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WINES & VINES

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CALIFORNIA GRAPE GROWER

Vol. I — San Francisco, California, December 1, 1919. — No. 1

NOW FOR THE 1920 GRAPE CROP

By Horatio F. Stoll

"Thank God the vintage season is over and I have disposed of my grapes somehow," said one of our representative wine grape growers when he visited my office a few weeks ago. And he added: "I wonder how we will get rid of our grapes next year."

That question is bothering nine-tenths of the vineyardists of the State, for if they take time to reflect, they must realize the disposal of their 1919 crop of grapes has been little short of a miracle.

During the last weeks of August, the writer visited practically every grape district in the State in an effort to arouse the growers to an understanding of the critical situation. He was amazed to find them making absolutely no preparations for the disposal of their crop in case the wineries were not permitted to operate. They turned a deaf ear to the suggestions that they should try to develop other avenues of escape than wine-making. They had no patience with those who suggested costly driers; they laughed (particularly in the dry wine district) at the idea of buying shook to make boxes so that they might ship their wine grapes out of the State in refrigerator cars.

The winemakers, too, refused to consider installing improvements that would enable them to make grape syrup, grape juice or any other product. Lulled into a sense of false security by well-meaning but mistaken friends, they announced they were doing to make wine, because the ban would surely be lifted before the crop was ready to be harvested.

Then came the unexpected demand for fresh wine grapes from Eastern cities and buyers began to appear offering from $25 to $30 per ton. Before the season was over, $65 per ton was gladly paid.

It is safe to say half of the total wine grape crop of 400,000 tons could have been sold outside the borders of our State if sufficient cars had been available during September and October. It is too early yet to learn how many carloads of wine grapes actually left the State, but it is believed the shipments in refrigerator, ventilated and box cars will reach the 4,000 mark, which means something like 65,000 tons.

There is no use trying to hide the fact that this demand came from wine drinkers in every nook and corner of the country who wanted to make a limited quantity of wine for home consumption.

Thousands of tons of grapes were used in the manufacture of grape juice, which, it was expected, might later be fermented into wine.

A considerable quantity of grape syrup also was manufactured and it will be interesting to see how the American public takes to this excellent product.

Last, but not least, was the dried wine grape output. Most of these grapes were sundried, but a sufficient tonnage was handled in different types of dehydrators, evaporators and dryers to make us realize that evaporation is one of the most promising "outs" for the growers.

There is no doubt the vintage of 1920 will take on an entirely different complexion from that just ended. National Prohibition will be in effect and the manufacture of any beverage over one-half of one per cent will be prohibited. Just how far the Government will go in enforcing the drastic enabling act remains to be seen.

Having learned by experience that only a limited quantity of fresh wine grapes can be shipped out of the State within 60 days, the growers must begin at once to develop other legitimate avenues that will stabilize the industry.

Already plans are forming to organize a co-operative marketing association to insure the prosperity of the wine grape growers.

I hope when the movement is launched, after the first of the year, every grape grower will fall in line and give the association his heartiest support.

In the meantime, my advice to the growers is:

INTERPLANT IF YOU CAN, BUT DON'T DIG UP YOUR VINES!

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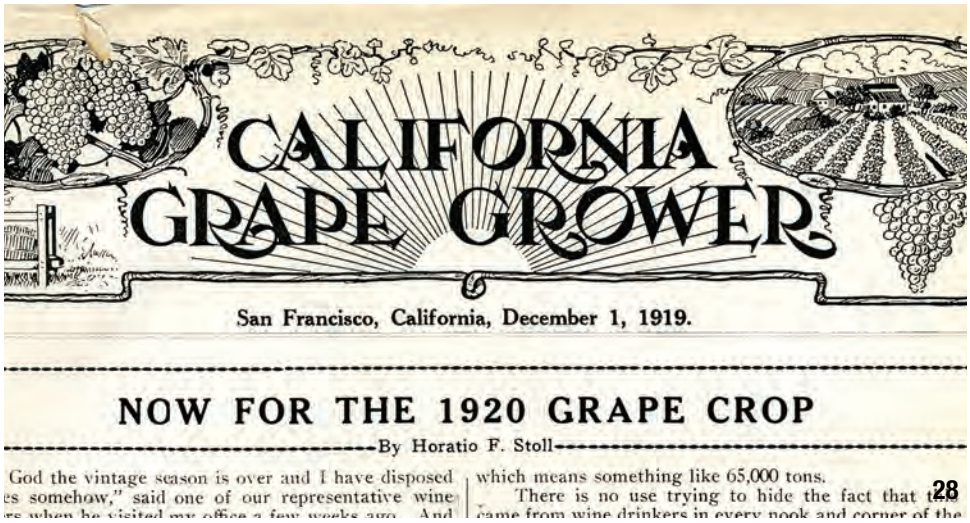
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San Francisco, California, December 1, 1919.

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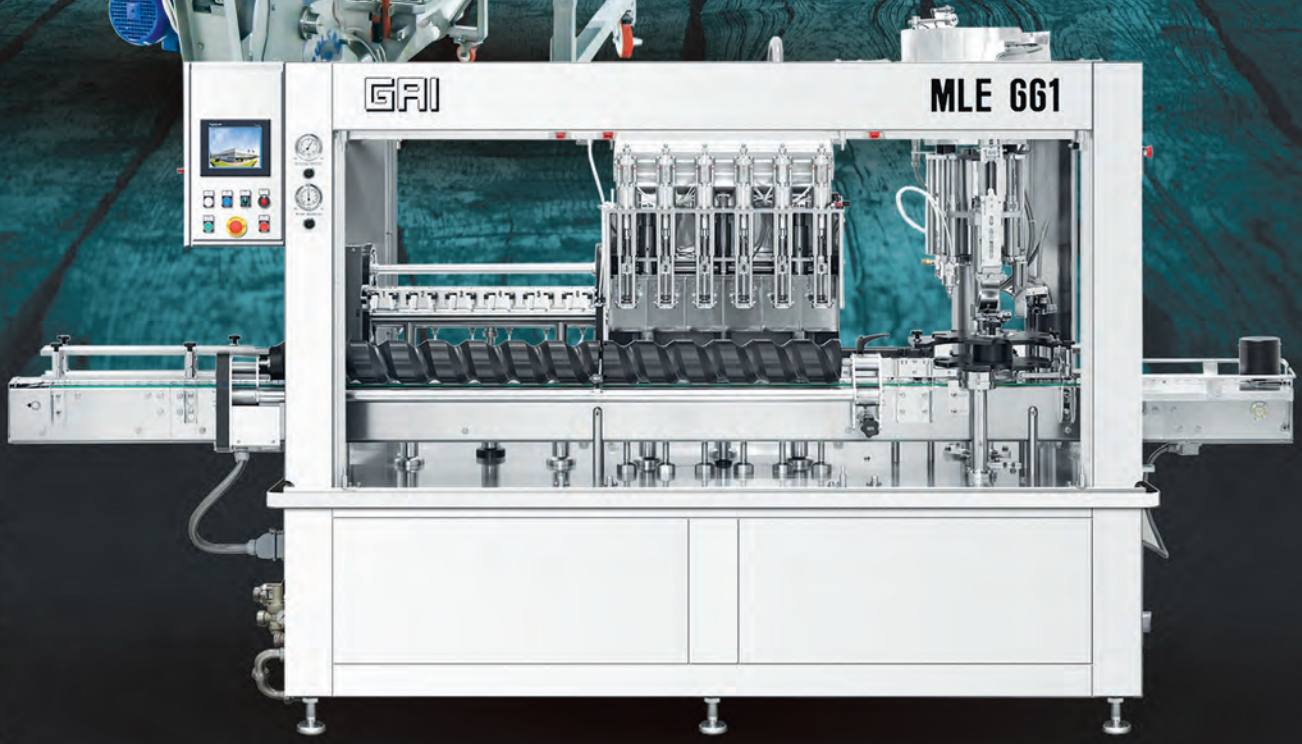

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CONTRIBUTORS

Jim Gordon was the editor of *Wines & Vines* for more than 12 years and spent most of the previous year as editor at large for the magazine. Gordon drew on his 40-year career in journalism to co-write and edit the lengthy Game Changers report that begins on page 28. Gordon also wrote this month's technical profile of The Hess Collection Winery (page 94) and the in-depth interview with members of the fifth generation of the Wente family (page 90). Prior to joining *Wines & Vines*, Gordon was the managing editor of *Wine Spectator* and editor-in-chief of *Appellation/Wine Country Living* magazine. Gordon is now a contributor for the *Wine Analytics Report* and editor at large for *Wine Business Monthly* magazine.

Few in the industry have not read the work of **Hugh Johnson** who is considered one of the greatest wine writers of all time and definitely one of the most successful. Johnson is the author of, among several works, "The World Atlas of Wine" as well as the autobiography "A Life Uncorked" and "Hugh Johnson's Pocket Wine Book," which is now in its 42nd edition. Johnson recounts the early days of California wine and his reliance on *Wines & Vines* to keep tabs on the growing industry in a Viewpoint column on page 74.

Geographer **Patrick L. Shabram** has more than a decade of experience consulting and performing geographic research in the wine industry and more than 15 years of experience as a geographer working in education and retail location analysis. He has consulted with growers, winemakers, lawyers and trade associations, and has been hired to submit several petitions related to the establishment of or modifications to existing American Viticultural Areas. Shabram explores the limitations of the Winkler Scale, used for decades to differentiate growing areas, and more accurate and realistic alternatives in an article starting on page 108.

ON THE COVER

An editorial urging growers to find a secondary market for their grapes in light of the coming "National Prohibition" appeared on the cover of this magazine's first edition in 1919. An article starting on page 78 features more vintage covers.

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QUESTION FOR JANUARY:

What has been the most impactful innovation in the wine industry within the last 100 years?

Hugh Davies,
Vintner
Schramsberg Vineyards and Davies Vineyards
Calistoga, Calif.

THE U.S. WAS HEADED TOWARD PROHIBITION 100 years ago and thank you Prohibition was lifted — that may be the biggest game changer of all! But in my experience, the biggest changes that have occurred over the last 50 years relate to what varieties might be grown where. We've evolved quite a bit at Schramsberg over the last five decades with our sparkling wines, from pressing to filtration techniques, SO_2 management, *dosage* preparation and the like. But as we've tested vineyard sites closer to the bay and the ocean, I feel that we've really moved the needle. We're not the only ones, mind you. Our Chardonnay and Pinot Noir fruit from cooler coastal pockets (UCD Region 1 zones) come with brighter natural acidity and fruit intensity. Meanwhile, on our home property (in Napa), we've come to realize that Cabernet and red Bordeaux varietals produce a fantastic result in the somewhat warmer inland hill country. So, perhaps it's the discovery of these new viticultural locations throughout the new world, and the matching of them with the best variety choice that is the most exciting change in the wine industry over the last 100 years.

Cathy Corison
Owner/winemaker
Corison Winery
Saint Helena, Calif.

AFTER REPEAL, as wineries recovered from two World Wars, the Great Depression and Prohibition, research and innovation focused on learning and/or remembering how to make sound wines without major flaws. Then in the 1960s huge strides in wine *quality* began. It's hard to say one innovation is more important than the rest, but I vote for advances in canopy management because I can't make a wine any better than the grapes that come in through the door. Great grapes make great wine. Period.

Before the mid-1970's, growers pruned in the winter and then sat back and waited to pick. Crops were bigger and harder to ripen. But important canopy research by Richard Smart in Australia and Mark Kleiwer at UC Davis connected the dots between the developing crop and the grapevine, discovering that the balance between crop load and vine growth were key and that regulating the way light and air interacts with the fruit has an enormous impact on flavors, color and balance in resulting wines. Their findings have changed grapegowing all over the world. Today my crew and I take at least nine passes through the vineyard each season, touching every vine. The result is fully ripe, delicious grapes, picked at lower sugars, to affect the power and elegance I'm looking for stylistically.

Paul Hobbs
Owner/winemaker
Paul Hobbs Winery
Sebastopol, Calif.

STAINLESS STEEL GETS MY VOTE. No other material, idea or practice has had greater impact. It has literally revolutionized winemaking in the last century and in my view eclipses Louis Pasteur's discoveries of the previous era. Why? Today, there is hardly a commercial wine made that doesn't employ it at some moment in the winemaking process. Yes, cold, unfeeling, inert stainless steel. Readily cleaned and sanitized, durable, strong and malleable, it can be formed to serve almost any need one can imagine. Today it is used in virtually every type of winery equipment and even when it is not playing a lead role, it does all the heavy lifting in the supporting role. Concrete vessels, oak foudre and tanks, are all largely fitted and dressed out with stainless steel fittings. According to the literature, it was the UC Department of Enology in the '50s that was the first to champion its use and the California wine industry embraced it. The world followed, and wine is far better for it. It makes it easier and safer to hold, move, cool and heat. Its application is seemingly limitless. Amen.

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The End of a Remarkable Century

THIS SPECIAL, DOUBLE ISSUE CELEBRATES THE 100TH YEAR OF THIS PUBLICATION, which launched in 1919 as the *California Grape Grower*. We've incorporated the cover of that original publication into the cover of this issue of *Wines & Vines* that comes out nearly a full century later.

It has been an honor and privilege to produce and publish this magazine. We are lucky to work in an industry that is based in conviviality and hospitality. There is a true camaraderie to our business of making wine and we hope we have fostered that spirit through the pages of *Wines & Vines*.

This magazine has borne witness to our industry's successes and struggles. It helped growers get through Prohibition, World War II and economic slumps. During the good years, *Wines & Vines* helped our readers understand the trends and how to take advantage of them.

You can read more about the history of the publication in an article by our associate publisher Tina Vierra who first worked for the company in 1992. That article is just one of several pieces that comprise our special section commemorating a century of reporting on the wine industry by *Wines & Vines.* We also have columns by celebrated wine writer Hugh Johnson and respected viticulturist Richard Smart. Our editorial team compiled a lengthy package on the people and innovations that changed our industry in the course of the last 100 years.

Wines & Vines has continually evolved with the industry to best meet its goal of providing the news and information our readers need.

One of this magazine's greatest strengths has been the professionalism and commitment of the diverse group of contributors who helped put the magazine out each month. Many of the writers who produced this issue, and the hundreds that came out before it, have decades of experience in both journalism and the wine industry.

This issue also includes several of the stories that we hope you find as helpful to your business as they are interesting to read. As you'll see in this special issue, *Wines & Vines* has evolved with the industry to best meet its goal of providing the news and information our readers need. That evolution continues as this is also the last print edition of the magazine.

As we announced back in August, the magazine is merging into the pages of *Wine Business Monthly* and many of the writers who helped produce this issue will now be writing for that publication. The Wines Vines Analytics division will continue to offer our full suite of database marketing services as well as publish the annual Directory & Buyer's Guide. We'll soon be launching a new publication, the *Wine Analytics Report* that will be a monthly, subscription-based report based on our popular Wine Industry Metrics. The report will also feature news and analysis of the data and trends that shape our industry.

We hope you'll enjoy this collector's edition of the magazine and join us for the start of the next 100 years. We'll continue to provide you with the information you need to be prepared for whatever the future may bring. Thank you to all of our subscribers and advertisers who have made this past century unforgettable. Cheers!

Chet Klingensmith
president,
Wines Vines Analytics

Andrew Adams
editor,
Wine Analytics Report

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Key Indicators

Complete data is available at **winesandvines.com/metrics.**

U.S. Wine Sales

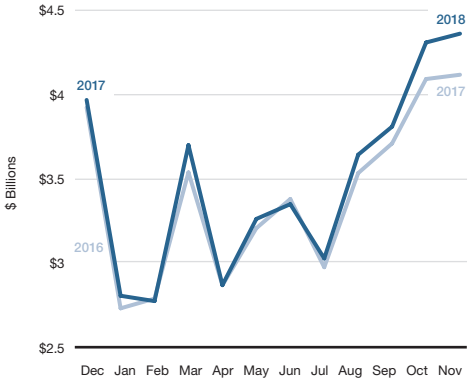
MONTH

November 2018	$4,350M	6% ↑
November 2017	$4,107M	

12 MONTHS

November 2018	$47,621M	4% ↑
November 2017	$45,874M	

MONTHLY SALES



Source: bw166.com, Wines Vines Analytics. Domestic table and sparkling wine sales on-premise and off-premise.

Off-Premise Sales IRI Channels

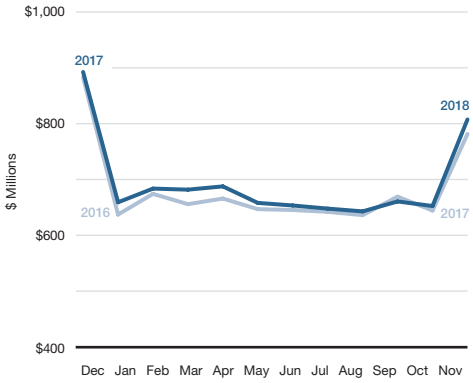
MONTH

November 2018	$808M	3% ↑
November 2017	$782M	

12 MONTHS

November 2018	$9,026M	2% ↑
November 2017	$8,871M	

MONTHLY SALES



Source: IRi, Wines Vines Analytics. Domestic table and sparkling wine sales in multiple-outlet and convenience stores, four weeks ended Dec. 2, 2018.

Direct-to-Consumer Shipments

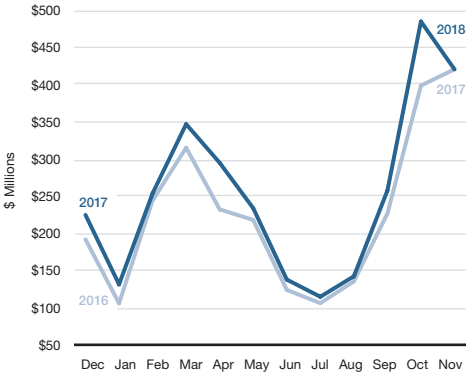
MONTH

November 2018	$416M	<1%
November 2017	$417M	

12 MONTHS

November 2018	$2,981M	12% ↑
November 2017	$2,659M	

MONTHLY SHIPMENTS



Source: Wines Vines Analytics/ShipCompliant by Sovos.

Winery Job Index

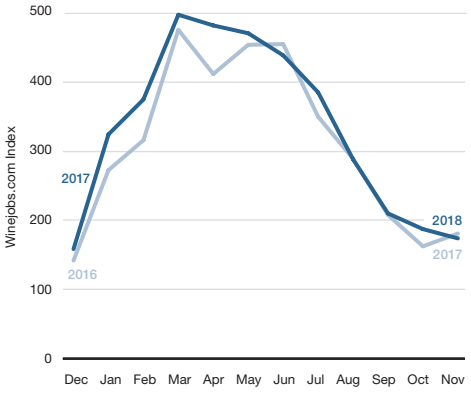
MONTH

November 2018	183	-4% ↓
November 2017	190	

12 MONTHS

November 2018	337	7% ↑
November 2017	315	

MONTHLY INDEX



Source: winejobs.com

U.S. Wine Sales

U.S. Wine Sales Rise 6% in November

U.S. wine sales strengthened in November, market research firm bw166 reported, rising 6% to $4.3 billion. The growth underscored positive trends bw166 has noted in recent months, and occurred in advance of what's typically the strongest period of the year for wine sales.

Domestic table wine sales increased nearly 6% to $4 billion while sparkling wines gained just 2% in the month. Bulk wine sales were flat, reflecting lower demand as wineries sought to manage domestic wine supplies following a bountiful harvest. Total volume didn't grow as fast as sales value, however, rising 4% in the month to more than 27 million cases. The phenomenon points to a more discerning consumer: willing to spend but selective when it comes to purchases.

A similar trend was evident in the latest 12 months, with the value of domestic wine sales rising 4% to $47.6 billion versus a 3% gain in case volumes. While sales of packaged imports increased 8% in the period, domestic wines led in actual dollar terms with a gain of $1.7 billion. Together, the categories drove total wine sales in the U.S. to $71 billion, 5% higher than a year ago.

—Peter Mitham

TOTAL WINE SALES

	$ Millions			
	2017	2018	Change	% Change
Domestic Table, Sparkling & Imported Bulk	$45,874	$47,621	$1,747	4%
Packaged Imports & All Other Wines	$21,807	$23,506	$1,699	8%
Total Wines	$67,682	$71,127	$3,445	5%

Source: bw166.com, Wines Vines Analytics. Consumer expenditures for all wines on-premise and off-premise, 12 months through November 2018. Excludes cider.

Off Premise

Selective Consumer Buying Boosts Off-Premise Sales 3%

Off-premise sales through multiple-outlet and convenience stores in the four weeks ended Dec. 2 totaled $808 million, market research firm IRI reported, a 3% increase from last year. Case volumes gained just 1% to 9.7 million. Sales for the latest 52 weeks were flat at just over $9 billion on softer case volumes.

The data pointed to a willingness among consumers to spend, but more selectively. This was seen not only in the aggregate data but even among the most expensive wines, those selling for $25-plus a bottle. Total sales in the segment increased 8% in the latest 52 weeks to $235 million against a backdrop of low unemployment and Conference Board reports of exceptional consumer confidence. The top five varietals accounted for 85% of the value, or $201 million. This was up 9% from a year ago. Case volume, however, increased just 7%. The result was an average bottle price for the top five varietals of $36.68.

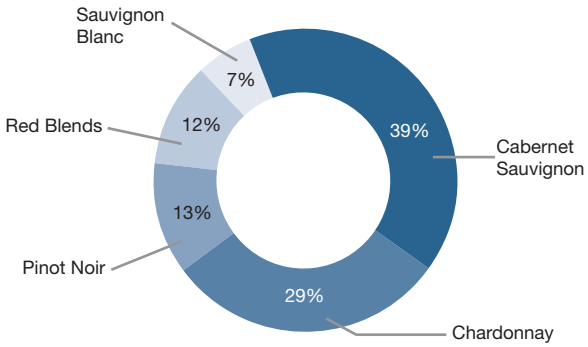
Cabernet Sauvignon retained its top rank in the segment, with sales of $78 million and a 39% share of the top five varietals. Its share was down a percentage point from last year, while Pinot Noir and Sauvignon Blanc inched up a percentage point each. Sauvignon Blanc saw the greatest growth among the top five varietals in the segment, rising 25% in the past year to sales of $14 million.

Sauvignon Blanc also saw its sales value rise faster than volume sold, one of three varietals to experience the phenomenon. Consumers also opted for more expensive Cabernet Sauvignon and Chardonnay, the latter standing out as case volumes actually declined while sales value rose 3% to $58 million.

Pinot Noir and red blends saw their average bottle price drop slightly but remained strong off-premise performers. Red blends took the hardest knock, with stronger volumes pulling the average bottle price down 3.5% to $34.87. Pinot Noir slipped 1% to $36.07. These stood against 2.8% growth in the average price of Cabernet Sauvignon, the most expensive of the varietals, at $47.30 a bottle.

—Peter Mitham

OFF-PREMISE $25-PLUS RELATIVE SHARE



Source: IRI, Wines Vines Analytics. Table wine sales in multiple-outlet and convenience stores; 52 weeks ended Dec. 2, 2018.

