Determining Vineyard Outcomes

Viticision aids vineyards in maximizing grape flavors and avoiding cluster sunburn with "Grape's Eye View Model" hemispheric photograph calculations.

Glen Martin

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StU WEISS GOT INTO the wine business on the wings of a butterfly—the bay checkerspot, to be precise. Weiss, the chief scientist of the **Creekside Center for Earth Observation** in Menlo Park, has conducted much of the extant research on this endangered, jewel-like, northern Californian lepidopteran. His work has not only expanded the body of knowledge on the checkerspot, but has contributed to the protection of the last parcels of serpentine rangeland that support the butterfly's rare food plants.

Indeed, to study the checkerspot, Weiss observes, it is necessary to study their food sources, including dwarf plaintain, the only plant that checkerspot larvae will consume.

"To help checkerspots, we needed to understand the range that sustains them," Weiss says. "And that meant we had to undertake solar exposure analyses of serpentine grasslands. Solar exposure, obviously, affects temperature ranges—and that relates to the phenology of the checkerspot and its food plants."

Phenology is the manifestation of certain biological events as a response to climatic conditions—for plants, that includes flowering, seeding and senescence. The checkerspot, already on the razor's edge of survival, is extremely sensitive to phenological changes in its food sources.

But to conduct his solar analyses, Weiss had to employ some pretty arcane thermodynamic modeling and measurements.

As he worked on the checkerspot, his modeling approaches got Weiss thinking about alternative applications. He also recalled earlier work on monarch butterfly over-wintering habitat in Mexico, where he had used cameras fitted with wide-angle fisheye lenses to analyze forest canopy; monarchs need conifer groves with canopies of certain densities to survive winter temperatures.

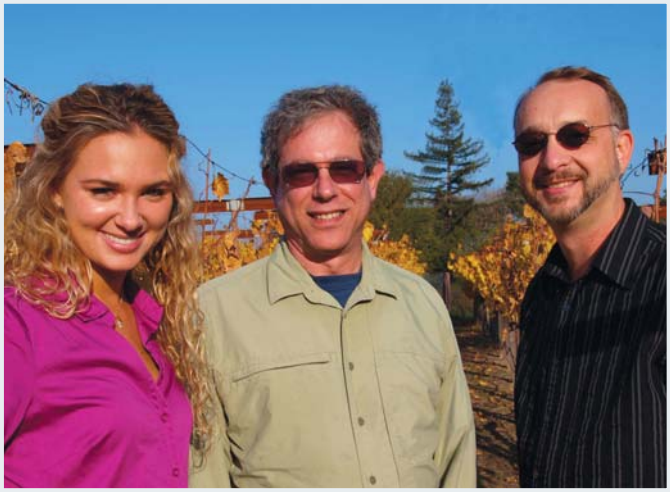
"It occurred to me that the stuff we were doing could be applied to vineyards," says Weiss, a longtime enophile as well as a butterfly enthusiast. "Temperature response is basic to all organisms and is especially critical in premium viticulture. Vineyardists spend a lot of time and money trying to maintain control over light and heat on their grapes. To a very large degree, heat and light contribute to grape quality—or the lack of it."

Out of that epiphany came **Viticision**, a company comprised of Weiss, co-founder and CEO **David Luth**, COO **Ty Frieberg** and marketing director **Carrie-Anne Kunkel**. The company offers vineyard consulting services based on proprietary technology and algorithms developed by Weiss and Luth. To date, Viticision—earlier known as **Precision Viticulture International**—has worked with **Etude Vineyards**, **Soter Vineyards**, **Domaine Chandon**, **J. Lohr Vineyards**, **Renteria Vineyard Management**, **Robert Mondavi Winery** and **Woodbridge Winery**.

Central to Viticision's work is the company's "Grape's Eye View Model"—shorthand for hemispheric photograph calculations. A camera fitted with an 8 mm lens and mounted on gimbals provides photos of a vineyard's canopy structure. Sun paths for an entire year can then be superimposed on the images at half-hour increments. This allows growers to calculate the amount of sunlight striking the fruit throughout the growing season—knowledge which aids in both maximizing grape flavors and avoiding cluster sunburn.

The hemispheric photo tech is bolstered by the use of thermochrons. These small sensors are wedged into grape clusters and record precise temperature variations over weeks or months. The combined data constitutes a powerful new tool for growers, says Weiss: it can be used to improve management over existing vineyards, or it can be employed before vineyard installation as a "virtual vineyard," a computer-generated entity that can be tweaked any number of ways.

