougioukas, who joined UC Davis in January 2012, after serving 10 years in the Department of Hydraulics, Soil Science and Agricultural Engineering at Aristotle University

of Thessaloniki in Greece, was guest speaker at the Western Center for Agricultural Health and Safety's seminar in May. His presentation was titled "Bio and Ag Engineering at UC Davis Update: Workers and Co-Bots for Specialty Crop Production."

"Humans and machines must co-exist, coordinate and cooperate in order to achieve overall improved efficiency," says Vougioukas. A combination of these "co" terms with "robots" result in the madeup term, "co-bots." Conventional mechanical and robotic harvesters have not successfully replaced the judgment, dexterity and speed of experienced farmworkers, but working in combination with new technologies, farmworkers could maximize performance while minimizing exposure to risk of injury, including fatigue and repetitive motion.

As an intermediate to complete mechanization, labor aids such as mobile platforms have been introduced in the fields. At the single machine level, Vougioukas' current research focuses on orchard platform evaluation, design and automation. He uses

concepts and methods from virtual prototyping, robotics, ergonomics and horticulture to study the interactions between factors such as platform size, structure, mobility, crew size, and tree canopy shape and orchard layout.

At a system level, Vougioukas investigates the problems of

coordination, cooperation and safety between teams of workers and automated labor-aid vehicles. For example, he uses methods from operations research to simulate and optimize the collaboration between human fruit pickers

*Vougioukas continued on page 2*



California Department of Pesticide Regulation Director Brian R. Leahy (above, left, with WCAHS Director Marc Schenker) provided the WCAHS March 4 monthly seminar titled, "Future Directions for Pesticide Regulations."

If you missed this balanced presentation, Mr. Leahy's seminar Power Point, which provides a little history and includes protecting applicators, neighbors, the environment, along with the need to work together to meet new challenges as more urban conflicts are expected, can be viewed at: [http://agcenter.ucdavis.edu/seminar/webcast\\_2013.php](http://agcenter.ucdavis.edu/seminar/webcast_2013.php)

and autonomous transport carts in the field.

In 2013, the USDA funded a \$1.1 million 4-year project (under the NSF National Robotics Initiative) for Vougioukas and investigators to lay the scientific and technical foundations for developing teams of inexpensive, relatively small, harvest-aiding mobile robots, he refers to as FRAIL-bots (Fragile cRop

hArvest-aiding mobiLe robots). These “co-bots” will support human pickers by supplying them with empty containers and by transporting containers filled with harvested crops to unloading stations.

Models of human harvest activities and robot fleet operations, together with real time harvest and robot sensor data will be used to predict the

spatiotemporal distribution of transport requests. Based on this information, dispatching and routing will be communicated to the robots, which optimizes productivity and ergonomic metrics with the minimum number of robots.

The collective operation of these “robotic carts” is envisioned to offer the services of a fast and robust crops transport

system in the field. The proposed system has the potential to offer financial benefits for U.S. fruit and vegetable farmers, market advantages for SMEs building advanced agricultural equipment, as well as increased safety for farm workers.

For more information, please contact Stavros Vougioukas at [svougioukas@ucdavis.edu](mailto:svougioukas@ucdavis.edu)

## Spanish language resources available online for occupational health and safety information

Xochitl Castaneda, director of the Health Initiatives of Americas (HIA), School of Public Health, UC Berkeley, in collaboration with the Western Center for Agricultural Health and Safety (WCAHS) at UC Davis, is pleased to announce the launch of the Occupational Health and Safety Virtual Resource Center for agricultural workers in Spanish. This idea sprouted from a needs assessment that indicated that although there are many existing health resources on the occupational health and safety of agricultural workers, they are not very accessible. Good quality materials with the necessary information are often difficult to find. HIA, with support from WCAHS, decided to improve accessibility of health resources by centralizing educational materials including data sources, links to bilingual informational websites, and a comprehensive list of national and state agencies that protect agricultural workers. The Virtual Resource Center is an interactive repository.

As a result of our needs assessment, the Occupational Health and Safety Virtual Resource Center is based on the five key themes as areas of importance. These themes are farmworkers' rights, injury, respiratory illnesses, heat illnesses and pesticide exposure. A complementary Promotores training manual and the public service announcements (PSAs) are also based on the five key themes and were developed to offer preventative information and resources. The Promotores manual and PSAs will be made available through the Virtual Resource Center as well.

To access the Virtual Resource Center on the WCAHS website, please visit <http://agcenter.ucdavis.edu/>. To add the Virtual

### HISTORIAS DEL IR Y VENIR

**MANUAL DE SALUD OCUPACIONAL Y PREVENCIÓN DE ACCIDENTES EN LA AGRICULTURA**












Resource Center to your webpage, or for more information, visit Health Initiative of the Americas, <http://hia.ucberkeley.edu>, email [hia.isa@berkeley.edu](mailto:hia.isa@berkeley.edu), or call 510-643-1291.