Direct to Consumer

DtC Shipments Hold Steady in November

November direct-to-consumer (DtC) shipments were flat versus a year earlier at $416 million, Wines Vines Analytics/ShipCompliant by Sovos reported. The lack of movement followed an exceptionally strong performance a year ago when wineries resumed shipping after the wildfires of October 2017. Volumes slipped nearly 1%, totaling 797,451 cases.

Shipping activity also dropped compared to the prior month because October 2018 had five Mondays, which is a popular day for wineries to send club shipments. In general, DtC shipments appear to be following the overall trend in the U.S. market; value is outpacing overall volume.

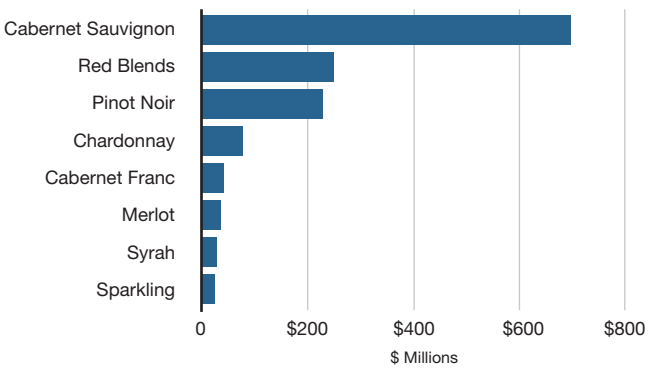
Stable shipment value on lower volume pointed to overall strength in advance of the holiday season. The trend wasn't seen just among Napa and Sonoma wineries where two-thirds of DtC shipments originate from, but further afield in Washington, which accounts for just 4% of shipments. "Overall volume has leveled, if not contracting somewhat, but value has continued to stay strong," said Ryan Pennington, senior director of communications and corporate affairs with Ste. Michelle Wine Estates in Woodinville, Wash. "You're getting that discerning consumer in the DtC channel."

Underscoring the strength of the market, shipments of $60-plus bottles totaled $1.4 billion in the latest 12 months, or 47% of the $3 billion worth of wine shipped DtC during the period. The price segment enjoyed 29% growth from $1 billion a year ago. Cabernet Sauvignon led the segment, with shipments worth $678 million. Red blends — many of them Cabernet-dominant — followed at $253 million. Pinot Noir ranked third in terms of value at $229 million worth of shipments, but case volumes exceeded those of red blends, totaling 238,957. This was second only to Cabernet Sauvignon, which saw 445,284 cases shipped.

Cabernet-dominant red blends took the top spot in terms of price, averaging $134 a bottle compared to $127 for Cabernet Sauvignon. Pinot Noir trailed the top five varieties with an average bottle price of just $80. Cabernet Franc varietals trounced it, averaging $88 a bottle, while Chardonnay checked in at $81.

—Peter Mitham

DTC SHIPMENTS FOR $60-PLUS



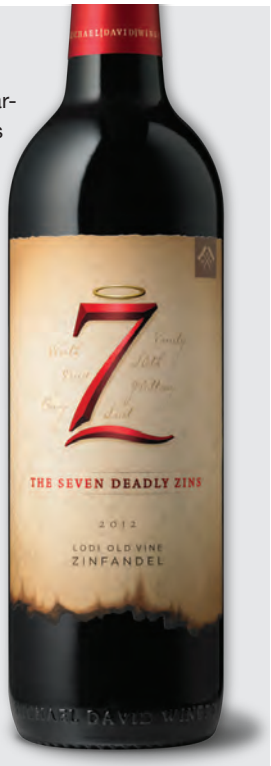
Source: Wines Vines Analytics/ShipCompliant by Sovos; 12 months through November 2018.

Top Stories

The month in perspective

Bountiful harvest of mergers and acquisitions

Autumn brought not only the 2018 grape harvest but also a bountiful harvest of mergers and acquisitions in the wine industry. Wine brands including iconic Qupé in California's Central Coast, the 7 Deadly brand of Lodi, Calif., and boutique winery Elyse in Napa Valley changed hands, while vineyards including Saracina in Mendocino County, Calif., and 50-acre Olenik vineyard in Oregon's Chehalem Mountains AVA went to new owners. (See more on this page and in Regional News starting on page 21.)



Elouan Pinot Noir labels declared misleading

Accused of misleading labeling by Oregon vintners, the state's Liquor Control Commission and the TTB, Copper Cane wine company of Napa, Calif., agreed to discontinue its current labels for the Elouan and Willametter Journal brands. The wines have been made in California from grapes grown in Oregon and the labels had been approved by the TTB, but after protests from Oregonians, notably Jim Bernau of Willamette Valley Vineyards, both the state liquor control commission and the TTB intervened. (See page 16)

Fetzer family sells Mendocino's Saracina Vineyards

John Fetzer and Patty Rock have sold Saracina Vineyards in Hopland, Calif., to Heritance Vintners, owned by the Taub Family Companies, which is known largely for its importing company, Palm Bay International. Saracina is a 250-acre property adjoining U.S. Highway 101 in southern Mendocino County, with a modern winery, barrel aging cave and sophisticated hospitality facility. Founded in 2000, Saracina makes 7,500 cases annually under the Saracina and Atrea brands. Heritance makes Napa Valley Cabernet Sauvignon while another Taub family brand based in California, Au Contraire, focuses on Pinot Noir.

Vintage Wine Estates acquires Qupé

Vintage Wine Estates added more pearls to its necklace of noted wine brands with the purchase of Qupé in California's Central Coast. Founded in 1982 by Bob Lindquist, Qupé produces 35,000 cases per year of mostly Rhône-variety wines. The purchase includes the brand and inventory. No price was disclosed. Lindquist will stay on as consulting winemaker, and the tasting room, located in Arroyo Grande, Calif., will remain open. Qupé was previously owned by Terroir Selections, which acquired it in 2013, and formed a sales and marketing partnership with V2 Wine Group in 2018.

Wine Group acquires 7 Deadly brand

The Wine Group purchased the 7 Deadly brand created by Michael David Winery of Lodi, Calif., which includes 7 Deadly Zins, a varietal Zinfandel, and 7 Deadly Red, a proprietary red blend, both currently made from grapes sourced from the Lodi AVA. "We look forward to continuing to work with 7 Deadly's growers in the Lodi AVA, which we believe grows the best Zinfandel in California and the world," said Brian Vos, CEO of The Wine Group in a press release. No price was disclosed.

Non-exempt workers and Wine Group settle

A California judge in late October okayed a $6.8 million agreement to settle a lawsuit in which non-exempt workers alleged a series of labor violations by the Livermore, Calif.-based company, including failure to properly pay overtime and minimum wages. The lawsuit also maintained that the company failed to pay wages on time and maintain requisite paperwork. The Wine Group produces more than 50 million cases of wine annually according to Wines Vines Analytics and produces dozens of brands.

St. Francis buys Russian River vineyard

St. Francis Winery & Vineyards acquired an 80-acre Chardonnay vineyard near Eastside Road in the Russian River Valley AVA for a reported $9.2 million. According to a press release announcing the acquisition, the winery plans to replant the property to additional varieties. St. Francis now owns four estate vineyards that include another property in the Russian River Valley and two in Sonoma Valley. Zepponi & Company was the exclusive advisor to Silverado Investment Management Company, which sold the property to St. Francis.

Lawsuit alleges TCA taint from barrel

Opus One winery in Napa Valley filed a lawsuit for more than $470,000 over the sale of barrels allegedly contaminated with 2,4,6-trichloroanisole (TCA), according to court records. The winery alleges 10 French oak wine barrels were contaminated with TCA, resulting in the loss of 590 gallons of Cabernet Sauvignon. The defendants listed in the lawsuit include Alain Fouquet and Associates Inc., Alain Fouquet French Cooperage, Bouyoud Distribution and associated entities, according to the complaint filed Dec. 11 in Napa County Superior Court and first reported by *Wine Business Monthly*. Opus One seeks at least $471,356 in damages, which include wine losses, $9,800 for the 10 barrels and testing expenses, according to the lawsuit. When contacted by *Wine Business Monthly*, Alain Fouquet referred questions to Bouyoud Distribution, saying he is only a distributor for the barrels. TFF Group of France owns Bouyoud and Alain Fouquet French Cooperage, TFF's website indicates. Neither TFF nor Bouyoud representatives could be immediately reached to comment on the complaint.

Francis Coppola gets into the cannabis business

A new company created by film director and California winery owner Francis Ford Coppola has launched a cannabis lifestyle brand called the Grower's Series. "Wine and cannabis are two ancient and bounteous gifts of Mother Nature, linked by great care, terroir and temperateness. Expertise making one applies to the other," said Coppola in a news release. The Coppola product's packaging features an innovative tin canister that opens to reveal three precise grams of cannabis flower. According to the company, each strain offers a unique experience that reflects the diverse Humboldt County microclimates where the cannabis is grown.

LATEST NEWS

More detail on the news at winesandvines.com.

MARZOLA leads the field in grape-pressing technologies

Nowadays, it is hard to find companies that have been active for more than 160 years, the result of constant renovation, with the purpose of catering to the current needs of their market. Marzola specializes in the design, manufacturing and maintenance of machinery and equipment for wineries. The company was established in 1851 and has helped the wine industry grow ever since, collaborating in the technological development and innovation of some of the most important wineries in the world.

Marzola offers a full range of equipment and systems for all wine production processes, from cutting-edge grape reception and pressing machinery to engineering projects, providing tailor-made solutions for each client, robust, reliable and powerful technology.

Flagship products include the Basket Press for traditional grape pressing, and the Progressive Draining Press (PDP), applying a technology that prevents mass from returning into the containers during pressing.

Vertical press system

The pressed wine extracted from vertical press systems is known for premium quality compared to the wine produced with other pressing processes. Vertical press systems require additional workers and the pressing yield compared to other systems is much lower, but the result is higher quality in the wines produced.

Benefits of Marzola's vertical press system are:

- No pumping is required to transport grapes to press;
- Pressing without the movement of mass: Whole grapes remain intact so the grape juice comes out clearer;
- The clearer and cleaner grape juice requires less filtering.
- Marzola's years of experience in the wine sector achieved ideal design in vertical press systems for the highest yield and quality of the grape juice.
- Steamlined pomace removal: The tray with the pressed grapes is transported to the pomace area of the winery, leaving the crushpad clear of debris and and producing an area that can be shown to and enjoyed by customers.

Marzola clients can install a modem for a direct online connection between Marzola and the winery for the remote maintenance of the machines, modification of programs, fault control, etc., with no need for Marzola's technicians to visit the winery facilities. The press connects to winery computer systems for monitoring of all operating parameters such as the pressing settings, times, pressures, etc.

Continuous-processing progressive draining presses (PDP)

Wine-producing areas with high production volumes (mainly white grapes) require machines that can process a high volume of grapes with continuous-processing systems to speed up the reception of the harvested grapes at the winery. The traditional "rack-and-frame press" had many limitations and problems.

The Progressive Draining Press (PDP) has managed to change the negative perception about continuous-pressing systems.

Benefits of Marzola's Progressive Draining Presses:

- All elements in contact with grapes are made out of AISI 304 Stainless Steel;
- The screw conveyor (rotor) does not touch the vat (stator), reducing the wear between elements to the bare minimum thanks to the absence of friction, allowing a higher process yield;
- With the new screw conveyor design, there is no friction and no mass anti-return elements are installed, achieving higher quality levels and production yields;
- Flexibility and ease of programming of the pressing parameters, achieving the optimum operating pressures and production yields.
- Grape juice quality that is similar to that obtained with pneumatic press systems, but with the added benefit of applying continuous production processes, which prevents interruptions in the operation of the reception assembly.

Marzola also offers PDP customers a remote maintenance service for its machines, with an online connection between the company and the winery, as in the case of the vertical press. The system is computerized and all operating parameters can be recorded and analyzed by the winery, without the need for technicians to visit the winery's facilities.

Thanks to the know-how acquired during all of these years, Marzola is a leader in the manufacturing of winemaking machinery adapted to current times, now supported by the Biele Group.

TOP STORY

Officials Say Elouan Oregon Labels Misleading

Copper Cane Wines & Provisions of Rutherford, Calif., agreed in November to discontinue its current labels for the Elouan and Willametter Journal brands after it was accused of misleading labeling by Oregon vintners, the Oregon Liquor Control Commission (OLLC) and the Tax and Trade Bureau (TTB) of the U.S. Department of the Treasury.

The fast-growing Pinot Noir wine brands are produced and bottled in California from grapes grown in Oregon. The labels had been approved previously by the TTB, but were rejected after protests from Oregonians, including Oregon State Representative David Gomberg and Jim Bernau, the board chairman and president of 125,000-case Willamette Valley Vineyards.

At press time, Copper Cane's vice president of operations, Jim Blumling, told *Wines & Vines* that the company voluntarily "surrendered" nine certificates of label approval (COLAs) including those involved in the dispute, and has gotten approval for new labels with revised wording to be used when bottling resumes in January. In the meantime, officials gave Copper Cane a "use up" provision to sell the remaining 76,000 cases of Pinot Noir with the old labels.

Copper Cane's annual production is 300,000 cases, according to Wines Vines Analytics, and its average bottle price is $21.

"Our expectation is that come January when we bottle, we will use the added rigor in terms of labeling that will meet the TTB's expectation," he said.

Oregon objections

Oregon winemakers became vocal about Copper Cane's labels earlier this year. The protests ramped up during the harvest season at the same time that some Oregon growers grumbled that Copper Cane had refused to buy contracted grapes, citing smoke damage from wildfires.

State Representative Gomberg made a great issue of the use of "fanciful" terminology such as "Oregon Territory" and "Oregon Coast" monikers on the Copper Cane labels, which he said were either archaic or non-existent, and certainly not regulated appellation names. This added to the potential for consumer confusion, he said.

Bernau of Willamette Valley Vineyards has protested publicly that the Copper Cane wines will diminish the reputation of Oregon wines in general and Willamette Valley wines specifically. He said that Copper Cane owner Joe Wagner, whose family founded Caymus Vineyards in Napa Valley and created the best-selling Meomi California Pinot Noir brand, is making wines that are darker, more powerful and less varietally correct than the style established by Oregon winemakers in the past 40 years.

But what made it a regulatory question, was Copper Cane's use of wording that stated or implied the wines represented individual AVAs instead of being the statewide blends that they are

Earlier the OLCC had declared that Copper Cane had committed seven violations in labeling and threatened to prohibit sales of the wine in Oregon, where less than 10% of Elouan's 100,000-case-plus production is sold. Blumling accompanied Wagner for a meeting with the OLCC, after which it confirmed that Copper Cane remained legally licensed and allowed to sell in Oregon, Blumling said.

It's the TTB's responsibility to see that wine labels meet all the labeling requirements of the federal government including proper use of state and county appellations and individual American Viticultural Areas. "But you've got to realize that they can go back and look again," said Napa, Calif.,based attorney Richard Mendelson, who has advised wineries on legal issues in labeling for decades. "Anybody has the right to question a COLA."

He added that the TTB's main objective in issuing COLAs is to ensure that they are truthful and not misleading. That was one of the arguments by members of the Oregon industry. The labels for Elouan and Willametter Journal wines included place names such as Willamette, Rogue and Umpqua that are the same or similar to individual Oregon AVAs.

When AVAs can be used

But since the wines were produced and bottled in California, the TTB doesn't allow them to be identified by the AVA names, only by the broader Oregon appellation. This is a provision only for contiguous states.

Other California-owned wine companies such as Jackson Family Wines have bought or built wineries in Oregon for quality control reasons and so that the wines they make from Oregon-grown grapes can legally carry the AVA names on the packaging.

The Jackson-owned Siduri winery labeled its 2015 Pinot Noir as Zena Crown Vineyard, Eola-Amity Hills, Oregon, produced and bottled by Siduri Wines in Yamhill, Ore.

WALT wines, based in St. Helena, Calif., has taken another approach, buying Oregon Pinot Noir grapes, making the wine in California, labeling it as an Oregon wine and also adding an individual vineyard designation, which is not regulated by law. For instance, WALT's 2015 Oregon Pinot Noir front label states Shea Vineyard, which is in the Yamhill Carlton AVA and the Willamette Valley AVA, but makes no mention of those.

Geographic wording on Elouan labels was ruled misleading.

Out-of-state specialist

One winery whose business plan is founded on using out-of-state grapes is Cooper's Hawk, based in Woodbridge, Ill. The 700,000-case winery buys grapes, must and bulk wine mostly from California but does most of the production and bottling at its new winery in Illinois.

"Our entire portfolio except for some imported, bottled wines, is appellated American and nonvintage," said Ben Hummer, senior vice president of operations and winemaking. "It's really just to give our winemaking team the best opportunities to hit a specific wine profile."

Hummer said that Cooper's Hawk has never made a Pinot Noir from Oregon grapes, but he comes from Washington State and worked in Walla Walla, Wash., for Precept Wines. He said he understands the response to Elouan's labeling transgressions.

"What I know about the Oregon wine industry as a whole is they have a tremendous amount of pride, especially in Willamette Valley Pinot Noir," Hummer said. "Coming from the Northwest, I definitely understand why they would have concerns about protecting the reputation of their region."

—Jim Gordon

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Northwest Continues to Lure Investment

Washington may be the second biggest wine producing state in the U.S., but its growth has been driven largely by homegrown entrepreneurs with little help from foreign investors. California wineries have made investments here, and Ste. Michelle Wine Estates' ventures with Ernst Loosen and the Antinori family have won acclaim, but Oregon has been the destination of choice for direct foreign investment.

The construction of a 22,000 -square-foot winery and tasting room south of Walla Walla by Bodegas Valdemar S.A. of Rioja is changing that. Valdemar expects to spend up to $18 million on winery and vineyard development over the next five years, the first time a vintner from Europe has set up a new winery in the state independent of local partners.

"We came here with my father and my sister and we really fell in love with Washington, to be honest," says Jesús Martínez Bujanda, CEO of Valdemar Estates, the Washington venture of his family's Rioja winery in Oyón. "In the first trip, we realized that we were going to do something here."

Bodegas Valdemar produces approximately 150,000 cases a year and wanted to expand within Spain, but after scouting local opportunities it turned its attention abroad. The market at home was crowded, and the family looked for a less mature market with dynamism and opportunity.

Washington fit the bill. Martínez Bujanda spent a semester as an exchange student at the University of Washington in 2009 during his business administration studies so he was aware of what was possible, and the state ranked high on the list. The cost of entry was cheaper than California, and the range of high-quality grapes being grown was more diverse than many other U.S. regions.

"Washington has a lot of opportunities for, basically, all the varietals," he said. "The prices here are still reasonable in terms of the grapes, and the prices of the wines are quite high." A key partner in establishing the new venture is Norm McKibben, who sold Valdemar a site adjacent to Amavi Winery for a new, 20,000-square-foot production facility and tasting room.

Valdemar Estates will have a capacity of 10,000 cases but production will start small and increase in step with demand. A stunning 2,000-square-foot tasting room with an outdoor seating area of similar size promises to make the winery a destination and build a following for wines expected to retail in the $80 range.

The winery crushed 12 tons last year from vineyards across the state, which will underpin an initial release of approximately 600 cases when the winery opens in 2019. It received 36 tons of fruit this year sourced from some of the region's best vineyards, including two sites in the Rocks District of Milton-Freewater on the Oregon side of the Walla Walla Valley AVA as well as properties in the Yakima Valley and on Red Mountain.

Valdemar has purchased 26 acres in the Rocks, which it expects to begin planting in 2020 and is also in discussions for another 50 acres in a "very interesting place" but negotiations are ongoing. The plan is to continue sourcing fruit from vineyards across the state for the foreseeable future, learning about local capabilities.

The focus of winemaker Ma-

rie-Eve Gilla will be Cabernet Sauvignon and Syrah, as well as Grenache. Chardonnay, given Gilla's experience in France, is a top candidate for a white varietal. The project excites Ashley Mahan, chief operating officer of the Walla Walla Valley Wine Alliance, who toured the emerging facility a month ago. "I'm still blown away," she said. "The family is extremely nice and come with a great deal of knowledge, passion, and camaraderie. We're very happy to welcome them into Walla Walla!"

Meanwhile Oregon continues to draw significant investment with the latest new player being The Family Coppola company, which announced its acquisition of Vista Hills Vineyard, a 42-acre property in the Dundee Hills AVA, in late October. The Family Coppola includes Francis Ford Coppola Winery in Geyserville, Calif., and other wine companies.

"Washington has a lot of opportunities for, basically, all the varietals. The prices here are still reasonable in terms of the grapes, and the prices of the wines are quite high."

—Jesús Martínez Bujanda, CEO of Valdemar Estates

The deal makes the Coppola family the latest to venture into Oregon and adds 42 acres of Pinot Gris and Pinot Noir to its vineyard portfolio. While the acreage in Oregon is small, the real estate is important as Coppola looks to the future. "These vineyards produce some of the finest fruit in Dundee Hills and make a perfect fit within our premium wine offerings," CEO and winemaker Corey Beck said in a statement announcing the deal. "We're proud of this opportunity to own prime real estate embedded in such a respected region."

Others are also on the hunt for properties, including Foley Family Wines.

"Over the past six months we have been investigating several potential vineyard acquisitions in both the Willamette Valley and Southern Oregon," Foley Family Wines president Hugh Reimers told *Wines & Vines*. "As you can imagine not every vineyard is created equal, and finding the best properties is challenging in a hot grape and real estate market."

The heat sparked the advisory firm Metis LLC to open a Portland, Ore., office early this year. Santa Rosa's Zepponi & Co. is also active in the market, advising Vista Hills owners the McDaniel family on its sale to Coppola and also participating in Foley's purchase of Acrobat. It advised on Duckpond Cellars' sale in September to the Great Oregon Wine Co., a division of Integrated Beverage Group, and Huneeus Vintners' purchase of Benton-Lane Winery in January.

"There's a lot of activity," said Mario Zepponi, founder and principal of Zepponi & Co., noting that Willamette Valley properties are known as premium plays. "It's quite high, because of the interest that's being driven domestically, primarily by California wineries … And then on top of that you have this compound effect of a number of foreign wineries and spirit companies looking at Oregon for some of those niche luxury plays as well."

—Peter Mitham

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Mastering Misinterpreted Merlot

The Masters of Merlot seminar, held Nov. 1 at the Culinary Institute of America in Napa, Calif., brought together a panel of experts to discuss the nuances of the grape variety and the importance of educating the consumer.

"In my roles as a writer and educator I taste all sorts of wines with just about anyone who will listen," said the event's moderator Anthony Giglio. "Merlot often comes up in the context of, 'do you drink Merlot?' as if asking for approval. The answer, of course, is yes."

The panel included Ted Edwards, winemaker for Freemark Abbey Winery; P.J. Alviso, vice president of winegrowing for Duckhorn Vineyards; Cleo Pahlmeyer, president of Pahlmeyer and Chris Carpenter, winemaker for Mt. Brave & La Jota.

All agreed that Merlot is a "finicky" variety to grow. The vines can be over-vigorous; grapegrowers need to constantly monitor soil moisture and vine stress. The thin-skinned grape is often prone to rot and requires regular leaf management. Merlot is sensitive to extreme temperatures, with a tendency to shatter; growers must be aware of temperature fluctuations and respond appropriately.