Given a desired degree of sunlight exposure on the clusters, Weiss says, "You can adjust row configuration, different trellis systems, canopy management techniques such as leaf



Carrie-Anne Kunkel, Stu Weiss and Ty Frieberg

pulling—all before you break ground on the vineyard. The model also allows you to do better trellis retrofits for existing vineyards."

That's the idea, anyway. Weiss acknowledges that the virtual world is still a generalized simulacrum of the almost infinitely fractal and complex real world. Still, he emphasizes, Viticision's tech can greatly narrow the range for reasonable options. It points growers away from those systems that clearly won't work—knowledge that can literally mean the difference between success and utter disaster.

In one of Viticision's early projects, the company analyzed trellis systems for **Woodbridge Winery** in Lodi.

"Woodbridge wanted a qualitative sunburn analysis," says Weiss. "To maximize desirable grape flavors, you want sun exposure on the fruit—but too much sun will burn the clusters, reducing both quality and quantity. The ideal is indirect sun exposure, with emphasis on avoiding direct light in the middle of the day. So we photographed the trellis systems, from tight VSP (Vertical Shoot Positioning) to a vigorous sprawl, and manipulated them in the computer to represent four different row systems."

Viticision's analysis demonstrated that in Lodi—one of the state's warmer premium viticultural regions—leafier canopies generally were more desirable.

"In certain row directions, exposed VSP systems could have 25 to 30 percent loss from sunburn," observes Weiss. "That's unacceptable for any grower."

Tony Soter, founder of **Etude Winery** in California and the proprietor of Soter Vineyards in Oregon, has

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been working with Viticision over the past year and is bullish on the technology.

"We began looking at trellis design and row direction out of frustration with the standard VSP approach, which isn't well suited to warmer climates where sunburn can cost you quality and yield," says Soter.

Because of Viticision's analyses, says Soter, "We've had superb results with row orientation selections in both Oregon and California. And where Viticision's analyses of existing vineyards suggested the status quo is going to be problematic, it has been just that. That led us into studying re-trellising designs to mitigate these issues."

Thermochrons will be combined with hemispheric photography to produce a web-accessible heat transfer modeling program that should be available by the 2010 growing season, Weiss says. Typically, 20 to 30 thermochrons are strategically placed in grape clusters throughout each vineyard block shortly after veraison. Each thermochron records temperature fluctuations constantly as the fruit ripens.

Linking this data to nearby weather stations will allow growers to obtain real-time information on the temperature status of their fruit simply by logging onto their computers.

"We've run trials that gave us unbiased temperature prediction errors of 2°F," says Weiss. "Say you have temperatures of 100 degrees on a given day, with this program, you'll be able to log on and find the cluster temperatures for each block in your vineyard within two degrees of variation. That will help a great deal with vineyard management. It can tell you whether to turn on overhead sprinklers, or whether or not you can pull leaves or move wires to expose fruit to sunlight."

That's the kind of information vineyardists must have to maximize grape quality, says **Steve Lohr**, the vice president and chief of vineyard operations for J. Lohr Vineyards and Winery. J. Lohr markets about one million cases of wine annually, mostly from the Paso Robles and Monterey viticultural regions.

"The whole point is to get enough light and heat on the fruit to develop the complex, subtle flavors that can make great wine," Lohr observes. "At the same time, too much sun will burn the fruit and cook some of the good flavors out of them. Getting that balance is all about control in the vineyard—ongoing control, throughout the growing season. Viticision's work advances us significantly in that direction."

That, of course, is the seductive promise implicit in Viticision's services: control. Maximizing the ability to determine outcomes in the vineyard translates directly to the winery: better grapes mean better wine. Does Viticision have the master technology to establish that kind of control? Not all of the company's clients are convinced of that, but they remain hopeful.

"I think the technology and applications are still developing, but its future could be tremendous," says **Josh Rubin**, the viticulturalist for Domaine Chandon in Yountville; the company owns 1,100 acres of vines. Viticision is running predictive temperature projects on some of the winery's Chardonnay vineyards near Yountville.

A grape, says Rubin, is at its essence "a bag of enzymes. If it gets cooked by the sun before maturation, it shuts down and ends up with a very truncated range of desirable flavors and aromas. So you do everything you can to avoid that—canopy management, temperature control systems, whatever."

At this point, says Rubin, "I'm assuming Viticision's models will be situational—the farther (a vine is) from a weather station, the less accurate the predictions could be. We need more data—but for a high-end vineyard, it's well worth investigating."

For more information about Viticision, call 650-270-9861 or go to *www.viticision.com*.

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