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## Keeping up with the increasing global food demand

When Dr. Fred Perlak was looking for a place to put his Ph.D. in microbiology to work, he was preoccupied with the question of how to utilize recent advances in science to address issues in agriculture. Monsanto had just announced it would begin agricultural research operations, and he saw a chance to pursue his passion.

That was nearly 30 years ago, and in this time both he and Monsanto have been a part of the substantial changes the agriculture industry has undergone with the aid of science. Today Perlak is the vice president of research and business operations for Monsanto Hawaii. The position is a new chapter for the distinguished science fellow, who has spent the last 15 years working with cotton and came to Hawaii this year to oversee corn research efforts.



*Researchers at Monsanto's Kihei, Maui farm inspect a young corn crop.*

It is a chapter that he finds newly rewarding and challenging.

As the global demand for food grows, corn has become an increasingly sought after commodity. Keeping up with this demand drives Perlak. And the company's statewide corn research program plays a lead role by augmenting Monsanto's ability to develop varieties that will work not only on the U.S. mainland but around the world, he says.

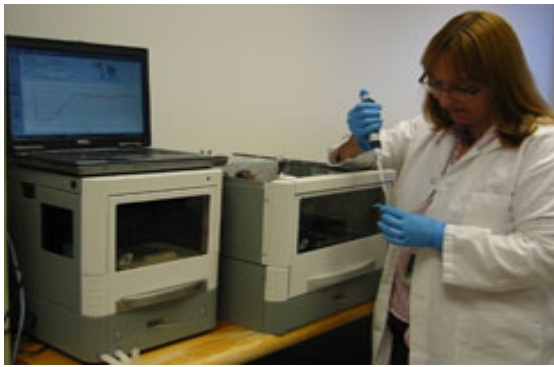
What makes Hawaii so special? The weather, of course. Monsanto employs classical corn breeding techniques to develop new varieties, which are akin to solving a Rubik's Cube, Perlak explains. Just as the cube must go through a series of turns to be solved, so too must a new variety in its creation. The islands' year-round growing season dramatically speeds up breeding efforts by allowing four turns, or harvests a year, compared to a place like Iowa, which offers only one.

Typically it takes eight to 10 years to create a new variety, he says, but through accelerated breeding practices the process works twice as fast. "A lot of hard work, dedication and skill are involved in a successful program, and Maui and Hawaii's more than 800 employees contribute this everyday," Perlak says. He likens the work done here to the major leagues of corn breeding, and says that Maui plays a significant role in the research and analysis part of the process.

With such tools at hand, Monsanto has set forth a sustainable yield initiative, which aims to double the global yield of corn and cotton - using fewer inputs (such as water and nitrogen) - by 2030. Armed with passion and dedication, Perlak sets off with his team to help make this goal a reality.

And he is pleased to be able to do this in Hawaii. As someone who grew up in Massachusetts and has a love for the ocean, he is happy to be surrounded by it once again.

## SKI Pro technology to play a role in cancer and AIDS research



*Silicon Kinetics' Gwendolyn Cheney Rivera prepares a sample for analysis in the SKi Pro at the company's Kahului laboratory.*

In the rapidly changing world of life sciences, Silicon Kinetics is making a strong debut. The company that was founded several years ago as a spin off of the research and design house Trex Enterprises Corporation has come into its own with the recent market release of its trademark SKi Pro technology.

SKi Pro was launched in May this year and in this short time has been named a finalist in the Most Innovative New Product Award by the San Diego-based economic development program CONNECT and earned a place in a National Cancer Institute study. Silicon Kinetics has paired with SAIC-Frederick in the study to utilize SKi Pro to better understand the proteins involved in cancer and AIDS disease progression and how drug interventions affect protein interactions.

The technology employed by SKi Pro is the first of its kind with its three-dimensional, label-free analysis platform. Compared to other products, this technology offers increased sensitivity and versatility, which has the potential to provide new insights into disease processes and the development of drug therapies for disease, says Gwendolyn Cheney Rivera, the company's Maui team leader.

The product's price also sets it apart from competitors, she says. A lower price is a byproduct of the instrument's design – its proprietary silicon biochip is less expensive to produce than other chips on the market. This can be of importance to researchers in academia, for example, she says, who often operate on limited budgets.