According to California Department of Food and Agriculture's vineyard acreage reports, bearing acreage of Merlot hit a high of 51,570 acres in 2006 but fell to 48,648 in 2007. Acreage continued to decline in subsequent years and has remained flat at around 40,000.

Though California's Merlot plantings have decreased, the panelists agreed those plantings are more purposeful and the winemaking is more mindful.

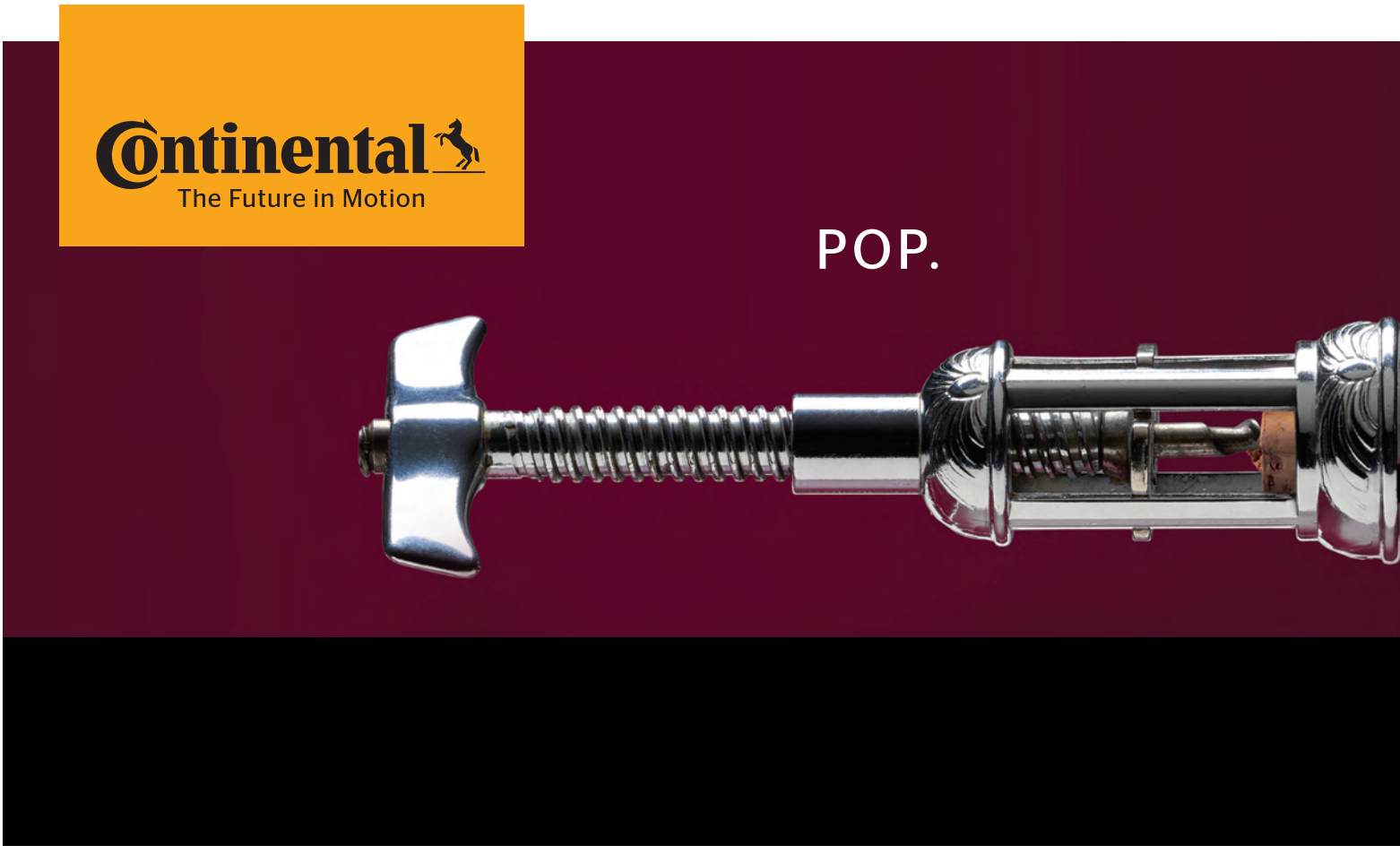
During the tasting, Edwards presented the Freemark Abbey 2015 Bosché Vineyard Merlot. Located up against the Mayacamas Mountains separating Napa and Sonoma counties, the Bosché Vineyard, according to Edwards, is an idyllic spot to grow Merlot. Situated along the Rutherford Bench, the area enjoys deep gravelly loam soils and a high water table during winter and spring.

Carpenter pointed out that in today's marketplace, wine consumers have many choices, and it's the lack of education about those choices that makes them miss out on a wine as significant as Merlot. "It's like expounding on the difference between blues and rock and why each form of music should have a showcase and a place in your listening time," he said. "Merlot is the blues to Cabernet Sauvignon's rock, and to not experience it as its own expressive choice is to miss out on something that is as enjoyable as other 'noble' varieties are," he said.

According to a Wines Vines Analytics report based on data by the market research group IRI, Merlot was the only major varietal to see a sales decline falling 6% to $563 million in the 52 weeks ending July 15.

But consumers could be seeking out higher quality Merlots from better sites as direct-to-consumer shipments of Merlot increased nearly 10% in the last 12 months ending in July. The total value of all Merlot shipments increased from $65 million in the 12 months ending April 2017 to $72 million in the same period ending April 2018. Merlot's average bottle price also increased from $30.53 to $32.46.

—Stacy Briscoe



Regional News

CALIFORNIA

WX acquires Reckless Love, Sunday Funday

WX Brands purchased Reckless Love and Sunday Funday wine brands. The two brands join WX Brands' portfolio, which includes Bread & Butter, Chronic Cellars, Jamieson Ranch Vineyards, Jelly Jar and Our Daily Wines. Reckless Love and Sunday Funday was founded by winemaker Chip Forsythe.

Boeger receives congressional commendation

Greg Boeger, founder and owner of Boeger Winery in Placerville, Calif., received a Congressional Commendation for Wine by U.S. Representative John Garamendi. The award "officially recognizes outstanding public achievements" of people who live in the congressman's district. Earlier this year, Boeger received the Wine Lifetime Achievement Award from the California State Fair.

Paradise Ridge breaks ground on new winery

The Byck family officially broke ground to rebuild Paradise Ridge Winery a year after it was destroyed in the October 2017 wildfires. The winery hired Santa Rosa-based TLCD Architecture to design the new structure using the same footprint as the original building. Wright Contracting will be managing construction. While Paradise Ridge moves forward in the next stage of recovery, the winery's Kenwood, Calif., tasting room remains open.

Sonia Byck-Barwick, left, Walter Byck and Rene Byck.

Napa's Elyse Winery sold

Ray and Nancy Coursen sold Elyse Winery to fellow Yountville local Josh Peeples. Russel Bevan will continue as winemaker. Elyse Winery was founded in 1987 with their first production of Zinfandel from Morisoli Vineyard. After a decade of winemaking at various custom crush facilities, in 1997 the Coursens purchased their winery and vineyard on Hoffman Lane.

Halkovich named VP of operations at Heitz

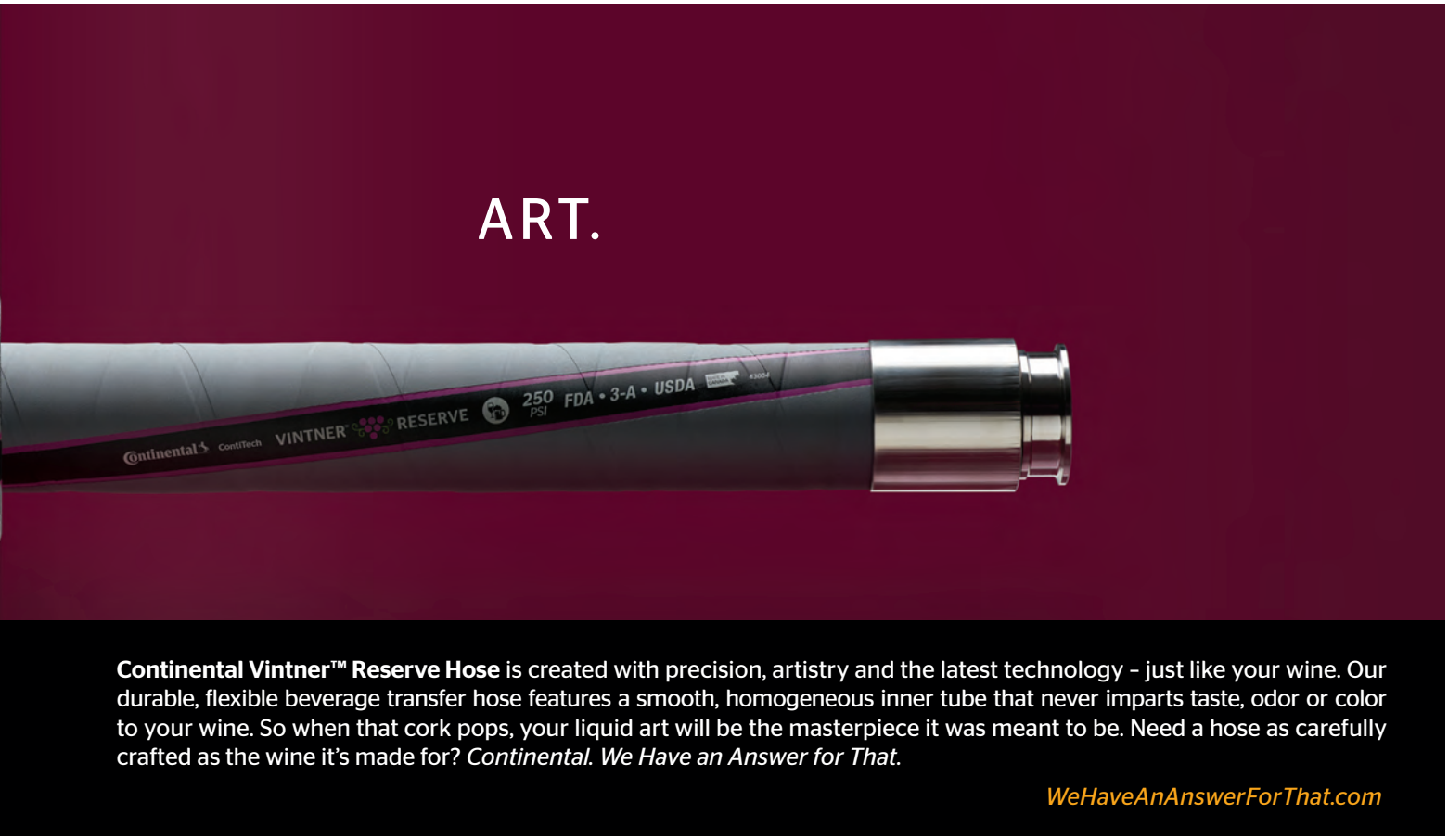
Heitz Wine Cellars hired Toby Halkovich as vice president of operations. Halkovich's responsibilities will include leadership and oversight of vineyard operations, winemaking, production and facilities. Most recently the director of vineyard operations at Cakebread Cellars in Rutherford, Calif., Halkovich was also the Cakebread viticulturist for almost a decade.

Ted Reimer dies

Thirty-year wine industry veteran Paul David Reimer, known by most as Ted, passed away in early November. His early career began with Joseph Phelps, which led to establishing his first company WineSpell. He owned, managed or worked for some of the country's top wine importers and distributors, including The Sorting Table, Wilson Daniels, Sherbrook Cellars, The Henry Wine Group, Benchmark Wine Group and Big Bang Wines. He is survived by his daughters, Natalie and Audrey, ex-wife, Jennifer, siblings, Mark and Kristie, and father, Paul.

Maley hired as GM at Robert Young

Robert Young Estate Winery in



Healdsburg hired Karen Maley as its new general manager. Prior to joining Robert Young, Maley was the general manager at Electric Sky Wine, held a leadership role at StackTeck Wines, was a founding partner at Stryker Sonoma Winery in Alexander Valley and worked as a senior director of marketing at E. & J. Gallo Winery.

Donum Estate's new winery

The Donum Estate announced it expected to complete a new winemaking facility, permitted to produce up to 12,000 cases of wine annually, by the end of 2018; the first vintage made in the new facility will be 2019. It is designed by San Francisco-based MH Architects, the same team that designed the Donum hospitality space that opened in September 2017. The winemaking facility is located on Donum's 187-acre estate in the Carneros region of Sonoma County.

C. Mondavi names new CFO

C. Mondavi & Family of St. Helena hired Claire Hobday as the company's chief financial officer. Most recently, Hobday acted as director of finance and accounting of wine entities for Pacific Union Company. In this role she provided financial leadership and reporting for wine entities such as Harlan Estate Winery and BOND Estates. Hobday received an executive MBA in wine business at Sonoma State University in 2018, and also holds a Level II WSET certification.

NORTHWEST

Cooper Mountain Vineyard purchases Olenik Vineyard

Cooper Mountain Vineyards purchased the 50-acre Olenik Vineyard in the Chehalem Mountains AVA in Willamette Valley. The purchase of the vineyard brings Cooper Mountain Vineyards' holdings to a total of five vineyards and 152 planted acres. The winery celebrated its 40th vintage with the 2018 harvest.

Katie Santora

New Winemaker at Chehalem Winery

Chehalem Winery in Newberg, Ore., promoted Katie Santora to winemaker. Santora has been with the winery for seven years, hired as assistant winemaker in 2012 and promoted to associate winemaker in 2016. She received an enology and viticultural degree from the University of California, Davis.

Corcelettes buys 132 acres in Similkameen

Corcelettes Estate Winery in Keremeos, British Columbia announced its purchase of 132 acres of land on the Keremeos Upper Branch in the Similkameen Valley. The property is contiguous to the winery's current estate and will support increased production of red wines. According to a statement announcing the purchase, Corcelettes will develop 30 acres of new vineyards over the next five years.

CENTRAL

New executive director of Texas group

The Texas Wine & Grape Growers Association Board appointed Dacota Haselwood as its new executive director. Haselwood's selection follows the resignation of the current executive director, April Mitchell, who resigned to pursue other business interests. Haselwood began her tenure with TWGGA in September of 2004 and served as executive director until late 2008. At that

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time, Haselwood became TWGGA's part-time chief governmental affairs officer.

Leelanau pioneer dies

Bernie Rink, who founded Boskydel Vineyard winery in Lake Leelanau, Mich., in 1965 died on Nov. 29. He was 92. Rink is credited with helping to launch the wine industry in northern Michigan when he planted a 1 acre test vineyard in Leelanau County. In 1970, Rink opened the winery and the region's first tasting room. The Rink family closed the winery in 2017. In addition to his work as a vintner, Rink was the library director at Northwestern Michigan College for 30 years.

EAST

Constellation Brands names next CEO

Constellation Brands, Inc. named Bill Newlands as the company's new president and chief executive officer, succeeding current CEO Rob Sands, effective March 1,


Bill Newlands

2019. Sands will then assume the role of executive chair. Newlands joined Constellation Brands in 2015 as executive vice president and chief growth officer. Prior to joining Constellation Brands, Newlands held several senior leadership roles in the beverage alcohol industry spanning more than 30 years.

Shenandoah Vineyards purchased

Michael Shaps of Michael Shaps Wineworks purchased Shenandoah Vineyards, the second oldest active winery in Virginia, located on South Ox Road in Edinburg, Va. Shenandoah Vineyards was founded in 1976 by Jim and Emma Randel.

SUPPLIER

Joe Martin joins StaVin

StaVin Inc. hired Joe Martin as its new sales consultant servicing California's Central Coast wineries. Martin comes to StaVin with more than 20 years of experience in wine production. Most recently, Martin held a winemaking position at Constellation Brands' Gonzales, Calif., winery, where he specialized in red wines.

LibDib partners with RNDC, expands to Wisconsin

Republic National Distributing Company (RNDC) and Liberation Distribution (LibDib) have partnered together. As a part of the agreement, LibDib clients will be able to use RNDC's logistics to deliver their products to buyers in all available markets. In return, RNDC will have access to LibDib's technology and data collection, enabling the company to further expand its services. According to a press release, the two companies are working to integrate technologies and complete the expansion into new markets. RNDC and LibDib will share data and technologies to provide both customers and suppliers with broader market access and modern selling tools. Additionally, LibDib founder and CEO, Cheryl Durzy announced during her keynote speech at the Craft Beverage Distribution Conference that the company is also partnering with Capitol-Husting Company, Inc., a family-owned and operated alcohol wholesale business in Wisconsin. The partnership will allow any licensed producer of wine and spirits to sell their products into the state of Wisconsin and any licensed business in the state to purchase products on the LibDib website.

Product News

Latest offerings and announcements

Optical grape-sorting robot

Conception Industrielle & Technologies Futures (CITF) debuted its "Alien" optical grape-sorting robot on the crush pad of Alpha Omega Winery in Napa Valley, Calif. The Alien, which at Alpha Omega was positioned after a destemmer and berry sorter, employs delta robotic technology, with each robot consisting of three arms that move up and down and from right to left quickly and have a suction gripper at the end. After the machine spots material other than grapes (MOG) in the berry stream, the robotic arms move toward the material and suck it off the conveyor for disposal. According to the manufacturer, the machine can sort up to 8 tons an hour and remove up to 400 MOG per minute. "A human sorter, after two or three hours on the line, their eyes get tired. They're talking and get distracted," Alpha Omega winemaker and general manager Jean Hoefliger said in a statement released by the winery. "Alien achieves the same level of accuracy and consistency from the first second to the very last second." CITF-group.us

Bottle for *terroir*-focused wines

Saverglass describes its new Bourgogne Terroir bottle as glass with "character and strong personality" to help express the principles of "authenticity, artisanry, handcraftsmanship," which are hallmarks of wines made to express *terroir*. The bottle features a long, slender neck; deep, square punt; pronounced shoulders; and a broad and cylindrical body. To further reflect the diversity of wine regions, the bottle is available with a classic, angular Bourgogne finish, traditional "lotus" finish and double cordon finish. saverglass.com

Platform to support export programs

MHW Ltd. announced it is offering U.S. beverage alcohol companies a model to build export business to Europe, with other world regions to follow. According to the company, the MHW European platform will operate through a logistics hub in the Netherlands with additional staff in the United Kingdom and back-office support from more than 100 employees based in New York. Services include: compliance and European legislation consulting; customer service; operations support; and accounting, all supported by a best-in-class technology suite providing real-time business intelligence to clients. MHW is a nationally licensed importer and distributor that serves more than 350 wine, spirits and beer clients in the U.S. mhwltd.com

Swatch book of performance labels

Monadnock Paper Mills released a swatch book of the company's Envi line of wet-strength labels that it claims are "proven not to fray out or wrinkle over time, even in the coolest and wettest of environments." The book also includes a range of premium, uncoated stocks composed of alternative fibers such as wood, post-consumer waste fiber and the Kona series produced with fiber from reclaimed coffee-bean bags. mpm.com

Enhanced TankNet controller

Acrolon Technologies released a new TankNET PM-4000 touchscreen controller to manage cellar temperature by "intelligently" picking between mechanical cooling and night-air ventilation cooling. The PM-4000 is also capable of humidity control and carbon dioxide exhaust and can be integrated seamlessly into an existing TankNET system and remotely monitored and controlled from

any web browser, iPhone or Android device. acrolon.com

Recycled-content clear-film labels

UPM Raflatac unveiled the Vanish PCR line of ultrathin, clear-film labels that are available with 90% recycled-content face and lines. In what the vendor describes as "a global first for sustainable packaging," the material provides a "no-label" appearance and is ideal for glass or aluminum beverage packaging. "New Vanish PCR labels can help you stay ahead of market trends and meet — or even exceed — your sustainability targets," said UPM Raflatac's global marketing manager, Fernando Giron, in the press release announcing the new line of labels. upm.com

Organic insecticide

Caltec Ag announced that its AG DE-cide organic insecticide for soft-bodied insects such as vine mealybug has been approved for use in California. The manufacturer reports the product, which employs diatomaceous earth, is suitable for post-harvest applications and is listed with the Organic Materials Review Institute. caltecag.com

Smartphone for winery, vineyard work

Cat Phones collaborated with a Spanish winery to evaluate the Cat S41 smartphone, designed for the rugged parts of working in wineries and vineyards. The phone was built to withstand being dropped in mud or water or getting covered in soil in the vineyard. According to the manufacturer, the phone can also handle getting dropped from heights onto concrete floors, such as falling from a catwalk near the top of a tank. The phone also features extended battery life and better audio for making phone calls near loud equipment or machinery. catphones.com

Digital logistics platform

JF Hillebrand launched a new digital customer platform, myHillebrand. Available through the global logistics provider's website and apps for Apple and Android devices, the platform enables JF Hillebrand customers to track shipments from order placement to delivery, receive notifications, manage finances and monitor temperature and emissions levels. Jfhillebrand.com

Premium wire hood for sparkling wine

Sparflex, Muselet Valentin and Ateliers Martineau collaborated to produce a new luxury wire hood for sparkling wine called Muselet Art & Craft. Designed for "distinguished cuvées throughout the world," the hood is "embossed with great precision, finesse and depth" while still maintaining all expected sparkling wine packaging standards. Sparflex is distributed by Cork Supply USA. corksupplyusa.com

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No. 1

San Francisco, California, December 1, 1919.

NOW FOR THE 1920 GRAPE CROP

By Horatio F. Stoll

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There is no use trying to hide the fact that this demand came from wine drinkers in every nook and corner of the country who wanted to make a limited quantity of wine for home consumption.

Thousands of tons of grapes were used in the manufacture of grape juice, which, it was expected, might later be fermented into wine.

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COLLECTOR'S EDITION

CELEBRATING 100 YEARS

SPECIAL COMMEMORATIVE SECTION

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100 GAME CHANGERS

What moved the North American wine industry forward during the last 100 years? Events as big as Prohibition and as seemingly small as a television news report on "60 Minutes." People as prominent as winery founder Robert Mondavi and as modest as cold-climate grape breeder Elmer Swenson. Innovations as complex as membrane filtration and as simple as a collection of plastic tubing called drip irrigation.

As *Wines & Vines* enters its 100th year of publishing, we want to acknowledge and celebrate the contributions made by 100 Game Changers described in the following pages. They were critical in transforming the wine industry since 1919 from a depressed, practically hopeless scattering of wineries and vineyards about to be outlawed by a U.S. constitutional amendment to a thriving, growing industry that now generates $47 billion in sales per year of U.S. wines and has a $9 billion economic impact in Canada.

Our editorial team compiled the admittedly subjective list of Game Changers based on our own knowledge and judgments aided by several industry members. Our goal was to recognize people, events and innovations that significantly altered the course of wine production and grapegrowing. We hope you enjoy paging through the mini-articles that follow. They are not ranked in order of importance but are meant to provide a winding tour through the history of our industry.