## Western Center for Agricultural Health and Safety outreach highlights

During the month of February WCAHS collaborated with the Department of Pesticide Regulation and the Poison Control Centers to conduct seven Training of Trainers workshops (TOTs) on pesticide safety for Promotores. The 5-hour training topics included: What is the definition of pesticide(s); what are the different types; what are the symptoms of pesticide poisoning; how to be pesticide safe at work and at home; a review of workers' rights including information on how to report issues and where to find available resources. A total of 137 Promotores were trained at the following six locations: Santa Paula, Huron, Madera, Salinas, Calexico, and Visalia. Visit: <http://www.calpoison.org>



Victor Duraj

Responding to a request from the Sacramento County Farm Bureau, WCAHS Research Project 6 Engineer Victor Duraj conducted ladder safety presentations at the annual Farmworker Safety Day. The Sacramento County Farm Bureau provides its farming communities free trainings, safety tips presentations

and best practices for field supervisors and workers, this year included the proper use of ladders. Victor also discussed high risk to low back injuries, demonstrated the lumbar motion monitor, and mentioned NIOSH's *Simple Solutions* publication. For more information, visit <http://www.cdc.gov/niosh/docs/2001-111/default.html>

Following reports of spice-induced choking and aspiration, Associate Director Kent Pinkerton was contacted by MED-PAGE TODAY and asked to comment on the "Cinnamon Challenge," a craze in the news. Cinnamon Challenge is a "game" practiced within some youthful crowds, in which the challenge "game" is to swallow a tablespoonful of ground cinnamon within 60 seconds. Dr. Pinkerton stated that even though the "game" has been around for some time, there are not many studies about the potential medical consequences. The most important may be that cinnamon is an irritant that sometimes is mixed with cellulose, and cellulose is not dissolved in the lungs. In animal studies cellulose cause strong inflammation and fibrotic changes within a month of exposure. For more information, visit: <http://www.medpagetoday.com/Pulmonology/GeneralPulmonary/38595>



Kent Pinkerton



Shown here with her advisor John Balmes, M.D., Kathleen Navarro, MPH, is a UC Berkeley graduate student and WCAHS 2011-2012 Seed Grant recipient. Navarro presented her work, titled, "Improving Exposure Assessment Methods by Measuring Breathing Rates of Farm Workers" at the April 1 WCAHS-sponsored seminar. California produces half of the United States' fruit, nuts and vegetables, and in 2010, 173 million pounds of pesticide-active ingredients were used in California. The primary route of exposure is inhalation. Navarro's PowerPoint presentation from the talk is available at: [http://agcenter.ucdavis.edu/seminar/webcast\\_2013.php](http://agcenter.ucdavis.edu/seminar/webcast_2013.php)

## Dr. Maria Stoecklin-Marios moving on

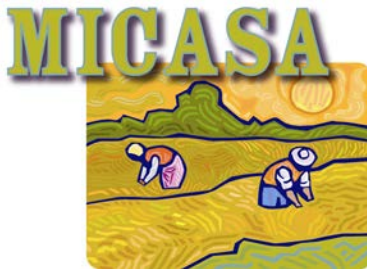
The Western Center for Agricultural Health and Safety has been fortunate to have Maria Stoecklin-Marais, Ph.D., MPH, on its investigative staff for the past 15 years, and we wish her the very best in her new pursuits. Dr. Stoecklin-Marais began her career here at UC Davis as a postgraduate



researcher in 1992. In 1998, she joined WCAHS Director Marc Schenker in his "Farmer Health Study" and aided in the grant writing, development, and project coordination of the Study of Agricultural Lung Disease (SALUD), a study examining paraquat exposure among workers in Costa Rica.

From 2005 to April 2013, Dr. Stoecklin-Marais, an epidemiologist, served as project manager for WCAHS' Mexican Immigration to California Agricultural Safety and Acculturation (MICASA) study, which was funded by NIOSH and The California Endowment. MICASA was a cohort investigation of occupational and environmental health risks in approximately 400 hired farm worker households in Mendota, California. While difficulties in accessing hired farm workers often account for the lack of population-based research, the MICASA cohort provided an opportunity to successfully examine occupational health patterns relevant to other farm worker populations.

"Both of these studies presented unanticipated challenges, from moving equipment in and out of Costa Rica post-Sept. 11 and overcoming recruitment challenges during periods of ICE raids in Mendota, but the important work was extremely satisfying as both a public health professional and researcher," says Dr. Stoecklin-Marais.



As project manager, Dr. Stoecklin-Marais expressed gratitude for the willingness, enthusiasm and generous cooperation of the MICASA families during this seven-year study. She says she also feels grateful for the opportunity to work with an exceptional research team in both Davis and Mendota, most of whom were on staff throughout the study's tenure. "I am fortunate to have such wonderful experiences and memories from interactions with all of the staff and participant families."

**Monday, June 3, 2013**

**Kent E. Pinkerton, Ph.D.**

"Climate Change, Agriculture and Global Health – What Can We Learn from Our Own Backyard?"  
4:00 – 5:00 p.m., C.H.E. on Old Davis Rd.

WCAHS Seminar Series will resume in October 2013. Please check the WCAHS website for updates at: <http://agcenter.ucdavis.edu>



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The Western Center for Agricultural Health and Safety's AgHealth e-mail discussion group is open to anyone interested in agricultural health and safety. We welcome and encourage participation by posting comments or questions about agricultural health and safety. Subscribe at the WCAHS homepage: <http://agcenter.ucdavis.edu>, click on "AgHealth email List."