Rivera is an engineer at the firm's Maui research and development facility in Kahului, where the biochips are developed and manufactured for use in SKi Pro and other instruments. The company's headquarters are in San Diego, California, which is also home to its instrument design division.

She joined the company four years ago after earning a masters degree in biosystems engineering from the University of Hawaii. It was an exciting moment for Rivera, who was born in Honolulu but moved to the mainland as a child with her family. "I was in school, preparing to graduate and thinking 'wouldn't it be great if I could stay in Hawaii and do what I love,'" when she saw an opportunity at Silicon Kinetics. "It feels good to be home again," she says.

She is also bolstered by her passion for helping to turn an idea into a usable research technology, and eagerly looks forward to the possibilities that future developments will bring.

## Cultivating algae's health benefits

Single cell microalgae may be invisible to the untrained eye, but these tiny plants play a colossal role in life on earth – they make nearly all of the living material and food for our planet. The microalgae *Haematococcus pluvialis* is no exception to this rule, and its center stage at the Maui-based biotechnology company BioReal.

The farm cultivates the petite powerhouse for the antioxidant it produces called astaxanthin, which is believed to have a number of health benefits. It's an antioxidant that is found throughout the natural environment, but is most easily recognized as the substance that gives the pink and red colors to salmon, shrimp and lobster, says company president Toshiyuki Yamagishi.

BioReal is one of only five facilities in the world that mass produces the antioxidant, which is used in the company's line of Astavita nutraceutical products and sold as a bulk ingredient. The Astavita products are designed for a number of uses, from boosting the body's overall health status to improving eye health to skin beautification. Similarly, the bulk ingredient finds its way for use in a range of consumer products, including food and beverage items, sports nutrition, cosmetics, veterinary healthcare and nutraceuticals.



*Hundreds of spheres make up Bioreal's bio-dome algae cultivation system.*

Historically it has been difficult to mass cultivate this algae, says Yamagishi, which is used because it offers the most abundant natural source of the antioxidant. BioReal has successfully solved the production riddle and garnered a spot at the forefront of global micro algal research and production through its proprietary bio-dome system technology. Compared to a conventional open pond cultivation system, which is subject to the whims of the environment and requires large production areas, the bio-dome's closed system offers a regulated environment that produces a high yield, high quality product at a low cost.

A glance at the company's bio-farm operations at the Maui Research and Technology Park leaves a distinct impression as hundreds of spheres sit in perfect formation, shimmering under the sun. Sunlight is an essential ingredient in the cultivation of algae, so BioReal designed its bio-dome system to mimic a tree, one of mother nature's most efficient gatherers of sunshine, Yamagishi says. With some imagination, one can see how a tree and a dome are related - as tree branches reach out to gather maximum sunshine, the tree top takes on a spherical form, and the bio-dome's round shape imitates this.

The sunshine and the island's moderate tropical climate are what brought Yamagishi here. "Maui has over 300 days of sunlight each year and a day-to-night temperature difference that is very small, which sets it apart from cities like Phoenix or San Diego," he says. This year-round growing season gives the company an advantage over its competitors.

And Yamagishi shows no signs of slowing down - he is looking to increase BioReal's edge by expanding its Maui operations to include the use of improved technology.

### **Upcoming events:**

#### **Maui TechOhana**

Speaker to be announced

Cost: \$25.00 in advance, Advance purchase and reservation is required. Admission includes lunch.

Reservations: Advance purchase and reservation is required. \$35 charge at the door if not registered in advance-space available basis only.

Date: Wednesday December 3, 2008

Time: 11:30AM - 1:30PM

Location: Stella Blues Restaurant in Kihei

Have a technology that can be used by the military AND the private sector? Consider attending the Hawaii Technology Development Venture's Tech Enterprise 2008. See this link for further info:  
[http://www.hitdv.com/TechEnterprise\\_2008/index.htm](http://www.hitdv.com/TechEnterprise_2008/index.htm).

To receive email updates about High Tech Maui events please visit the following link: <http://www.hightechmaui.com/programs/email-list.cfm>  
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