The articles were written by Andrew Adams, editor; Stacy Briscoe, staff writer; Linda Jones McKee, Wine East editor; Peter Mitham, Northwest correspondent; Laurie Daniel, contributing writer; and myself.

— Jim Gordon

Leon D. Adams

Author and advocate for American wines

Leon Adams (1905-1995) was an author and advocate for wine who helped introduce a then-niche beverage to a wide swath of U.S. consumers using plain language and a no-nonsense approach in his communications. Adams wrote numerous books on wine, most notably "The Wines of America," first published in 1973 and later going through three more editions with the last being printed in 1990. He was also a founder (or "the" founder, according to the jacket of his last book) of California's Wine Institute in 1934.

"The Wines of America" told the story of North American wines and winemakers from the 16th century forward and included brief descriptions of hundreds of wineries. It was a major reference work for the wine industry as well as consumers and helped guide a generation of what would later be called "wine writers." Adams pushed for organization and government policies that would make wine more acceptable in American culture and winemaking more practical as a way of making a living. He was a founder of the Society of Medical Friends of Wine and advocated for farm winery bills that allowed wineries to proliferate around the country.

The Boeing 707

International travel shrunk the globe for winemakers

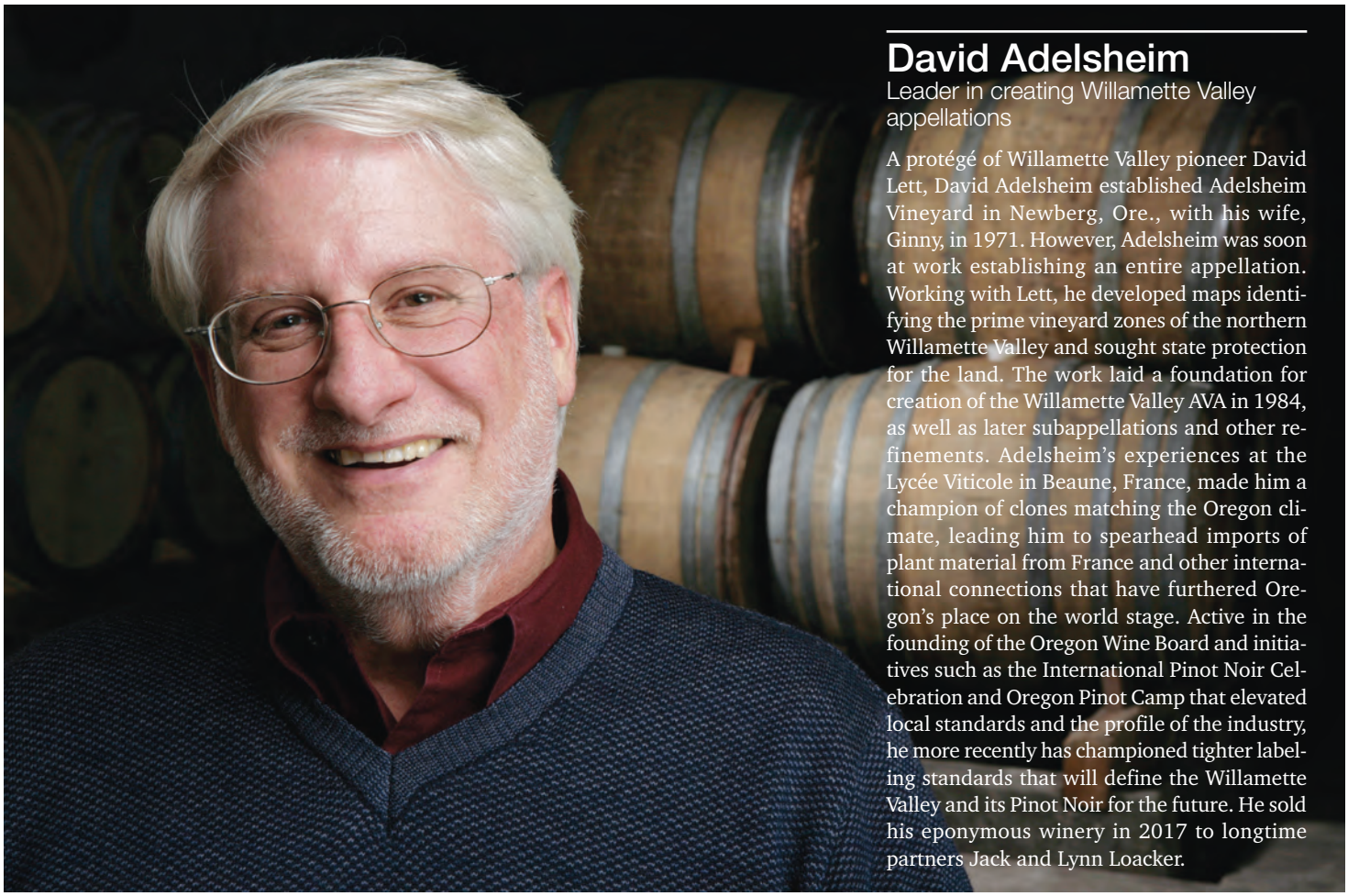
Affordable jet airline tickets became available for business and personal travel in the 1960s, enabling North American winemakers to see, smell and taste for the first time what was going on in the rest of the world's vineyards and cellars. Equally important, international winemakers were able to visit vineyards in the U.S. Exchanges of technical information, attendance at international conferences, and internships abroad became practical, and the profession of "flying winemaker" was created by consultants who worked in multiple hemispheres.

Dr. Maynard Amerine

Erudite researcher and teacher at UC Davis

A prolific researcher, educator and author, Maynard Amerine (1911-1998) was the first faculty member hired when, after the repeal of Prohibition, the University of California revived its Department of Viticulture and Enology at the Davis campus in 1935. He went on to conduct seminal research on the links between climate, grapegrowing regions and wine-grape varieties as well as important work on fermentation and sensory evaluation. His books ranged from how-to textbooks such as "Table Wines, the Technology of Their Production" in 1951, which he co-authored with M.A. Joslyn, to the subject of connoisseurship in "Wine, an Introduction for Americans" with co-author Vernon Singleton, first published in 1965.

Amerine worked with Albert Winkler in the early 1940s on research across California that resulted in the classification of regions by their number of growing degree days. Amerine also made substantial contributions to knowledge about wine-judging methods, wine and must analysis, color in wines, the aging of wine, the control of fermentation and the literature of wine. As his biography on the University of California, Davis website states: "His combination of practical and theoretical scientific knowledge, connoisseurship, erudition and prolific output made him, to the American public, the pre-eminent member of that group of U.C. Davis scientists who renewed research on vines and wines after Repeal of Prohibition."



David Adelsheim

Leader in creating Willamette Valley appellations

A protégé of Willamette Valley pioneer David Lett, David Adelsheim established Adelsheim Vineyard in Newberg, Ore., with his wife, Ginny, in 1971. However, Adelsheim was soon at work establishing an entire appellation. Working with Lett, he developed maps identifying the prime vineyard zones of the northern Willamette Valley and sought state protection for the land. The work laid a foundation for creation of the Willamette Valley AVA in 1984, as well as later subappellations and other refinements. Adelsheim's experiences at the Lycée Viticole in Beaune, France, made him a champion of clones matching the Oregon climate, leading him to spearhead imports of plant material from France and other international connections that have furthered Oregon's place on the world stage. Active in the founding of the Oregon Wine Board and initiatives such as the International Pinot Noir Celebration and Oregon Pinot Camp that elevated local standards and the profile of the industry, he more recently has championed tighter labeling standards that will define the Willamette Valley and its Pinot Noir for the future. He sold his eponymous winery in 2017 to longtime partners Jack and Lynn Loacker.

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American Society for Enology and Viticulture

Played a key role in making winemaking a respected profession

Founded in Stockton, Calif., in 1950, the American Society for Enology and Viticulture (ASEV) was a catalyst for turning the gritty job of winemaker into a respected profession. Its meetings, scientific journal — the *American Journal of Enology and Viticulture* – and scholarships were instrumental in the sharing of information among academics and working winemakers, which subsequently improved the quality of American wines.

The ASEV credits Charles Holden as its instigator. He convinced winemakers around California, who at the time were low-paid and sometimes laid off for eight months a year, that they deserved more recognition for their key role in wine production. The early founders and members included professors like Maynard Amerine and James Guymon as well as winemakers like Louis P. Martini and André Tchelistcheff.

The annual ASEV National Conference, now in its 69th year, became the leading event in North America for the presentation of new research on grapes and wine from around the world and for lectures that serve as continuing education for hundreds of winemakers and viticulturists. The ASEV joined with the California Association of Winegrape Growers to create another annual event, the Unified Wine & Grape Symposium, which is by far the biggest and most important conference and trade show for the North American wine industry.

Dr. Linda Bisson

Professor and researcher made breakthroughs in yeast genetics

A professor and geneticist, Linda Bisson is now an *emeritus* faculty member at the University of California, Davis Department of Viticulture and Enology and former department chair as well as past chair of the Academic Senate at U.C. Davis. Her work in yeast genetics has aided the wine industry in tackling multiple challenges from stuck fermentations to unwanted hydrogen sulfide production. Bisson has taught two generations of enologists since she joined the faculty in 1985 and still teaches classes ranging from wine production to advanced genetic analysis. She is also the science editor for the *American Journal of Enology and Viticulture*.

Calona Vineyards

Oldest licensed winery in B.C. helped create an industry

Originally established in 1932 to give Okanagan fruit growers an outlet for their fruit, Calona Vineyards made apple wine for three years before shifting to grape wines in 1935. It built a reputation with consumers and sold sacramental wine (echoing the purpose of the first vines planted in the Okanagan under Father Charles Pandosy in 1860 – who, in another connection, previously served in the Walla Walla and Yakima valleys of Washington). Calona's founder was Giuseppe Ghezzi, who attracted the financial backing of Kelowna's Italian community and British Columbia's future premier W.A.C. Bennett. Calona remains the oldest licensed winery in B.C., although the name disappeared following its 2005 acquisition by Andrew Peller Ltd. Peller has since consolidated its Western Canada operations at the Kelowna facility. Originally established at Port Moody in 1961 when it wasn't able to secure a license in Ontario, Peller is now the largest family-run winery in Canada and the second largest vintner after the Ontario Teachers Pension Plan, which owns Arterra Wines Canada Inc., the company that vaulted to international prominence under Donald Triggs as Vincor International prior to being acquired by Constellation Brands in 2006.

Columbia Winery

Washington's oldest operating winery

The itch to start Washington's oldest continuously operating winery came in the summer of 1951 when University of Washington psychology professor Lloyd Woodburne (1906-1992) ran into a patch of poison ivy in Oregon. He read a book on winemaking while recovering, and that fall made wine with grapes from California. A shortage of white grapes from California in 1954 led him to Eastern Washington, where he met William Bridgman and bought grapes. Woodburne and 10 of his academic colleagues signed a contract to buy grapes from Bridgman in 1961, and the venture formally incorporated the following year. California winemaker André Tchelistcheff approved of the partners' first vintage, and in 1963 Associated Vintners bought a Yakima Valley vineyard. The company hired winemaker David Lake in 1979 and was renamed Columbia Winery in 1983. It broke ground with Washington's first vintage-dated varietal wines as well as the state's first commercial plantings of Pinot Gris and Syrah. E. & J. Gallo Winery acquired the winery in 2012.

Alternative Packaging

Boxes, kegs and cans ballooned into big business

Attuned to a healthy appetite among wine consumers and sellers alike for popularly priced wine that is more environmentally friendly, wineries and the packaging manufacturers who supply them began in the 2000s to push the envelope on alternative formats. As a result, they have realized significant gains in consumer acceptance, recyclability and reductions in greenhouse gas emissions. Premium 3-liter bag-in-box wines became a consistently fast-growing category in food and liquor stores in the 2010s, and most recently canned wines and kegged wines heated up in terms of sales growth. Free Flow Wines expects to ship more than 250,000 stainless steel kegs of wine in 2019, and Nielsen data show that wine-in-a-can has grown from a $1 million business in the U.S. to a $50 million business in five years.

Colleges and universities

Formal winemaking education began in 1875 for California

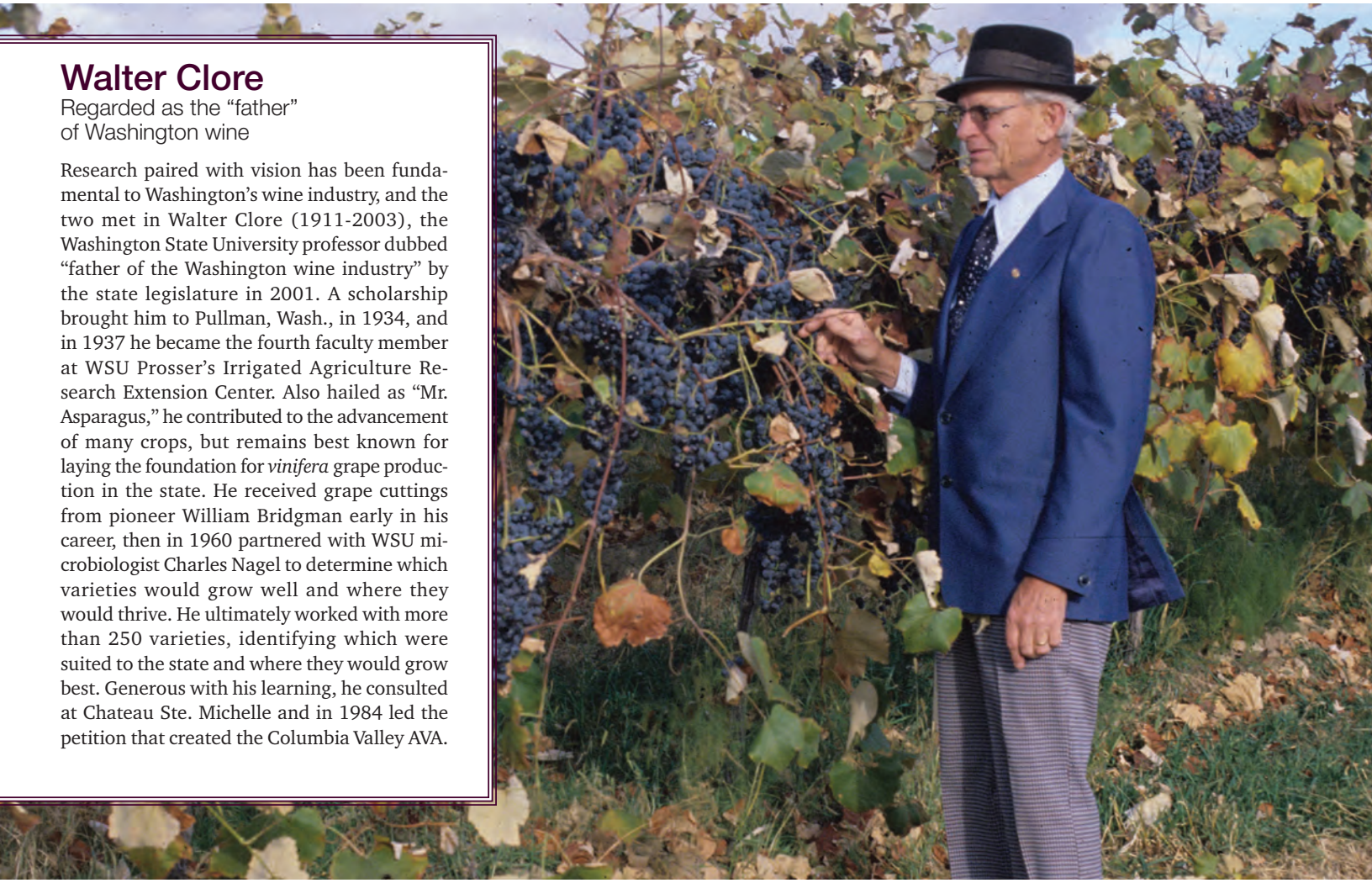
German-born soil scientist Eugene Hilgard paved the way for formal winemaking educa-

Barrels

A traditional tool still relevant in modern winemaking

In a change that's more incremental than radical, barrels have remained a critical piece of equipment for making wine despite all the other changes and innovations in wineries. Ask a winemaker what he or she thinks is the most important quality of a barrel, and the answer is typically consistency. With each vintage bringing its own set of ever-changing conditions, minimizing variation in barrels is a huge help to achieve a certain winemaking style or profile. After European coopers began investing in the United States, such as Nadalie USA opening a cooperage in 1980, America's own coopers, which had been wholly focused on whiskey, saw an opportunity to differentiate and expand. Cooperages 1912 Napa, which sells the popular World Cooperage brand of barrels and the premium line TW Boswell barrels as well as owning a stave mill and cooperage in France, has become one of the biggest wine barrel producers in the world. European cooperages have sought to build on centuries of tradition with such innovations as Oakscan by Tonnellerie Radoux and the ICÔNE oak composition analysis by Seguin Moreau, which has led to better-built and more reliable barrels. American oak wine barrels have also steadily improved, with European investment such as Chêne & Cie buying Canton Cooperage and improving production. A few coopers, such as Tonnellerie O, have begun to offer American oak from forests in specific states.

SEGUIN MOREAU



Walter Clore

Regarded as the "father" of Washington wine

Research paired with vision has been fundamental to Washington's wine industry, and the two met in Walter Clore (1911-2003), the Washington State University professor dubbed "father of the Washington wine industry" by the state legislature in 2001. A scholarship brought him to Pullman, Wash., in 1934, and in 1937 he became the fourth faculty member at WSU Prosser's Irrigated Agriculture Research Extension Center. Also hailed as "Mr. Asparagus," he contributed to the advancement of many crops, but remains best known for laying the foundation for *vinifera* grape production in the state. He received grape cuttings from pioneer William Bridgman early in his career, then in 1960 partnered with WSU microbiologist Charles Nagel to determine which varieties would grow well and where they would thrive. He ultimately worked with more than 250 varieties, identifying which were suited to the state and where they would grow best. Generous with his learning, he consulted at Chateau Ste. Michelle and in 1984 led the petition that created the Columbia Valley AVA.

tion in the United States when, in 1875, he came to the University of California, Berkeley as dean of the College of Agriculture and served as founding director of the U.C.'s Agricultural Experiment Station. In 1880, under Hilgard's urging, the California Legislature appropriated $3,000 annually for viticultural research and formed the Board of State Viticulture Commissioners. Hilgard led studies surrounding fermentation and phylloxera and created the first soil maps dictating which grape varieties thrived best in specific regions — an early step toward creating California's AVAs 100 years later. During Prohibition, the University of California system maintained its studies in California grapegrowing. In 1935, just two years after Prohibition was repealed, the agricultural school at Davis, Calif., — which would become the University of California, Davis — opened a Department of Viticulture and Enology that remains one of the largest and most respected wine-education programs in America. Now degrees in wine studies are available across North America, including at California State University, Fresno; Cornell University in New York; Virginia Polytechnic Institute and State University; Washington State University; Oregon State University; and California Polytechnic State University, San Luis Obispo, as well as community and junior colleges like Napa Valley College, Santa Rosa Junior College and Las Positas College in California, and many others in nearly every U.S. state and Canadian province.

Jack and Jamie Davies

Led the way in *méthode champenoise* production at Schramsberg

Jack and Jamie Davies moved from Los Angeles to Napa Valley in 1965 to attempt making high-quality, high-priced, bottle-fermented sparkling wine in California that could be favorably compared to Champagne. They bought the Schramsberg property near Calistoga, Calif., where winemaking had begun in 1862. The Davieses used primarily Chardonnay and Pinot Noir for their sparkling wines and soon learned to shift from their warm inland location for grape supply to cooler sites in Napa Valley, Sonoma and Mendocino counties for the highest-quality raw materials for sparkling wine.

Their efforts got high-profile validation in 1972 when President Richard Nixon served Schramsberg to Chinese Premier Zhou Enlai at the White House. It was the first time any American wine had been served at a White House or State event. Soon French Champagne producers noted Schramsberg's success and began buying California vineyard land and building their own sparkling wine facilities in California. Jack Davies also contributed to the wine industry by being an outspoken proponent of Napa County's Agriculture Preserve law. Voters approved it in 1968 to stop urban sprawl and protect open land for growing wine grapes and other crops.

Direct-to-Consumer Sales

Long legal fight has led to fast-growing wine market

Direct-to-consumer (DtC) sales, whether conducted on winery premises, via wine club memberships or online purchases, have grown to be a major advantage for wineries, especially those too small to get the attention of increasingly large distributors. A DtC sale skips the middle tier and the retail tier and enables wineries to collect the whole retail price of the wine.

According to Wines Vines Analytics and ShipCompliant by Sovos, DtC shipments totaled nearly $3 billion in the 12 months ending in October 2018 (not counting wines bought and carried out of winery tasting rooms), reflecting a 16% increase over the same period last year. And it's the small wineries (5,000 to 49,999 cases) and very small wineries (1,000 to 4,999 cases) that conducted the bulk of those shipments, accounting for 70% of the value of winery shipping.

Andy Beckstoffer

Helped win growers compensation commensurate with grape quality

Andy Beckstoffer is a major landowner and grapegrower in California's Napa, Mendocino and Lake counties who not only produces grapes that earn some of the highest scores possible from critics, but also has advocated for growers to be protected by appellation legislation and paid in fair proportion to the price of the wines that wineries make from their grapes. Beckstoffer came to Napa Valley in 1970 as an employee of wine and spirits company Heublein to form a company to develop and manage vineyards. He soon purchased the company and assumed ownership of several vineyard properties that remain a part of Beckstoffer Vineyards' 3,600 acres.

Beckstoffer was a founding director and the second president of the Napa Valley Grape Growers Association, and in that role he promoted a grape-pricing policy that became a widely accepted benchmark for high-quality wines in California: A ton of grapes should be worth 100 times the retail price of a bottle of wine made from them. He also led the Napa Valley Grape Growers Association in creating the Winery Definition Ordinance that required grapes used in wines labeled with the Napa Valley AVA to be at least 75% grown in the AVA.

Nat DiBuduo

Grapegrower spokesman helped empower vineyard owners

Nat DiBuduo served as president of the 500-member Allied Grape Growers association from 2000 until 2018. He became an important spokesman for its vineyard-owning members around California as they sought better prices for their grapes and more power in the sometimes testy relationships between themselves as grape sellers and the state's larger wineries as the grape buyers. A native of the San Joaquin Valley of California, DiBuduo earned a bachelor's degree in plant science and viticulture from California State University, Fresno in 1973. He managed vineyards in almost every major grapegrowing region in California before joining the AGG.

"My previous roles in farm management, independent consulting and vineyard development positioned me to understand the challenges facing California grapegrowers and equipped me with the desire and ability to make a difference," he stated when announcing his retirement. In recent years, DiBuduo had bemoaned falling prices for grapes from the interior valleys of the state and urged California wineries to be more competitive against low-priced, imported wines despite the wider premiumization trend in the U.S. market.

