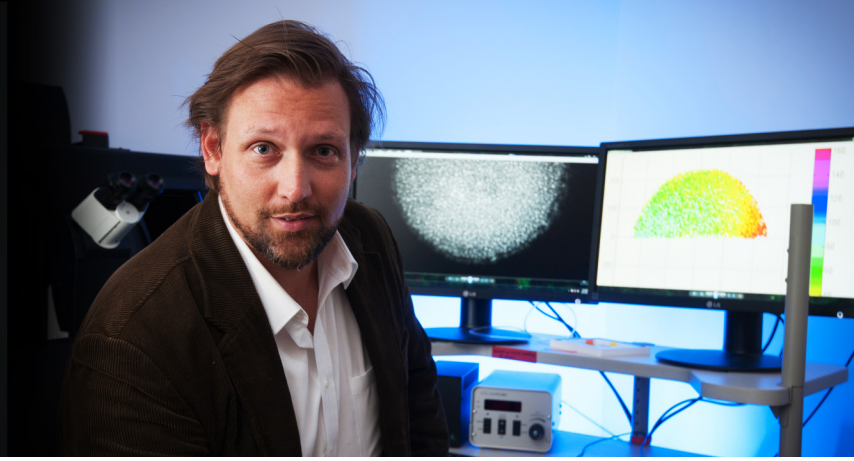
AG RESEARCH
SPOTLIGHT



David Umulis

"Engineers are developing new technologies all the time, and we are adapting new technology to new problems."
David Umulis, Ph.D., Associate Professor of Agricultural & Biological Engineering

The Ag Research Spotlight shines each month on an individual whose work reflects our commitment to the six strategic themes that guide Agricultural Research at Purdue. Our spotlight for October 2014 underscores the theme, "Utilizing molecular approaches to expand the frontiers of agriculture and life sciences."

THE RESEARCHER: Although David Umulis doesn't claim an agricultural background, he grew up with agriculture, especially cherry production, all around him in rural northern Michigan. (Family members sell their signature cherry vinaigrette dressing at sixlugs.com). Two individuals set Umulis on his career path: the AP biology teacher at his small high school, who sparked his interest in the subject; and a family friend/physician who helped him apply to college. Umulis studied chemical engineering at the University of Michigan and then, as a doctoral student at the University of Minnesota, honed his interest in the "biology-focused part of engineering." His next step was a postdoctoral joint appointment in genetics, cell biology, and development at the University of Minnesota Medical School and School of Mathematics. When he arrived at Purdue in fall 2008, he says, "I didn't know anything about how to run a research program. Nobody teaches you how to run a lab or write an NIH grant in grad school. A number of ARP programs were helpful in getting things off the ground."

THE RESEARCH: "In one sense, I'm studying the same problems Aristotle studied over 2000 years ago —what gives rise to shape and form in an organism and in the earliest stages of life," Umulis says. His lab focuses on the mechanisms of embryonic development and the regulatory pathways of information that give rise to the earliest differentiation of cells. "Our niche, with the engineering perspective, is extracting quantitative data from images and developing mathematical models from which we extract quantitative information on how cells take that information to drive the next round of gene instruction," he explains.

IMPLICATIONS FOR HUMAN HEALTH: The National Institutes of Health funds Umulis's work with developing zebrafish embryos. "It so happens that the molecules responsible for cell differentiation are often defective in some way in a number of cancers," he says. "They cause the cell to go down developmental pathways that take them in the wrong direction." His research is therefore relevant to human disease and to regenerative medicine.

PURDUE ASSETS: Umulis cites both the spirit of collaboration at Purdue and its excellent computational resources as key to his work. His team also collaborates with a group of scientists at the University of Pennsylvania. The risk of "tackling problems where I really don't know if what I'm going to try is going to work," he says, is tempered by the excitement of developing new tools and seeing their output.

PUSHING BACK: Umulis encourages his graduate students' creative thinking. If they generate an idea or approach he's never thought of, so much the better: "When I see students take ownership and engage in their research, and then they reach the point when they start pushing back on my recommendations — that's when I know they're on the verge of becoming 'Ph.D. thinkers.'" Outside the lab and away from the supercomputer, Umulis enjoys spending time with his wife and three children, ages 7, 5 and 3, and supporting their involvement in the martial arts.