Digital Resources for Vineyards

Major tools helped professionalize vineyard operations

Breakthroughs in digital tools for use in vineyards changed the game for vineyard owners and managers by helping them assess the state of their vines and strategically apply the results of new research into viticulture methods, irrigation and disease treatment. These included remote sensing for disease detection; Normalized Difference Vegetation Index (NDVI) for mapping vineyard variations for management and harvest decisions; Global Positioning System (GPS) for mapping and reference grid for infield attributes, and a basis for related data accumulation. They proved to be major tools for professionalization of vineyard operations and information.

Drip Irrigation

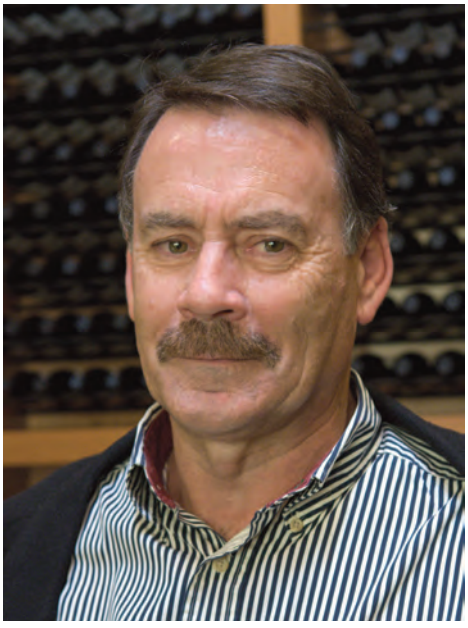
Conserving water and expanding vineyards

Irrigation water delivered through lightweight plastic hoses in precise quantities was an Israeli innovation, but it never found a better industry to serve than wine-grape growing in the Western states and British Columbia. Before drip or micro irrigation became available in the 1970s, grapegrowers in areas with a Mediterranean climate, meaning where little or no rain fell during the growing season, whose vines couldn't draw enough water from the ground to stay healthy and productive had to use either flood irrigation, which required an enormous volume of water and the costly rights to buy that water, or overhead sprinklers, which wasted water through evaporation, wet the vine canopy and encouraged mildew and other vine diseases.

Drip irrigation was easy to install above ground, could be targeted directly where the vine roots could take up the water, delivered fertilizer blended into the water and made hillside vineyards much more viable.

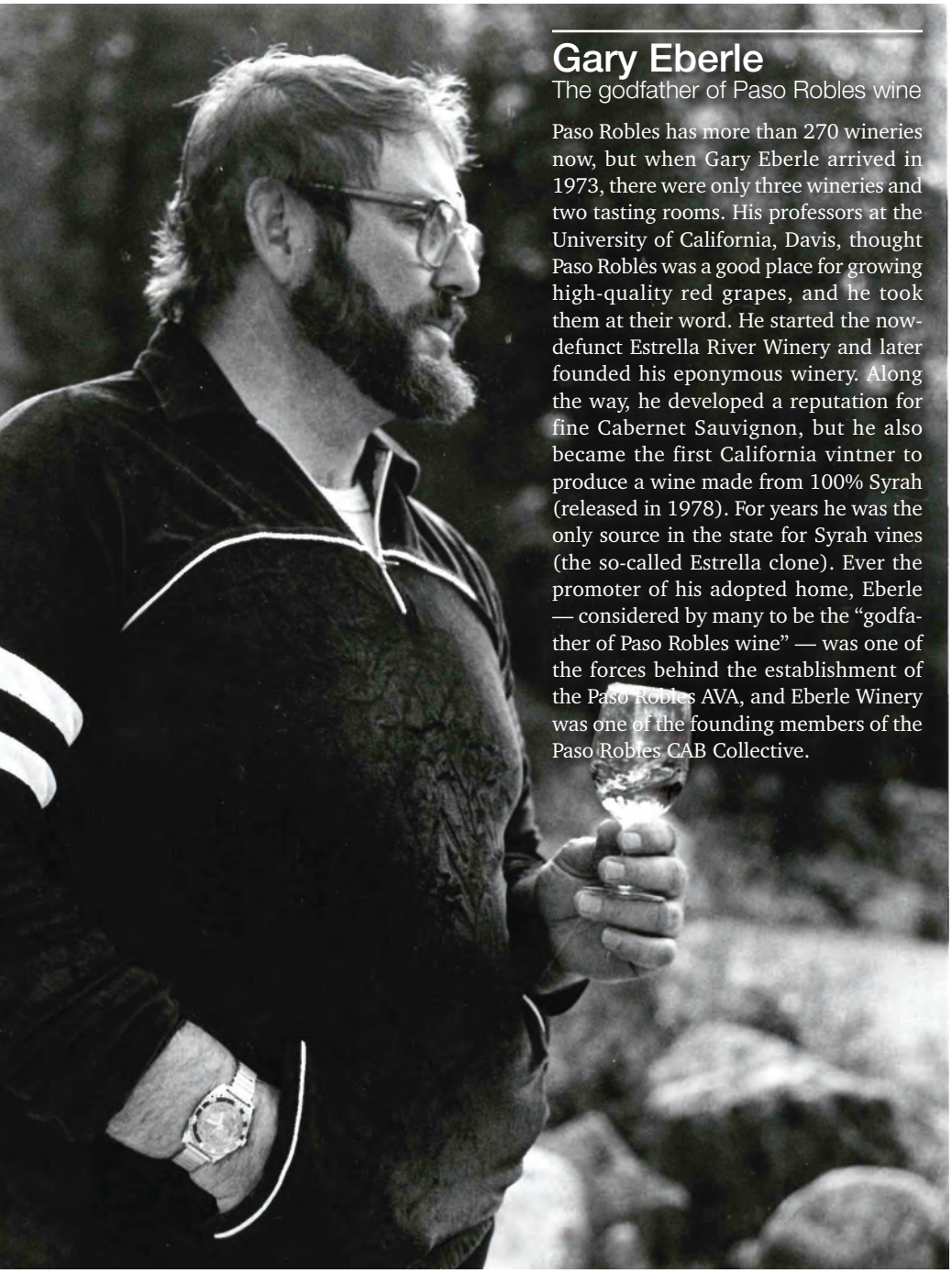
Dr. Roger Boulton

Imagined and built the winery of the future



After earning a Ph.D. in chemical engineering at the University of Melbourne, Australia, Roger Boulton came to the University of California, Davis and has been a leading researcher, teacher and author in his roles with both the Department of Chemical Engineering and the Department of Viticulture and Enology. In 2000 he was named among the "50 Most influential people in the U.S. Wine Industry" by *Wines & Vines*. In 1998, he and three colleagues (Vernon Singleton, Linda Bisson and Ralph Kunkee) received the Office International de la Vigne et du Vin Prize in Oenology for their book "The Principles and Practices of Winemaking." This text won a spot on the shelves of hundreds of winemakers in North America and was translated into Spanish and Chinese while still in its first edition.

Boulton has lectured widely about "the winery of the future" and got the rare opportunity to create such a facility when he led the design



Gary Eberle

The godfather of Paso Robles wine

Paso Robles has more than 270 wineries now, but when Gary Eberle arrived in 1973, there were only three wineries and two tasting rooms. His professors at the University of California, Davis, thought Paso Robles was a good place for growing high-quality red grapes, and he took them at their word. He started the now-defunct Estrella River Winery and later founded his eponymous winery. Along the way, he developed a reputation for fine Cabernet Sauvignon, but he also became the first California vintner to produce a wine made from 100% Syrah (released in 1978). For years he was the only source in the state for Syrah vines (the so-called Estrella clone). Ever the promoter of his adopted home, Eberle — considered by many to be the "godfather of Paso Robles wine" — was one of the forces behind the establishment of the Paso Robles AVA, and Eberle Winery was one of the founding members of the Paso Robles CAB Collective.

of UC Davis' Teaching and Research Winery, which opened in 2011 and has been heralded as the most advanced and most sustainable winery in the world.

Equipment Vendors

A whole new industry to support grapegrowing and winemaking

Just as the U.S. cooperage trade improved to serve the U.S. wine industry, so, too, have companies that either produce equipment or distribute products and materials from vendors in Europe. Cutting down wait times and ensuring the availability of key winemaking products such as yeast, enzymes and chemicals, while providing the equipment, spare parts and expertise to keep crush pads humming during harvest helped winemakers produce better-quality wines at ever-increasing volumes. Scott Laboratories, ATP Group, Enartis USA and many other vendors supply an extensive range of products, while companies such as Criveller Group, P&L Specialties, Tom Beard and Carlsen & Associates manufacture equipment such as bin dumpers, barrel washers and conveyors used by wineries. In light of the importance of the U.S. wine industry, major European equipment manufacturers such as Della Toffola, Bucher Vaslin and Pellenc have established offices and facilities in California and other states to directly support the industry. The multifaceted company G3 Enterprises is a leader in trucking as well as packaging, distribution and product development. As the options and services for equipment and materials expanded, analytical services from companies such as ETS Laboratories have grown more sophisticated and available in every major wine region in the U.S.

William Bridgman

Grower with a long-lasting influence in Washington

William Bridgman (1878-1968) was neither the first to plant grapes in Washington state, nor the first to make wine from them, but his influence on the state's wine industry may well have been the most far-reaching. An immigrant from Canada, he practiced law in Sunnyside and helped write legislation governing water rights that remains in effect today. Seeing the potential for viticulture in Eastern Washington, he planted vineyards at Harrison Hill in 1914 then at Upland Vineyard on Snipes Mountain in 1917. Thompson and Muscat grapevines remain today, near the remains of a winery Bridgman established in 1934. That same year, a young horticulture student named Walter Clore arrived at Washington State University, eventually becoming Bridgman's protégé. Bridgman also advised the founders of what became Columbia Winery and sold them grapes. Today, the Newhouse family operates Upland Vineyard, having acquired it following Bridgman's death in 1968.

Cellar Equipment

European expertise matched by American ingenuity

Not all of the industry's most helpful equipment is developed in Europe. American ingenuity and entrepreneurship have led to the successful development of many pieces of notable winemaking equipment. A San Luis Obispo, Calif., engineer developed the Bulldog Pup racking wand that gently pushes wine out of barrels using inert gas, and variations of the pumpover irrigator developed by Tom Beard and winemakers Dave Ramey and Zelma Long are used in wineries throughout North America. The small startup Vintuitive used 3D printing to create its Lotus pumpover device, which has proved to be a hit with several winemakers. Systems such as TankNet to monitor and control tank temperature as well as winemaking software such as Winemakers Database and InnoVint not only provide winemakers with an exceptional level of control but also allow for remote operation through tablets or smartphones. Winemaking may fundamentally remain the same, but it's become much more efficient, sanitary and easier, thanks to improved technology.

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Harriet Lembeck (left), Hugh Johnson, Frank Prial and Leon Adams congratulate Lembeck upon receiving the 1983 Perpetual Trophy for Excellence in Wine Writing from *Wines & Vines*.

Criticism

Wine writers evolved from advocates and enthusiasts to critics

The role of wine writers, reviewers and critics expanded steadily in its influence on consumers and the wine industry itself from the 1970s onward. Midcentury writers like Frank Schoonmaker and Leon Adams were interested in popularizing wine, but as the California wine renaissance got fully underway, writers like Frank Prial in New York, Hugh Johnson in Britain and Robert Balzer in Los Angeles came to prominence. They were joined by wine specialist publications like *Wine Spectator* in 1976, the *Wine Advocate* in 1978, *Wine & Spirits* in 1981 and *Wine Enthusiast* in 1988. With this wave came the 100-point scale (first used widely in wine reviews by the Wine Advocate) and the growing influence exerted on American wine styles and, thus, grapegrowing and winemaking practices by the scores and criticism written by James Laube, Robert M. Parker Jr. and others. In particular, the leading critics' praise of riper, richer, often oakier wines was embraced by their readers and eventually precipitated shifts at the winemaking level that have largely persisted until today.

Closures

Tradition has given way to competitive market

Cork producers will tell you consumers expect and relish the tradition of pulling corks from bottles. Winemakers, the wine trade and knowledgeable consumers, however, would argue that tradition shouldn't come with a one-in-10 chance that the wine smells like a wet dog and tastes "off" (see TCA, page 62). How a wine bottle is sealed for the market has changed dramatically in recent decades, as winemakers now have their pick of options such as screwcaps, different types of treated corks and closures manufactured from new materials. Founded in 1996, with the financial and technical booking of five major Californian wine companies, Neocork was an early player in the technical closures category that has come to be dominated by Nomacorc, which is producing more closures made with plant-based materials. The company has also been a leader in studying the role of oxygen and packaging as well as providing tools such as its Nomasense line of sensors to determine total package oxygen. DIAM jumped out to an early lead in the agglomerated cork closure market with its process of using supercritical carbon dioxide to strip impurities such as TCA from the granules that are later compressed into a cork. DIAM also touted its closures as providing a certain oxygen transfer rate (OTR) to help winemakers select the right closure for winemaking and bottle-aging goals. The world's largest cork producer, Amorim, has invested heavily in its NDTech line of individually screened natural corks, and another Portuguese vendor with U.S. facilities, Cork Supply, provides a similar product as well as a guaranteed technical cork.

John Daniel Jr.

Shaped Napa Valley's Inglenook wines into collectibles

The man who led Napa Valley's Inglenook winery to produce one of the first post-Prohibition wines to be collected by connoisseurs was John Daniel (1907-1970), the grandnephew of Inglenook founder Gustave Niebaum. He studied engineering at Stanford and became a pilot after graduation. In 1933, Prohibition was repealed, and Inglenook was once again producing wine. Daniel became increasingly involved in the day-to-day business and, on his mother's death, became owner of the already famous Rutherford estate from 1939 to 1964.

Daniel brought innovation to the industry, touching not only the wines and wine business of Napa Valley, but of California as well, according to his daughter Robin Daniel Lail. He adopted varietal rather than generic labels; experimented with new varieties including Charbono, so-called Red Pinot and Pinot St. George; and crafted Cabernet Sauvignons that aged well for decades. Daniel was the first to put "Napa Valley" as an appellation on his wines and was a pioneer in vintage-dating bottles. He played a key role in the founding of the Napa Valley Vintners Association and in creating awareness of Napa Valley as an appellation of distinction.

Kenneth Fugelsang

Winemaster at Fresno State's commercial winery

Ken Fugelsang (1946-2017) was a professor of enology at California State University, Fresno and a seminal figure who helped establish the university's high reputation for a practical education in viticulture and enology. Fugelsang was a recipient of some 50 research grants totaling approximately $5 million. He was recognized as one of the world's most authoritative experts on *Brettanomyces* and served as winemaster of

Fresno's first-in-the-nation commercial winery on a college campus. His 2007 book "Wine Microbiology – Practical Applications and Procedures," co-authored with Charles Edwards of Washington State University, received the Prix de l'OIV award from the Paris-based International Office of the Vine and Wine.

John DeLuca and Wine Institute

Trade association leader brought winemakers to Capitol Hill

As president and CEO of the Wine Institute for 28 years, John DeLuca helped the wine industry expand while countering anti-alcohol forces. He had served eight years as deputy mayor to Joseph Alioto in San Francisco, helping the mayor cope with the pressures of the social and civil rights upheaval of the 1960s, and then went on to lead the Wine Institute (founded 1934) from 1975 to 2003, before serving as its executive vice chairman for five more years. While the wine industry struggled with questions about marketing and legislation, De Luca broadened the institute's vision to emphasize the healthful benefits of wine, break down barriers to direct-to-consumer shipping, bring California winemakers to meet legislators on Capitol Hill, reduce trade barriers for wine exports and many other accomplishments.

Farm Winery Legislation

Opening new markets for a nascent industry

When Douglas P. Moorhead and William M. Konnerth started Presque Isle Wine Cellars to sell home winemaking supplies, equipment and juice in 1964, a winery in Pennsylvania could sell its wine only to the Pennsylvania Liquor Control Board (PLCB) or out of state. With the help of three other Erie County grapegrowers, George Luke, Blair McCord and George Sceiford, they wrote legislation that would allow "limited winery" license holders to produce no more than 50,000 gallons of table wine from grapes grown in Pennsylvania and sell it to individuals, the PLCB, and to hotel, restaurant, club and public service licensees. In spite of opposition by the PLCB, the legislation passed July 17, 1968. Two limited wineries were licensed in North East, Pa., in 1970: Moorhead and his wife, Marlene, opened Presque Isle Wine Cellars (as a winery) and Luke, McCord and Sceiford started Penn Shore Vineyards winery. Indiana was the second state to enact a small-winery bill, in 1971, followed by North Carolina in 1973, and Mississippi passed a Native Wine Law in 1976. In the mid-1970s, the grape and wine industry in New York was based on large wineries that produced sweeter red and white labrusca wines, ports and sherries. Demand for labrusca dropped when the bigger wineries started bringing in bulk wine from California, and growers looked at starting small wineries as an alternative market. The New York Farm Winery Act in 1976 reduced the license fee totals from nearly $1,600 per year to $125.

Marlene and Doug Moorhead.

European Investment

An influx of money and expertise helped transform American winemaking

Domaine Carneros

Beginning in the 1970s and spurred by the Judgment of Paris Tasting in 1976, established, reputable wine companies in Europe began investing in vineyards and building wineries in North America. The Champagne houses of Moët & Chandon, Taittinger and Louis Roederer started Domaine Chandon and Domaine Carneros in Napa Valley and Roederer Estate in Anderson Valley, while Spanish sparkling producers Freixenet and Codorniu established Gloria Ferrer Caves & Vineyards in Sonoma County and what's now Artesa Vineyards and Winery in Napa Valley. Also in Napa Valley, Chateau Mouton-Rothschild partnered with the Robert Mondavi Winery to create Opus One, and Christian Moueix from Château Pétrus founded Dominus Estate. Italian wine company Zonin established Barboursville Vineyards in Virginia in 1976.

Later, Jean-Charles Boisset, from a leading winery family in Burgundy, amassed a portfolio of several California wineries including Buena Vista, one of the state's oldest. French investment in Oregon vineyards started with Burgundy's Domaine Drouhin in 1988 and is continuing today.

European investments during the past 45 years constituted an important affirmation that U.S. winemakers were onto something worthwhile, and brought in capital and European expertise that has spread throughout the wine industry.

Charles Fournier

First commercial vinifera wines in New York

Charles Fournier (1902-1983) was born in Reims, France and his father and uncle expected that he would grow up to succeed his uncle (for whom he was named) as winemaker at the Champagne house Veuve Clicquot Ponsardin. Fournier graduated from the University of Paris with a degree in chemistry, then studied at wine schools in France and Switzerland. At the age of 24, he was named chief winemaker at Veuve Clicquot and became production manager in 1930. Fournier was offered the job of winemaker and production manager at the Gold Seal Vineyards in Hammondsport, N.Y., in 1934 with the goal of rebuilding the winery after Prohibition had ended. His reason for taking the job had nothing to do with wine. His first wife had died tragically after a fall down a flight of stairs. While the Finger Lakes had a different climate and was home to other grape varieties than he was used to in France, he found the combination of soils and grapes there could produce a sparkling wine with a Champagne-style bouquet and flavor. Using primarily Catawba, blended with some Delaware, Dutchess and Elvira, he produced his own blend. The *vinifera* program initiated in 1953 (and supervised by Dr. Konstantin Frank) resulted in the first commercial *vinifera* wines in New York, a 1960 Pinot Noir and a 1961 Pinot Chardonnay.

Filtration

Improved technology led to better, cleaner wines

Prior to the development of plastics, crossflow filtration was not possible. In the late 1950s, materials scientists began to develop polymer flat sheets that could let liquid pass through the sheet. In the course of polymerization, the polymer process could be stopped, which left holes in the sheet. An epiphany came to an engineer (who must have played pinball machines) that changed filtration forever. A thin sheet of plastic does not have the depth to build up solids, and so the material to be filtered blinds the sheet too quickly for that sheet to be an efficient filter.

However, when the direction of product flow is changed from perpendicular to horizontal, the "cross" flow keeps the potential blinding materials from blocking the holes in the plastic sheet. Since molecules can be envisioned as pinballs flying across the sheet of plastic, when a molecule gets "trapped" by a hole, it falls through and is removed from the product.

Sheets evolved from stacks to "jelly roll" assemblies and finally to hollow fiber. It took until the 1980s for crossflow technology to mature and be adapted for the wine industry. Tangential-flow filtration encompasses processes that range from reverse osmosis, which separates molecules as small as water from salts like sodium chloride, to nano-filtration, which separates particles 0.2 μ and smaller from all the rest.

Peter Meier, an engineer with Millipore, introduced this technology to the wine industry. Subsequently, companies such as Amicon, General Electric, Memstar and others have developed a panoply of membranes that can separate various combinations of molecules, based upon size and other factors. Membrane filtration has transformed wine filtration for more environmentally sound practices and better quality of wines at lower prices.

Fetzer and Bonterra

Mendocino wineries showed the way for organically grown wine grapes

The Fetzer family were modern-era pioneers in California's Mendocino County and started a large and profitable brand that continues today under the ownership of Chilean wine company Concha y Toro. They also did much to champion organic and later biodynamic grapegrowing in the county and as an example for the whole West Coast. Barney and Kathleen Fetzer purchased a ranch in the Redwood Valley section of Mendocino in 1958 and raised their 11 children there, while also founding the Fetzer Vineyards brand of mostly value-priced varietal wines that were unusual at the time. One son, Jim Fetzer, spearheaded certified-organic grapegrowing on their property along with a large organic garden at the winery's hospitality center.

After selling the winery and brand to Brown Forman in 1992, family members branched out to continue growing grapes and making wine under new brands. Meanwhile, Brown Forman moved ahead with a new brand under the Fetzer umbrella, Bonterra Vineyards, that used exclusively organically grown grapes in all its wines. In recent years, the strategy has paid off, with sales over 500,000 cases and a leadership position in the organically grown segment for U.S. wines.

Glassy-Winged Sharpshooter

Insect that spreads Pierce's Disease forced industry to fight back

JACK KELLY CLARK

The glassy-winged sharpshooter was, and is, a devastatingly effective delivery vehicle for Pierce's Disease, caused by the bacterium *Xylella fastidiosa*. Spread by the sharpshooters, Pierce's Disease destroyed a large chunk of the vineyard acreage in California's Temecula Valley in the mid- to late 1990s and threatened to spread and infect larger wine regions to the north. The insect was so feared by growers and winemakers that in 2000 they levied a tax on themselves for the first time in decades. The tax funded a research and prevention program, the Pierce's Disease Control Program under the California Department of Food and Agriculture, on how to beat back the sharpshooters and the plague that they vectored. The research soon bore fruit in terms of practical ways to slow or prevent the disease's spread with detection and biological control programs. The program has been very effective and impressed growers and wineries so much that they have continued to vote to renew the funding of the program, and it has expanded to target other pests and diseases.

Louis Gomberg

First to analyze data for wine industry clients

Gomberg, Fredrikson & Associates was founded in 1948 by wine industry pioneer Louis R. Gomberg (1907-1993), who was the first to track and analyze statistical data relevant to the wine business. Owned and operated by *Wines & Vines* and BW166.com since 2016, the firm now monitors monthly and annual comparative shipments of leading California wineries and wine imports by country. Its reports also provide commentary on and analysis of current business conditions and trends shaping the market. Gomberg was an editor at the *San Francisco Chronicle* when, in 1935, Leon Adams, then in the process of organizing the Wine Institute, hired him as an executive. The two began a number of institute programs that were long running, including a technical advisory committee, statistical data service and a series of member publications. Jon and Eileen Fredrikson took ownership of the business in 1983.

Mary Ann Graf

Set an example for women winemakers and entrepreneurs

Mary Ann Graf is the first woman to earn a degree in enology from the University of California, Davis and one of the first women entrepreneurs to start a wine industry service company. It was a harbinger of change in the male-dominated wine industry when Graf received her B.S. degree in fermentation sciences in 1965. She went to work as a chemist and assistant winemaker in the Central Valley and Sonoma County, working largely on fruit wines and becoming a quality-control expert. She joined Simi Winery in 1973 as the winemaker, and was mentored there by consulting enologist André Tchelistcheff. Graf left Simi and with Marty Bannister co-founded the Vinquiry wine laboratory, now Enartis USA, a business that specialized in providing analytical and consulting services to the winemaking industry. She

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E. & J. Gallo Winery

Biggest winery taught the industry how to be competitive

The Gallo organization's penchant for efficiency in production and fierce competitiveness in sales and marketing is legendary in the wine industry. Started by brothers Ernest Gallo (1909-2007) and Julio Gallo (1910-1993) just as Prohibition ended in 1933, the E. & J. Gallo Winery grew to be the world's largest wine producer while producing primarily inexpensive fortified wines sourced from mostly Central Valley vineyards in the early decades. Beginning in the 1980s and continuing today, Gallo transitioned toward premium-priced wines from coastal vineyards. Gallo has been a prolific brand creator and market opportunist, not usually the first to popularize a varietal or style, but often the first to turn that niche into a big category. One of Gallo's game-changing roles in the wine industry was to meticulously train winemaking and marketing people who would later disperse to various other companies and improve the competitiveness of the U.S. wine sector as a whole.

Ernest Gallo (left) and Julio Gallo in Modesto circa 1960.

retired in 2003. In addition to the Davis degree, her "firsts" include being the first woman winemaker of the modern era in California and the first woman on the board of directors of the American Society for Enology and Viticulture. In addition, she was a charter member of the California Enological Research Association.

Randall Grahm

An innovator *par excellence*

The desire to make the great American Pinot Noir is what prompted Randall Grahm to found Bonny Doon Vineyard in California's Santa Cruz Mountains in 1981. When his efforts fell flat, he turned to Rhône grape varieties, created his flagship Le Cigare Volant red blend and gained a reputation as one of California's original Rhône Rangers. Although Grahm was making serious wines, he became even better known as a master marketer: In addition to Le Cigare Volant (French for "flying cigar"), he created playful labels like Cardinal Zin and Big House (the latter was a reference to his vineyard location near a prison). Grahm was an early adopter of alternative closures — first, synthetic corks and, later, screwcaps — and once famously staged a mock funeral for the cork. He also was an early proponent of ingredient labeling.

Grahm's innovations extend beyond marketing and packaging. Although he primarily practices a non-interventionist style of winemaking now, he was an early proponent of micro-oxygenation. In the vineyard, Grahm has been an enthusiastic practitioner of biodynamic viticulture. He has downsized his operations in recent years, selling some of his popular labels to concentrate on his estate in San Benito County, called Popelouchum, where he's planting a number of obscure grape varieties as part of perhaps his biggest innovation yet: an ambitious project to breed 10,000 new grape varieties by crossing existing ones and planting the seeds that result.

Granholm v. Heald

Supreme Court opened door for direct-to-consumer shipping

On May 16, 2005, the Supreme Court of the United States issued an opinion in the case of Granholm v. Heald that significantly altered the way state laws are created and challenged. Jeff Carroll, writing about the decision in the June 2010 issue of *Wines & Vines*, stated, "By concluding that the states of Michigan and New York could not discriminate by allowing in-state wineries to ship directly to consumers while prohibiting out-of-state wineries from doing the same, the court affirmed that the 'dormant' part of the Commerce Clause trumps the 21st Amendment to the Constitution. In other words, states have every ability to regulate alcoholic beverages within their borders, but only if the laws treat in-state and out-of-state suppliers evenhandedly." After the decision, step by step and state by state the Wine Institute and other advocates for interstate shipping, such as the Free the Grapes Coalition, broke down local wholesalers' and legislators' resistance and opened their markets to wineries. Today, direct-to-consumer shipping is a $2.9 billion business, according to Wines Vines Analytics and ShipCompliant by Sovos, and only seven states have not dropped their shipping barriers.

Harvest Bins

Small containers kept grapes from juicing in the field

As late as the 1980s, even premium wineries used 2-ton capacity containers called valley bins or gondolas pulled behind tractors to haul grapes from the vineyard to the crush pad. Wooden lug boxes had given way to plastic 40-lb. capacity lug boxes for harvesting directly into, but they were rarely stacked on a trailer and taken to the winery. Grape


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bunches harvested into the old-fashioned 2-ton or larger containers often started juicing in the containers as more grapes were piled on top of them. Daytime harvesting in high temperatures often warmed this juice to the detriment of its potential quality as wine. Along came half-ton capacity MacroBins, 1-ton T bins and hand-carried plastic lug boxes (introduced mainly for sparkling wine) that could be stacked on top of each other on a trailer without smashing the grapes underneath. Half-ton and 1-ton bins also quickly became indispensable as fermenters for small lots of red wine.

Dr. Konstantin Frank

Growing *vinifera* in New York state

When Dr. Konstantin Frank (1889-1985) arrived in the United States in 1951, he had a career history in viticulture going back to the mid-1920s. Born in Odessa in southern Russia, he taught viticulture, restored a 36-square-mile vineyard devastated by phylloxera along the Dnieper River, earned a Ph.D. in viticulture at the Odessa Polytechnic Institute (the title of his dissertation was "Protection of Grapes from Freezing Damage"), and invented several pieces of mechanical equipment for use in vineyards, including a grape plow to bury vines for the winter, a mechanical planter, and a machine to mark planting locations in the vineyard. In 1941, he and his family fled first to Austria, then to Germany, and finally to New York. Frank found a job doing vineyard work and other menial tasks at the New York State Agricultural Experiment Station in Geneva, N.Y. He happened to meet Charles Fournier, president of Gold Seal Vineyards, who hired him in 1954 to supervise a program to grow *vinifera* grapes for Gold Seal. In 1956, Frank purchased 101.75 acres and planted his first vines in 1958. He left Gold Seal in 1962 and started his own winery, Vinifera Wine Cellars, in time for harvest. Gradually, home winemakers and others interested in better American wines came to Frank for advice and to purchase *vinifera* vines. Frank was an outspoken advocate for the *vinifera* and encouraged his "cooperators" to grow and support *vinifera* wines. Today, Frank's grandson, Fred Frank, is president of Dr. Frank's Vinifera Wine Cellars, and his great-granddaughter, Meaghan Frank, is general manager.

The Internet and Mobile Phones

Bringing new efficiencies from harvest to point of sale

Electronic technology brought about enormous changes in grapegrowing, winemaking and wine marketing. Cell phones enabled vineyard managers to keep in close touch with winemakers and created new efficiencies in harvest planning, to name one advantage. The internet brought everything from more available and accurate weather forecasts, to fermentation-management tools that could be monitored on cell phones and laptops, to digital sales and marketing methods that especially boosted direct-to-consumer sales.

Walter Hainle

Early and notable producer of ice wine

Walter Hainle (left) and son Tilman.

Walter Hainle may not have been first to market with ice wine in Canada, but he almost certainly made the first recorded example in North America. An immigrant from Germany, he arrived in the Okanagan with his wife and son Tilman in 1970 and was soon buying local grapes for winemaking. When the grapes he expected to buy froze on the vine in 1973, he recalled the German tradition of *eiswein*, and a practice was born. Within a few years he had his own vineyard, just down the road from British Columbia's first estate winery. Hainle opened his own winery in 1988, and the list included his vineyard's 1978 ice wine.

In the meantime, several Ontario producers were vying to make ice wine; the first to succeed through the traditional method of letting grapes freeze on the vine was Pelee Island Winery in 1983. The following year, the trend was firmly established, and Ontario was on its way to becoming the country's largest producer of the dessert wine. Canada's place on the world stage was cemented with Inniskillin Wines' receipt in 1991 of the Grand Prix d'Honneur at Vinexpo in Bordeaux for its 1989 ice wine.

Louisa and Alex Hargrave

First winery on Long Island

Alex and Louisa Hargrave received the AWS Award of Merit, Nov. 11, 1995 from AWS president Kenneth P. Brewer (right).

After completing their educations, Louisa and Alex Hargrave looked for suitable vineyard land on both the East and West coasts. On the advice of Cornell University professor John Tompkins, they bought 66 acres in 1973 on the North Fork of Long Island in Cutchogue, N.Y. That same year, they planted 17 of those acres with Cabernet Sauvignon, Pinot Noir and Sauvignon Blanc – the first commercial vineyard on Long Island. Hargrave Vineyard opened as a winery in 1976, and by 1981 the couple had 55 acres planted, adding Chardonnay, Riesling, Sémillon and Merlot. The Hargraves also provided vineyard space for the county cooperative extension agent, William J. Sanok, to conduct experiments on pruning and vine-training systems. Inspired by the example set by the Hargraves, by 1986 Long Island had 35 commercial growers, 1,800 acres of vineyard and 16 wineries. The Hargraves sold their vineyard and winery in 1999 to Marco Borghese from Tuscany, Italy, for $4 million.





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Hanzell, Innovation Incubator

James Zellerbach and Brad Webb pioneered Chardonnay and Pinot Noir

Hanzell founder James Zellerbach (1892-1963) and his winemaker, Brad Webb, created an innovation incubator at their hilltop winery above Sonoma Valley, established in 1953, from its first commercial vintage in 1957. They planted flags for Chardonnay and Pinot Noir on Sonoma soil at a time when very little was being cultivated. With Zellerbach's fortune earned in the paper business and his enthusiasm for the wines of Burgundy behind the venture, Webb introduced new cellar equipment and techniques in the winery's early vintages. The quality of hillside vineyards was already well known, but few wineries before had applied so much technical care to their wine. Webb commissioned what are believed to be the first small temperature-controlled stainless steel fermenters, an early nitrogen-sparged bottling machine and other rarities such as a custom stainless steel crusher-destemmer that still looks contemporary today, a small stainless steel basket press and an electrode to measure dissolved oxygen. (See the item on malolactic fermentation in this report for more details.) Hanzell's wines quickly became popular with wine connoisseurs and no doubt inspired other winemakers to emulate the winery's artisanal but technological approach to winemaking.

Labs for All

Leveling the playing field for smaller wineries

Before the 1980s, it was mainly the biggest wineries that had the money, the expertise and the space for serious winery laboratories. But as the number of wineries grew and the need for top-notch quality assurance became more pressing, independent commercial laboratories began to spring up to serve smaller wineries' needs. André Tchelistcheff, upon retiring from Beaulieu Vineyard in Napa Valley, opened a private lab as part of his consulting practice.

Gordon and Marjorie Burns established ETS Laboratories in St. Helena, Calif., in 1978, and 40 years later they now run labs in Healdsburg and Paso Robles, Calif., as well as one in Newberg, Ore., and one in Walla Walla, Wash. Mary Ann Graf (see related item) and Marty Bannister started Vinquiry laboratory in 1979 in Sonoma County. It is now known as Enartis USA and operates labs in four California wine regions. Other labs have opened around the U.S. since then and Okanagan Wine Lab has been serving British Columbia winemakers since 1997. Labs specializing in very focused services such as Enologix in Sonoma, Calif., are now well-established, too. The rise in number and growing sophistication of private labs have given small wineries access to analytical tools just as sharp as those available to the industry giants, and helped to level the playing field for achieving wine quality and consistency.

Invasions by non-native pests

A growing threat to the wine and grape industry

Over the past 20-plus years, four new non-native pests have arrived in different parts of the U.S. that pose a potential threat to grapegrowers.

Brown marmorated stink bug (BMSB)

An invasive species of stink bug, the BMSB was first found in Allentown, Pa., in 1996. Both the nymph stage and the adults feed on grapes, and in 2010 they did extensive damage to fruit trees in Maryland. Research in that state has shown that a distinctive crushed cilantro smell could be detected at five bugs per lug, but that the odor and resulting taste in wine disappear over time.

Multicolored Asian lady beetle (MALB)

MALB, originally introduced to feed on aphids in pecan orchards and soybean crops more than 100 years ago, attacked Ontario vineyards in 2001, and winemakers had to dump about a million liters of tainted wine. Many acres of soybeans are planted in Ontario, and soybean aphids may have attracted the MALB. The bugs also like damaged or rotten fruit. The current recommendation is prevention: Eliminate soybean aphids, spray to control rot and insects, and treat with oak chips if the wine has some taint.

Spotted wing drosophila (SWD)

First identified in strawberries in Watsonville, Calif., the SWD was found in Pennsylvania in 2010 and now is a major problem in the upper Midwest. The female possesses a serrated ovipositor that can cut into healthy grapes to lay eggs and will reproduce in fallen berries. Sour rot and fungal diseases can also be introduced. It is important therefore to

keep the vineyard clean and apply pest management appropriately.

Spotted lanternfly (SLF)

The newest invasive pest is the spotted lanternfly. It was originally detected in Berks County, Pa., in 2014, and the area was immediately quarantined by the Pennsylvania Department of Agriculture. SLF prefers Tree of Heaven and grapevines as hosts but will feed on fruit trees, hardwoods and approximately 70 other species. It pierces the vines and feeds on the phloem, reducing the vine's health and vigor, and excretes honeydew, which causes a sooty mold to form on leaves. All of southeastern Pennsylvania is now under quarantine, but SLF has also been found in New York, New Jersey, Delaware and Virginia.

Home of the Clones

Livermore Valley had European vine selections ready for the wine renaissance

John Concannon and the still thriving "mother vine" of Cabernet Sauvignon.

The two most popular wine types made in California — Chardonnay and Cabernet Sauvignon — might not hold those positions if it weren't for vineyards in Livermore Valley. The clonal selections from which the vast majority of today's grapevine plantings descended originated at Wente Vineyards (Chardonnay) and Concannon Vineyard (Cabernet Sauvignon). Livermore Valley wine pioneers went to France to procure prime plant material from Château Margaux, Château d'Yquem and other famous properties, then planted and preserved them in Livermore. When the dry wine revolution began slowly after World War II, excellent vine selections were waiting in Livermore to provide the raw material.

Well over half of the state's 100,000 Chardonnay acres are planted with vines descended from those introduced to the Wente family's property in 1912. These vine selections include Clone 4, Clone 2A and other "Wente clones" that trace their lineage here. For Cabernet Sauvignon, Clones 7, 8 and 11 came from Concannon in the 1960s, and the winery estimates that 80% of the Cabernet vines growing in California derive from those clones.

George W.B. Hostetter

Established *vinifera* grapes in Ontario

Brights Wines in Niagara Falls, Ontario, ordered a shipment of vines from France in 1946 that included three *vinifera* varieties — Pinot Chardonnay, Pinot Noir de Bourgogne and Perle de Csaba –along with 20 French hybrid varieties. George W.B. Hostetter (1922-2003) had just been appointed director of viticultural research, and he was put in charge of supervising the new plantings. While Hostetter had a degree from the University of Toronto, much of what he had learned about viticulture came from his father, Jake Hostetter, who was chief viticulturist at Brights. The younger Hostetter believed that the proper application of modern sprays and fungicides would allow *vinifera* grapes to grow in the East and in Ontario. He instituted a spray schedule for the new vineyard that used sulfur as a dormant spray before the start of a season and as a cleanup spray after harvest. The result was a notable improvement in the control of powdery mildew. Hostetter also experimented with different methods of pruning and thinning to control overcropping. Based on the success of the trial plantings, Brights put in 10 acres of Chardonnay on various rootstocks in 1952. This was the first commercial planting of *vinifera* in the East and the first successful *vinifera* vineyard. A Brights Pinot Champagne in 1955 and a Pinot Chardonnay in 1956 were the first commercial *vinifera* wines produced in the East.

Jackson Family Wines

The house that Chardonnay built took risks that paid off

Under founder Jess Stonestreet Jackson (1930-2011) and now under his wife and longtime business partner, Barbara Banke, Jackson Family Wines has disrupted the wine industry status quo in numerous ways. The family's oldest and most famous brand, Kendall-Jackson, produces the No. 1 best-selling Chardonnay in America, Vintner's Reserve, which made its debut with the 1982 vintage and did much to make Chardonnay the best-selling U.S. varietal today. It was unusual in being a premium-priced, off-dry Chardonnay with a California AVA designation at a time when most California AVA Chardonnays were "fighting varietals" at about $6 that included a lot of San Joaquin Valley wine in the blend.

Jess Jackson had owned a vineyard in Lake County since 1974, but the wine was soon being blended from coastal counties up and down the state, proving to consumers and the industry how high quality the grapes were in places as far-flung as Santa Maria and the Russian River Valley. Jackson successfully sued his former winemaker Jed Steele in 1992 to prevent him from revealing the Vintner's Reserve Chardonnay "recipe." In 1986, the family began buying vineyards and winery estates along the coast when most big wineries simply bought grapes and bulk wine. Today, a large percentage of the family's annual 775,000-case production is estate-grown.

Along the way, the family added properties in Australia, Tuscany, Bordeaux, Chile and recently in Oregon. Other innovations include purchasing their own oak barrel stave mill in France, partly because they barrel-fermented the Vintner's Reserve, starting their own distribution company and being in the forefront of many winery and vineyard energy, water and land-conservation issues.

David Lett

Demonstrated potential of Willamette Valley Pinot

Pinot Noir in the Willamette Valley of Oregon traces its origins and owes much of its renown to David Lett (1939-2008), who planted the Willamette Valley's first Pinot Noir and Pinot Gris vines. Working with 3,000 cuttings hauled north from California in a horse trailer, he established The Eyrie Vineyards near McMinnville in the Dundee Hills. Together with his wife, Diana, he produced his first Pinot Noir in 1970, but it was the winery's 1975 South Block Reserve Pinot Noir that showed the world – first in Paris in 1979, then a year later in Beaune – what Oregon could do. Oregon kept doing it, too, with Eyrie's success setting the standard for winemakers to come. Lett's first apprentice was David Adelsheim, and many more well-known names followed – David Lake, Joel Myers and Véronique Drouhin, among them. Lett not only trained a generation, he also defined the character of Pinot Noir for Oregon, a legacy the industry continues to cherish and defend.

Machine Harvesting

American invention improved with European engineering

During and after World War II, labor for harvesting agricultural commodities was in short supply. Dr. A.J. Winkler, professor of viticulture and enology at what would become the University of California, Davis, began work in 1953 on developing a grape harvester adapted from the horizontal cutter-bar harvester that worked well with grains. Unfortunately, the cutter-bar harvester required special trellising, hand labor to shoot position, and then damaged both the grapes and the vines.

Meanwhile, at Cornell University in Ithaca, N.Y., viticulturist Nelson Shaulis and E. Stanley Shepardson in the agricultural engineering department combined their teams and designed an over-the-row vertical harvester that shook the grapes off the vines. At the same time in the early 1960s, grapegrowers Roy Orton and his uncle Max Orton in Ripley, N.Y., created a horizontal-action machine that beat the trellis rather than shaking the vines. Chisholm-Ryder Co. in Niagara Falls, N.Y., cooperated with the engineering of the harvesters at Cornell and became the producer of the first commercially available grape harvesters. The first commercial use in New York took place in 1968.

In the ensuing years, the grape harvester has evolved. European companies, such as Gregoire, Pellenc and Braud, have increasingly automated the grape harvester. Harvesters can now run on autopilot, utilize geopositioning, pick grapes more gently all day and all night, maneuver on hillsides, blow off material other than grapes, destem, and report Brix, total acidity and pH levels.

Jerry Lohr

A vineyard pioneer in California's Central Coast

When J. Lohr Winery founder Jerry Lohr and his then-business partner bought nearly 300 acres in 1972 in Monterey County, Calif., and planted grapes, it was a risky move. Commercial viticulture there was only about 10 years old, and the results hadn't always been promising. They planted 11 varieties and, after a few years, settled on a few, mostly whites, that would perform well in the cool, windy conditions of what would become the Arroyo Seco AVA. For reds like Cabernet Sauvignon, Lohr knew he needed a warmer spot. His search took him to Paso Robles, where he bought land in the mid-1980s. When the *Wine Enthusiast* named him an "American wine legend" in 2016, the magazine said, "What Robert Mondavi was to Napa Valley, Jerry Lohr is to the Central Coast."

J. Lohr farms 4,000 acres of vineyards in Monterey County, Paso Robles and Napa Valley; the vineyards, as well as wineries in Paso Robles, Greenfield and San Jose, are certified by the California Sustainable Winegrowing Alliance. Lohr was a founder of Wine Vision and the National Grape and Wine Initiative and has been a major benefactor of viticulture and enology programs at the University of California, Davis, and California Polytechnic State University, San Luis Obispo.

Managing Malolactic

Researchers didn't solve the mystery of MLF until the 1950s

One of the most important natural processes in winemaking, the conversion of malic acid to lactic acid through the work of bacteria, was a mysterious process that winemakers had little control of until the second half of the 20th century. Louis Pasteur in the 19th century figured out how yeast achieves primary fermentation, but in the 1950s winemakers around the world had little traction on the malolactic (MLF) conversion.

Practical work to isolate bacteria strains and inoculate wine with them was conducted at the University of California, Davis and at Hanzell Vineyards in Sonoma County in 1959, where winemaker Brad Webb, working with UC Davis professor of microbiology John Ingraham, performed what was probably the first induced MLF in California from a pure culture of a strain of a bacterium (later named *Oenococcus oeni*). It was ML 34, isolated from a tank at the Louis M. Martini Winery in St. Helena, Calif., Ingraham said. Later they learned that in France, E. Peynaud and S. Domercq had used a similar approach and also been successful, probably before they had. Later Maynard Amerine, a master of enological literature, noted that M. Gomes, J.V.F. da Silva Babo, and A.F. Guimarais had been successful in 1956.

The major research and teaching interests of Ralph Kunkee (1927-2011) at UC Davis focused on ML fermentation, wine yeast and the sources and controls of microbiological spoilages of wines. Kunkee's work on MLF helped bring understanding to this bacterial activity and how to control it.

Dr. Ann Noble

Developed sensory evaluation as a discipline

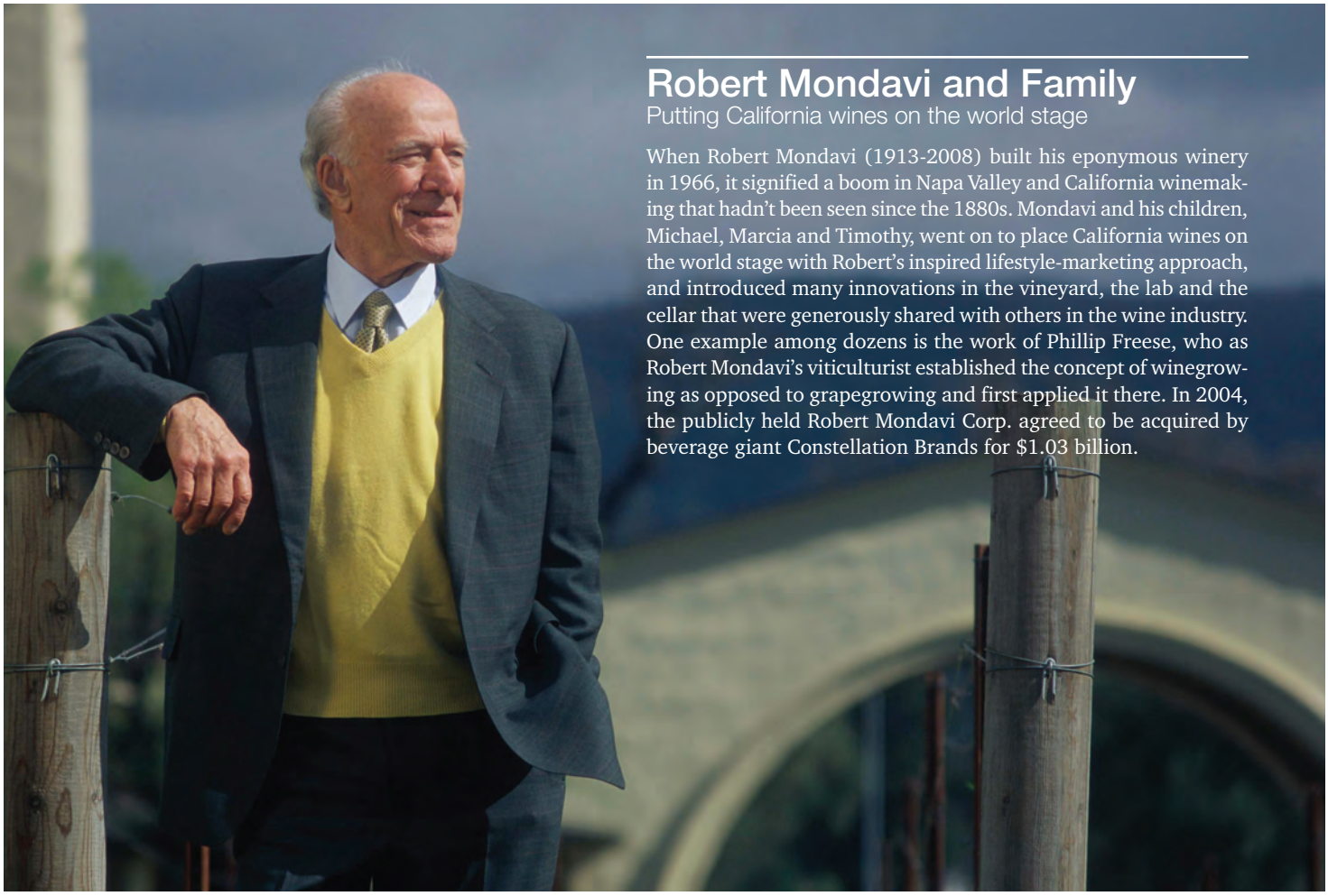
Ann Noble is a sensory chemist and retired professor from the University of California, Davis, who taught sensory evaluation to future winemakers and developed the wine "Aroma Wheel." During her time at Davis's Department of Viticulture and Enology, Noble invented the Aroma

—*continues on page 50*

Grape sorting

Quicker, cleaner and better

During the 2018 harvest, a French company debuted a robotic grape sorter at Alpha Omega Winery in Napa Valley. Driven by an optical sorter, the robot employed a series of arms with a suction gripper on the end to reach down and pull material other than grapes (MOG) off a conveyor carrying berries that had already been destemmed and sorted (see Product News, page 24). The robot is the latest innovation in sorting technology and shows how far grape sorting has come in recent decades. Sorting has evolved from simple shaker tables and conveyors to elaborate, multistep processes that can involve hundreds of thousands of dollars in equipment. Increasingly that equipment is being managed with as few workers as possible, because the machines are getting better and quicker and there are fewer workers available for sorting. The most significant development has been optical sorting, which employs high-speed cameras and computers to almost instantly analyze a flow of destemmed berries; identify MOG, raisins and unripe grapes; and then activate air jets that push the material out of the grape flow and into waste channels. Optical sorters have by Bucher Vaslin and Pellenc been popular picks for many high-end wineries, but the American company WECO's Vitisort machine has proved to be a competitive and popular machine as well.



Robert Mondavi and Family

Putting California wines on the world stage

When Robert Mondavi (1913-2008) built his eponymous winery in 1966, it signified a boom in Napa Valley and California winemaking that hadn't been seen since the 1880s. Mondavi and his children, Michael, Marcia and Timothy, went on to place California wines on the world stage with Robert's inspired lifestyle-marketing approach, and introduced many innovations in the vineyard, the lab and the cellar that were generously shared with others in the wine industry. One example among dozens is the work of Phillip Freese, who as Robert Mondavi's viticulturist established the concept of winegrowing as opposed to grapegrowing and first applied it there. In 2004, the publicly held Robert Mondavi Corp. agreed to be acquired by beverage giant Constellation Brands for $1.03 billion.

AVIS MANDEL

—continued from page 48

Wheel which is credited with enhancing the industry's and the public's understanding of wine tasting and terminology. When hired by UC Davis in 1974, Noble was the first woman faculty member of the viticulture and enology department. She retired from Davis in 2002 and in 2003 was named *emeritus* professor of enology. Since retirement she has participated as a judge in the San Francisco Chronicle Wine Competition.

North Coast Viticulture Research Group

Wineries funded research to link growing practices to wine character

A group of Napa and Sonoma wineries, dedicated to discovering the linkage between viticulture and wine style and quality, formed the North Coast Viticulture Research Group. The process was to fund research at the University of California, Davis, that linked growing practices to wine character, changing the vision from grape growing to wine growing. Funds were contributed by member wineries annually to fund research. As a consequence of this approach, UC Davis advanced the understanding of growing and winemaking disciplines to the benefit of both students and wineries. Member wineries included Joseph Phelps Vineyards, Robert Mondavi Winery, Simi Winery, Beringer Vineyards, Jordan Vineyard & Winery, The Christian Brothers Winery and Sterling Vineyards.

Zelma R. Long

Winemaker, mentor to women and advocate for research

Zelma R. Long is an American winery owner, executive and enologist who helped set precedents for women winemakers in a male-dominated industry. Long was chief enologist at the Robert Mondavi Winery from 1973 to 1979. She was the first woman to be the chief executive of a California winery in the modern era, as president of Simi Winery in Healdsburg, Calif., from 1989 to 1996. Long's hiring and mentoring of other women in winemaking jobs made a significant contribution to gender diversity. Long was the first president of the American Vineyard Foundation, which helped to finance enology and viticulture research, and also founded the American Viticulture and Enology Research Network (AVERN). She is the co-owner of Long Vineyards in St. Helena, Calif., and the co-owner of Vilafonte Wine Estate in South Africa.

Dr. Vincent Petrucci

Founded Fresno's viticulture and enology department

Vincent Petrucci (1925-2016) was known as the father of the Department of Viticulture and Enology at California State University, Fresno and taught three generations of vineyard managers and winemakers. Serving as a professor from 1948 until 1993 and continuing as an emeritus professor afterward, he helped trans-

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form the university's collection of wine-related classes into a coherent Department of Viticulture and Enology, established formally in 2000. Fresno was the first CSU campus to combine research and academic offerings in both disciplines and became a key driver of productivity and quality improvements in San Joaquin Valley vineyards and wineries, and those farther afield. In 1997, Fresno State became the first university in the nation with a bonded winery to market student-produced wines commercially. Its program graduates fill leading grape and wine industry positions worldwide.

Fred and Eleanor McCrea

Pioneers in DtC sales of a collectible wine

The founders of Stony Hill Vineyard on Spring Mountain in Napa Valley set the model for a boutique estate winery, and hundreds of other winery owners followed them in the next six decades. Fred McCrea (1897-1977) and his wife, Eleanor McCrea (1907-1991), made one of the first truly collectible Chardonnays in California and developed a mailing-list approach to sales that foreshadowed today's booming direct-to-consumer sector.

The McCreas made the rugged hillside spot on Spring Mountain their home in 1943. They planted the first vines on the property in 1948 to Chardonnay, Riesling and a small amount of Pinot Blanc, followed a few years later by sections of Gewürztraminer and Sèmillon. More recent decades saw the addition of Cabernet Sauvignon and a small amount of Syrah. The first Stony Hill harvest came in 1952, and by 1954, every bottle was sold via mailing list, with a waiting list growing by the day. Eleanor ran the business and Fred made the wine, developing Stony Hill's signature restrained style and minimalist approach. Upon Fred's death, his assistant and protégé, Mike Chelini, became the winemaker, and he has continued through the 2018 harvest. Also in 2018, Stony Hill Vineyard became part of Long Meadow Ranch Wine Estates through an acquisition. The McCrea family will retain an equity interest in the combined entity.

Norm McKibben

Influential player in vineyard, winery development

An engineer by profession, Norm McKibben retired to Walla Walla, Wash., in 1985 at the age of 50, when the valley had just three wineries. He had made his fortune in heavy construction, but his focus in retirement has been wine. An initial investment in Hogue Cellars of Yakima led to him planting his own vineyard, Pepper Bridge, in 1991. Together with partners Gary Figgins (Leonetti Cellars), Marty Clubb (L'Ecole No. 41) and Bob Rupar, he purchased the acclaimed Seven Hills Vineyard on the Oregon side of the Walla Walla Valley AVA in 1994. The 20-acre vineyard expanded to more than 200 acres by 1998, and three years later the partnership acquired an adjacent 2,700 acres for SeVein, a project set to have 1,700 acres of vineyard. The management company, North Slope Management LLC, drilled 1,000 feet into the terrain to secure water for the venture, which is now home to more than a dozen projects. Besides being a managing partner of North Slope and other ventures, McKibben is partner in Artifex Wine Co., a custom-crush facility that's given a start to Canvasback, Double Canyon and many other Washington wineries. A founder of VINEA, the Walla Walla Valley's sustainable viticulture organization, McKibben has been widely recognized for his service to the industry in both Washington and Oregon.

Prohibition and Repeal

Constitutional amendment closed the wine industry from 1920 to 1933

Put into effect in 1920, the 18th Amendment to the U.S. Constitution prohibited commercial production, importation, transportation and sale of wine and other alcoholic beverages except in certain limited circumstances. Grapegrowing and home winemaking were still allowed, and *Wines & Vines* got its start during this period as a publication called *California Grape Grower* that carried information on those topics.

Organized crime networks sprang up to illegally provide alcohol to a public that remained thirsty. The violence that accompanied that black market trade, along with the lack of tax revenue from alcohol sales, helped spur the 21st Amendment, which repealed Prohibition in 1933. With Repeal came the regulations that established the three-tier system for alcohol sales that persists today. Prohibition caused the great majority of wineries to close and many vineyards to be uprooted or converted to lower-quality grapes. It changed the wine industry fundamentally and kept it from fully recovering for several more decades.

Lucie Morton

Viticultural consultant and researcher

First recognized in East Coast viticultural circles for her translation from the French of Pierre Galet's book, "A Practical Ampelography: Grapevine Identification," Lucie Morton has helped countless potential growers and existing vineyard owners understand all aspects of vineyard management, from site selection to grapevine maintenance. Morton attended the École Nationale Supérieure Agronomique in Montpellier, France, and planted her first grapevines on three acres at the family farm in northern Virginia. In addition to her consulting, Morton is an independent viticultural researcher based in Charlottesville, Va. Much of her research has focused on various diseases in grapevines. Her work on "black goo," which afflicts grapevine rootstocks and causes young vines to die, resulted in the fungus responsible for that

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Membrane presses

A major innovation in press efficiency

The basket press is an old and reliable technology that has been upgraded through the years, and modern versions remain popular with many wineries producing premium red wines (see Product Focus, page 100). But starting with the first rubber-bladder pneumatic press developed by Willmes in 1951, pressing took a major step forward. Willmes followed up the bladder with a membrane press in 1974, and Bucher soon had one available, too. The membrane stretched across one entire side of the enclosed, cylindrical press chamber and when inflated would press pomace or grapes evenly against drain plates. The press cake could be broken up by rotating the press chamber. Later versions of these presses had systems to flood the press and pass pan with inert gas and press cycles to match winemaking style or variety. Simon Nordestgaard, a senior engineer at the Australian Wine Research Institute, concluded in a history of wine presses published in the August 2015 issue of *Grapegrower & Winemaker* that such presses were able to produce high yields of high-quality juice at much higher throughputs than was previously possible.

disease being named *Phaeoacremonium mortoniae* in 2001. She also has done research on the red-blotch virus and, most recently, on *Pestalotiopsis*, a fungus that can cause fruit rot as well as trunk and leaf problems.

Judgment of Paris

A PR coup for California wines during U.S. bicentennial year

In 1976, British wine merchant Steven Spurrier organized a blind tasting of prestigious French wines versus upstart California wines in which the judges were mostly French experts. A 1973 Napa Valley Cabernet Sauvignon by Stag's Leap Wine Cellars received the highest score of the 10 red wines involved, and a 1973 Chardonnay from Napa's Chateau Montelena ranked highest among 10 white wines. Journalist George Taber wrote up the results for *Time* magazine, and when his article was published a month before the U.S. bicentennial celebration, it made a huge public relations impact that still reverberates today.

Kosher Winemakers

Ernie Weir and Peter Stern broke the syrupy sweet stereotype

Ernie Weir, founder of Hagafen Cellars in Napa Valley and Peter Stern, winemaker for Royal Wine Co. and Herzog Wine Cellars in the U.S, and Golan Heights Winery and Yarden Wines in Israel, proved that superior kosher wines can be made that are indistinguishable from the world's finest wines, breaking the syrupy sweet stereotype. Hagafen Cellars was founded in 1979 and in the years since its wines have earned many accolades regardless of their kosher credentials, including being served at White House functions more than 20 times. Stern helped build the 73,000-square-foot Herzog winery in Oxnard, Calif., in 2004, which became the largest kosher facility producing dry varietal wines in the United States.

"60 Minutes"

Morley Safer's report on the French paradox lifted wine sales

Sales of red wine in the U.S. spiked upward by a third — and never came back down — in the year after television newsman Morley Safer produced a segment on the popular CBS show "60 Minutes" in 1991 that documented the wine's credentials as an essential part of a heart-healthy diet. Interviewing Serge Renaud, a researcher at the University of Bordeaux, Safer told the story of the antioxidant properties in wine, and red wine in particular, due to the phenolics in the skins of grapes. He focused on the startling differences between Americans and French people in terms of deaths from heart disease and how they correlated with the normal diets of the two

DEKÁNY ZSOLT

Oak barrel-alternatives

Better quality has led to better wines with lower production costs

Twenty years ago, using oak barrel-alternative products was something winemakers had no problem talking about in general, but they would never publicly admit to using such products themselves. That attitude has changed, largely because the quality of alternatives has improved dramatically in that time. More vendors such as Creative Oak, Oak Solutions Group, Innerstave and StaVin have specialized in producing alternative products, and the range of options— from fine dusts to heavy tank staves — that correspond to different and specific uses in the winemaking process has also expanded dramatically. Barrel producers have also been active in improving the quality of alternative products and developing new ones, such as the as the Oenofirst "logs" of compressed oak chips produced by Seguin Moreau. Such products have helped wineries produce better wines at more affordable prices, and that has helped build U.S. wine consumption. Alternative oak products developed almost in tandem with micro-oxygenation technology, which delivers a precise and minute amount of oxygen similar to the amount that passes through the staves of barrels. Companies such as Vivelys USA have developed oak chips to work with specific micro-ox programs, while others such as Parsec offer a broad range of micro-ox options, and new ones such as Wine Grenade have developed systems that are simple to use and for smaller wineries.

countries. The French, who ate butter and pâté without guilt and also drank red wine regularly, suffered less heart disease per capita than typical Americans who ate hamburgers and French fries but drank soda and beer. This was the French paradox. Its exact causes have been questioned since then, but the healthy glow the show gave to red wine, including American red wine, has hardly faded.

Dr. Vernon Singleton

In 33 years at UC Davis, he researched phenolics and control of oxidation

Vernon Singleton (1923-2016), a prominent viticulture and enology professor from 1958 to 1991 at the University of California, Davis, was known for trailblazing research and textbooks that are still used today. Singleton, who earned a Ph.D. in biochemistry at Purdue University, would become an expert in wine chemistry at Davis. At the time of Singleton's death, one colleague, professor Roger Boulton, said, "His role in the science of wine was the characterization of phenolic compounds at a time when people didn't think they were important."

Another colleague, Axel Borg at the UC Davis Library, said that Singleton's research dealt with wine aging, phenolics and the effect of oak barrels on wine. His research explored the composition of phenols and their reactions during fermentation and storage. One important accomplishment was to reveal the specific chemical reaction pathway for oxidation, showing the steps of oxygen reduction and the organic products along the way that would affect wine aroma and color. This provided winemakers with specific insights into how to improve grape handling and winemaking practices to reduce oxidation, opening the door to fresh, fruity white wines, one of the major improvements in wine production of the 20th century.

Sustainable Sonoma County

Ambitious plan to certify all vineyard acres by this year

In 2014, Sonoma County Winegrowers president Karissa Kruse announced the county would be the first in the nation to have every acre of vineyard certified as sustainable by 2019. It was a bold goal, and one that some saw as commendable but not possible. Since then the number of certified acres has steadily grown, and by 2018, the growers reported 92% of the approximately 60,000 acres of vines have undergone a sustainability assessment and 72% have been certified. In promoting and leading the county's push toward sustainability, Kruse, who holds an MBA from The Wharton School, has become a leader in the global wine world speaking about sustainability at several international conferences and helping to bring greater recognition to Sonoma County. Kruse was named a Marshall Memorial Fellow, launched the Center of Ag Sustainability and was named the 2018 Leader of the Year by the California Association of Winegrape Growers.

Dr. G. Hamilton Mowbray

Producer of the first commercial ice wine in the U.S.

One of Dr. Konstantin Frank's early cooperators was Dr. G. Hamilton Mowbray (1922-2001), an experimental psychologist in the applied physics laboratory at Johns Hopkins University in Baltimore. Mowbray first visited Frank in 1958 and bought vines from him the next spring. Mowbray and his wife, Phyllis, purchased a 100-acre farm in Silver Run Valley near Westminster, Md., in 1964, planted some vines and opened their winery, Montbray Wine Cellars, in 1966. One of Mowbray's first wines was made from Seyve-Villard 5-276, which is now called Seyval. Because it was a French hybrid wine, Frank was upset and did not refer to Mowbray as one of his cooperators after that. On Oct. 5, 1974, Mowbray took advantage of an early freeze in Maryland and harvested enough Riesling at dawn when the temperature was 21° F. For Christmas the following year, he released the first commercial ice wine; it was also the first commercial Riesling ice wine. Mowbray also ran a wine school to help growers learn more about grapegrowing and winemaking, served as a lecturer on wine at the college level, and was a consultant for many new wineries in Maryland and Virginia.

Screwcaps

Overcoming an initial stumble with consumers

The screwcap story is one of innovation moving faster than consumer preference. The French company Le Bouchage Mécanique (LBM) started researching alternatives to cork closures in the 1950s after the company's Stelcap closure had enjoyed widespread success in the spirits industry. About a decade later, LBM had developed the first versions of the Stelvin cap, and the company was approached in 1964 by Peter Wall, the director of Yalumba winery in Australia. Wall was able to convince a group of other Australia wineries to use the closure, and it was introduced into the market by 1973. While winemakers, retailers and the wine trade immediately saw the benefits of the new closure, consumers did not, and by the 1980s twist-off caps had been pegged as suitable only for cheap plonk. By the 1990s, however, concerns about cork taint prompted most wineries in Australia and New Zealand to ditch corks, and they helped pave the way for the return of screwcaps to premium winemaking. In the United States, consumers have come to expect crisp whites and rosés under screwcap, no doubt in part because of the continued success of imported New Zealand Sauvignon Blanc. Stelvin screwcaps remain a leader in the category and are now produced by Amcor, which has also developed a range of different liners to provide varying oxygen transfer rates.

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Rootstocks

A new appreciation after phylloxera's resurgence

Grapevine rootstocks have been vital for most of the world's winegrowing regions since a global infestation of the soil-borne aphid phylloxera wreaked major havoc in vineyards in the 19th century. Using native American grapevines or crosses made from them as rootstock was the answer then and still is today, since they have natural resistance to phylloxera, having evolved together in North American soil. But phylloxera made a resurgence in California vineyards in the late 1980s largely due to growers widely planting a rootstock with low resistance to the bugs, AxR1.

When phylloxera began killing vines on AxR1 roots, it caused a new surge in the awareness of rootstock types as vineyards were ripped out and replanted. Growers exercised new caution in their choices, and found they could not just manage phylloxera but also vigor, water use and other viticultural challenges with the proper choice of rootstocks. The majority of rootstocks used today were bred at the end of the 19th century or at the turn of the 20th century. They are mainly hybrids of: *Vitis berlandieri, Vitis riparia* and *Vitis rupestris*.

Social Media

Changing the way wineries communicate with consumers

#WIYG this #WineWednesday? Did you celebrate #CabFrancDay on Dec. 4? Are you joining #WininghourChat this Tuesday? How consumers choose wine, find new brands and communicate with wineries and fellow wine drinkers has changed drastically with the influence of social media. It started with forums hosted by popular websites and swiftly moved on to the blogosphere. Though many bloggers still remain key influencers and a few have moved on to established publications, Facebook, Twitter and Instagram have developed new ways for critics and consumers to share their thoughts on wines — from live-streaming tastings to staged bottle shots with accompanying tasting notes.

Wineries are now learning to adopt these new tools by communicating directly to their consumers on the various social media platforms, commenting and reposting favorable mentions and joining online chats to encourage consumer engagement. Making wines more visible gives the impression that they are more available, thus has expanded the direct-to-consumer (DtC) opportunities for those wineries utilizing social media. Many DtC sales management systems now incorporate social media into the software to assist wineries in monetizing their social media relations.

David Ramey

Bringing traditional methods to modern winemaking

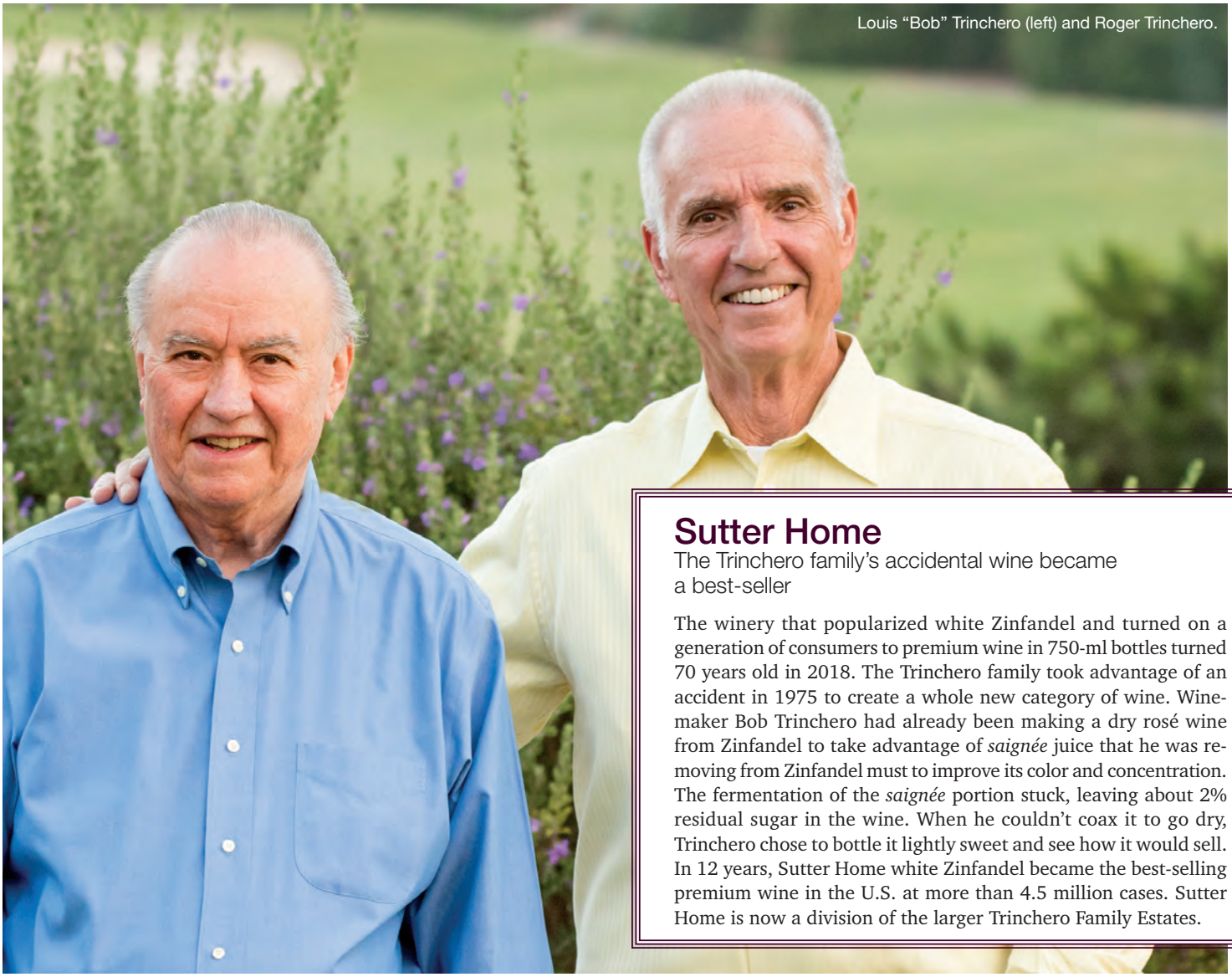
Over the years, the founder of Ramey Wine Cellars in Healdsburg, Calif., has helped pioneer traditional, artisan winemaking techniques in California during a period when making wine by the university book was the norm. David Ramey's efforts helped shape the way many wines in the United States are made today, including the elimination of skin contact for most white grapes; the use of oxidized juice in making white wine; *sur lie* aging of white wines in barrel; malolactic fermentation of Chardonnay; native yeast fermentations; harvesting fully mature fruit; eliminating acidification of red wines; and bottling without filtration.

After 16 years making wine in Sonoma County, and establishing Matanzas Creek and Chalk Hill wineries in the marketplace, Ramey crossed the Mayacamas Mountains to spend six years in Napa Valley, first as winemaker for Dominus Estate and project manager for the construction of its new winery, then helping Leslie Rudd reshape the Girard Winery into Rudd Oakville.

Dr. Bruce Reisch

Grape breeder and genetic engineer

The New York State Agricultural Experiment Station at Cornell University has a history of grape research and breeding that goes back more than 100 years, but it was not until 1972 that the first wine grape, Cayuga White, was named. Bruce Reisch took over the grape-breeding and genetic-engineering programs in 1980. Since then, his program in the department of horticulture has released 13 new grape varieties – three seedless table grapes and, in cooperation with the department of food science and technology, 10 wine grapes. Perhaps Reisch's most successful grape, Traminette, is a midseason white grape with a varietal character very similar to one of its parents, the *vinifera* grape Gewürztraminer. Officially released in 1996, Traminette not only yields well and produces quality wines, it is also more cold-hardy and disease-resistant than its well-known parent. It is the signature white wine grape in Indiana and was named the "Outstanding Fruit Cultivar" in 2015 by the



Louis "Bob" Trinchero (left) and Roger Trinchero.

Sutter Home

The Trinchero family's accidental wine became a best-seller

The winery that popularized white Zinfandel and turned on a generation of consumers to premium wine in 750-ml bottles turned 70 years old in 2018. The Trinchero family took advantage of an accident in 1975 to create a whole new category of wine. Winemaker Bob Trinchero had already been making a dry rosé wine from Zinfandel to take advantage of *saignée* juice that he was removing from Zinfandel must to improve its color and concentration. The fermentation of the *saignée* portion stuck, leaving about 2% residual sugar in the wine. When he couldn't coax it to go dry, Trinchero chose to bottle it lightly sweet and see how it would sell. In 12 years, Sutter Home white Zinfandel became the best-selling premium wine in the U.S. at more than 4.5 million cases. Sutter Home is now a division of the larger Trinchero Family Estates.

American Society for Horticultural Science. In addition to his traditional breeding program, Reisch works on new grape-breeding techniques to develop new wine grapes that are cold-hardy, disease-resistant and have superior wine quality. His studies focus on an array of DNA techniques to put molecular markers on genetic linkage maps and then use the maps for marker-assisted selection of new grapevines.

Richard Sommer

Brought Pinot Noir to Oregon

Oregon's modern wine industry got cracking in 1961 when Richard Sommer (1930-2009) migrated north from California to an egg farm northwest of Roseburg and began planting *Vitis vinifera*. His grandfather had a small vineyard near Ashland, but Sommer pioneered a new era. Pinot Noir was among the first eight varieties he planted, and by 1966 a winery was in full operation. His – and Oregon's – first Pinot Noir was released in 1967. A passionate but modest character, Sommer encouraged many others with his dedication and belief in the industry, including Dick Erath, who followed him north to Oregon, and David Lett, who won renown for showing the kind of Pinot Noir that was possible in the Willamette Valley and, by extension, Oregon. A co-founder of the Oregon Wine Board, Sommer sold Hillcrest Vineyards in 2003. In 2011, the state legislature honored him for his pioneering leadership in the state's wine industry.

Three-Tier System

After Prohibition, producers were separated from distributors and retailers

The three-tier system of beverage alcohol distribution came into effect after Prohibition was repealed in 1933. It was intended as a way to prevent incidences of alcohol abuse, prevent monopolies in the marketplace, keep organized crime out, as well as make it possible for individual states to collect taxes on alcohol producers. The purported benefit of the system was that, by separating the producers from selling directly to stores and restaurants and requiring independent distributors, those producers had a better chance of selling their product nationwide. The downfall in recent decades has been that small-scale producers have a hard time finding and affording large-scale distribution services.

Within the last decade, consolidation in the distribution tier has resulted in a small number of distribution companies controlling the majority of wine sold in the U.S. Now the wine industry has seen the emergence of "work-arounds," including more major wineries starting their own distribution companies and marketing companies that work on behalf of smaller wineries to find distribution companies able and willing to work with their case production.

From left: Marvin Sands (CEO, Canandaigua Wine Co.), Charles E. Hetterich (president, Widmer's Wine Cellars), and Richard Sands (president of Canandaigua), with New York U.S. Sen. Alphonse D'Amato.

Marvin and Richard Sands

The story behind Constellation Brands

Constellation Brands' story begins with Marvin Sands' father, Mordecai "Mack" Sands. He founded the first of the family's wineries — Car-Cal Winery in Greensboro, N.C. — in 1936 and established the brand Old Maude, a 20% alcohol dessert wine. When Marvin returned home after World War II, Mack arranged for Marvin to buy a bulk wine plant, Canandaigua Industries.

It took several years for Marvin to get Canandaigua established. Mack sold Car-Cal in 1948 and joined Marvin as manager of southern operations. Mack opened Richard's Wine Cellars (named after his grandson) in 1951 and three years later launched Richard's Wild Irish Rose, a 20% alcohol, bright red rosé. By 1963, Canandaigua had $10 million in sales, and the Sands family began to buy additional wineries. The purchase in 1974 of Bisceglia Brothers Wine Co. in Madera gave them a California presence. The winery introduced the Sun Country brand of wine coolers in 1984, and profits rose dramatically. Richard Sands became president of Canandaigua in 1986, and his brother Robert joined the company as general counsel. That year, the company acquired several large Finger Lakes wineries, including Widmer's Wine Cellars. Taylor, Great Western and Gold Seal wineries joined the Canandaigua group in 1994, and well-known wineries in California, including Almaden and Inglenook Vineyards, were also purchased. Marvin Sands died in 1999.

Canandaigua changed its name to Constellation Brands Inc. in 2000. When the company purchased Robert Mondavi Corp. in 2004, the company became the largest U.S. winery. Constellation now markets wine, beer and spirits and this year invested in a Canadian cannabis company. Robert Sands became president and CEO of Constellation in 2007, and Richard continued as chairman of the board. In October 2018, Robert announced that Bill Newlands will become president and CEO in March 2019. At that time, Robert will become executive chair of Constellation, and Richard will become executive vice chair.

U.S.-Canada free trade agreement

Helped wineries and growers on both sides of the border

Perhaps no trade deal changed the game for North America's wineries like the 1988 agreement establishing free trade between the U.S. and Canada. Taking effect Jan. 1, 1989, the deal opened Canada to wines from California and across the U.S., while Canada's industry contemplated the removal of thousands of acres of labrusca and hybrid varieties that had been the mainstay of the industry since Prohibition. Growers were promised average compensation of $8,100 an acre, an amount even agrologists admitted was insufficient to cover replanting costs. However, the trade agreement also included provisions that allowed Canada's industry to find its feet, which it quickly did. Within five years, Inniskillin Wines had won international recognition for its ice wine, and British Columbia's Mission Hill claimed the Avery Trophy for the world's best Chardonnay at the International Wine and Spirits Competition. Today, California $1.4 billion worth of wine to Canada, its biggest export market, while Canada's wineries produce more than $1 billion worth of wine from 30,985 acres of vineyard.

Dr. Nelson Shaulis

Viticulturist and pioneer of mechanization

Nelson Shaulis (1914-2000), "the father of canopy management," was viticulturist at Cornell University's New York State Agricultural Experiment Station (NYSAES) in Geneva, N.Y., from 1944 to 1978. His research on the nutritional requirements of grapevines, balanced pruning and the development of the Geneva Double Curtain (GDC) training system helped to transform the cultural practices in vineyards in New York and elsewhere. The GDC training system divided the thick canopy of grapevines such as Concords into two less-dense canopies. The result was improved grape maturity and fruit quality. The average yield of grapes per acre in New York increased from 1.5 tons in 1944 to 4.5 tons in 1965. Shaulis also was a major factor in the development of the mechanical harvester for grapes, in part so that mechanical harvesting could be used on GDC-trained grapevines. In an interview with Hudson Cattell in October 1994, Shaulis said that the first farm research paper was called "Mechanical Grape Harvesting." "We were very proud of it," he said, "until someone wrote to me and asked what a mechanical grape was. I never again used that term but always the 'mechanical harvesting' of grapes."

The engineering for the harvester project was done by E. Stanley Shepardson in the de-

Stainless steel tanks

Better fermenters brought winemaking into the modern era

One could argue that the importance of stainless steel tanks to the modern wine industry can be seen in how many articles in consumer and trade media (including this publication) have reported on the trend of winemakers ditching stainless steel for concrete, clay or plastic or returning to oak vats for fermentation. When something is perceived to be intrinsic to winemaking, any deviation from that can be considered news. According to the International Stainless Steel Forum, stainless steel was invented at the turn of the 20th century and was being used for cutlery and surgical tools by 1919. A few years later, in 1925, the first stainless steel chemical storage tank was built, and in 1928 a brewery was the first to use a stainless steel tank for fermentation. Probably because of tradition, the lack of investment and growth during Prohibition, and — in California — the abundance of large redwood fermenters, the use of steel in the wine industry did not pick up until the 1960s. In tandem with better temperature control, it quickly became the industry standard, and as the domestic wine industry grew rapidly it did so with stainless steel tanks. Today, the industry is served by foreign and domestic distributors and manufacturers including JVNW, Westec, Santa Rosa Stainless Steel, Quality Stainless Tanks and Spokane Industries.

partment of agricultural engineering at Cornell University in Ithaca and the Chisholm-Ryder Co. in Niagara Falls, N.Y.; grape-quality studies were done by James Moyer in the food science department at NYSAES. The project began in 1957 and was first used commercially in New York in 1968.

Dr. Richard Smart

Australian consultant evangelizes for science-backed viticulture

Richard Smart, an Australian-born viticulturist who earned his Ph.D. at Cornell University under professor Nelson Shaulis, led the charge for better-designed vine trellises based on his and others' research findings. In particular, he is known for his insights into the effect that increasing sunlight exposure on grape bunches can have on developing positive sensory qualities in the wines made from them.

Smart and co-author Mike Robinson wrote "Sunlight Into Wine," a handbook for wine grape canopy management, which was first published in 1991. They based it on work they had done for the New Zealand government and wanted it to be an applied book, directly used by grape producers wanting to adopt what was then an exciting new approach to trellis design. Smart spread the message around the world through lectures and direct consulting with grapegrowers and developed the Smart-Dyson Trellis with John Dyson to show one unorthodox but effective way to get more sunlight into the vine canopy. (See an article by Richard Smart on page 76 of this issue.)

TCA Cork Taint

Persistent flaw forced industry improvements

The bane of winemakers, scourge of sommeliers and cause of confusion for consumers, 2,4,6- trichloroanisole, the cause of cork taint, can be blamed for ruining countless bottles of wine. Typically described as causing odors of wet dog, damp newsprint or mustiness, the compound can seem to strike individual bottles at random or bedevil wineries. Yet for all the problems and economic damage TCA has caused, one should consider the improvements made by the industry overall in its fight against TCA. Pinpointing the exact compound and the resulting sensory threshold required for humans to perceive it (around 2 parts per trillion [ppt]) and then to reject wines (3 ppt) are benefits of better sensory and analytical science. When several prominent California wineries were called to task for TCA by a prominent wine critic, they renovated their cellars and raised the issue of TCA quality control through the entire wine-supply chain. Barrel coopers and other suppliers improved their facilities, and some even secured third-party verification to demonstrate they did not use chlorinated water or treated wood products, such as delivery pallets, that could expose a winery to TCA. As for the actual cork side of cork taint, the fight against TCA helped the development of an entirely new alternative-closure industry, and that in turn has forced cork suppliers to improve their production methods.

Elmer Swenson

Cold-climate grape breeder

Cold-climate grape breeding began in 1943 when Elmer Swenson (1913-2004), a farmer in Osceola, Wis., started to breed grapes for winter hardiness. He had read T.V. Munson's "Foundations of American Grape Culture" and acquired some of the varieties developed at the University of Minnesota after World War I. One variety, known as MN 78, was used by Swenson as one (or more) parent in eight of the 10 new grapes he named during the course of his career as a grape breeder. Swenson took some of his hybrid grapes to a field day at the University of Minnesota's Horticultural Research Center in 1965. Four years later, he retired from farming and became a member of the center's staff. Two of Swenson's varieties were introduced in conjunction with the University of Minnesota in 1974: Edelweiss, a white grape that was crossed in 1949 (MN 78 x Ontario) and is hardy to -30° F, and Swenson Red, crossed in 1966 (MN 78 x Seibel 11803) and hardy to -25° to -30° F but is somewhat susceptible to downy mildew. The grapes developed by Swenson have formed the base for producing wine across the cool- and cold-climate states in the upper Midwest, northern New York and New England.

"Sideways"

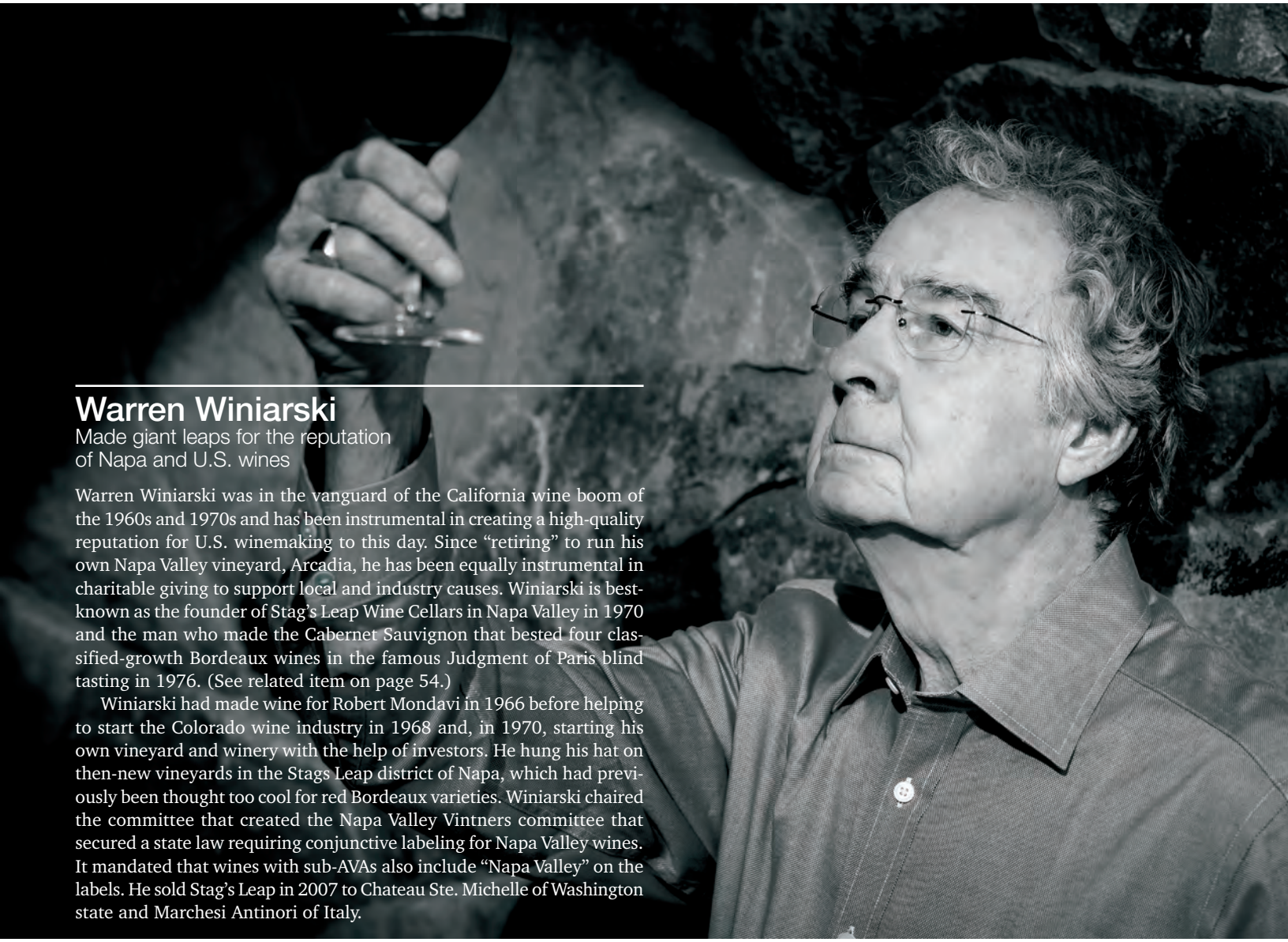
Film fueled the rise of California Pinot Noir

"Sideways," a 2004 film about two buddies drinking their way through the wine country of Santa Barbara County, Calif., received ample critical acclaim, including an Academy Award nomination for best picture. But in the wine industry, it is better known for its effect on the popularity of California Pinot Noir. As the characters stop at such landmarks as Sanford Winery, Foxen Winery, Fess Parker Winery (called "Frass Canyon" in the film) and the Hitching Post restaurant, protagonist Miles rhapsodizes about the ethereal appeal of Pinot Noir – and denigrates Merlot in no uncertain terms. After the movie's release, Pinot Noir sales soared (and Merlot sales tapered off), and a number of studies attributed those trends to the "Sideways" effect. A Sonoma State University study found that the movie had a positive impact on sales of Pinot Noir across all price points, with the biggest impact on the $20-$40 segment. Planting of California Pinot Noir also saw big increases for about five years to meet demand. The movie also boosted the image of Santa Barbara County wines in general, and Pinot Noir in particular. And it was good for tourism: Tourism bureaus and private tour operators still promote "Sideways"-inspired itineraries.

Viruses

Cleaner plant material boosted productivity, but the battle continues

A decades-long campaign to control grape-



Warren Winiarski

Made giant leaps for the reputation of Napa and U.S. wines

Warren Winiarski was in the vanguard of the California wine boom of the 1960s and 1970s and has been instrumental in creating a high-quality reputation for U.S. winemaking to this day. Since "retiring" to run his own Napa Valley vineyard, Arcadia, he has been equally instrumental in charitable giving to support local and industry causes. Winiarski is best-known as the founder of Stag's Leap Wine Cellars in Napa Valley in 1970 and the man who made the Cabernet Sauvignon that bested four classified-growth Bordeaux wines in the famous Judgment of Paris blind tasting in 1976. (See related item on page 54.)

Winiarski had made wine for Robert Mondavi in 1966 before helping to start the Colorado wine industry in 1968 and, in 1970, starting his own vineyard and winery with the help of investors. He hung his hat on then-new vineyards in the Stags Leap district of Napa, which had previously been thought too cool for red Bordeaux varieties. Winiarski chaired the committee that created the Napa Valley Vintners committee that secured a state law requiring conjunctive labeling for Napa Valley wines. It mandated that wines with sub-AVAs also include "Napa Valley" on the labels. He sold Stag's Leap in 2007 to Chateau Ste. Michelle of Washington state and Marchesi Antinori of Italy.

vine viruses has seen its share of victories and setbacks, but the awareness of winemaking problems caused by viruses and the search for new ways to solve them have continued nonstop. Repeated waves of replanting, especially in California, have been the main method to control common virus-related vine diseases such as grapevine leafroll-associated virus, grapevine fanleaf virus, red blotch-associated virus and, more recently, grapevine Pinot Gris virus.

Replanting with vines propagated from virus-free plant material has changed the face of many wine regions, bringing significant improvement in grape and wine quality and productivity. Industrywide, clean nursery stock for Chardonnay particularly drove plantings. New research since 2000 that shows grapevine viruses spread not only through plant material but by vectors such as mealybugs has spurred more targeted management approaches.

Helen Turley

Winemaker who mastered ripeness and high ratings

Winemaker and winery owner Helen Turley played a big part in establishing a cadre of cult Cabernet Sauvignon and Chardonnay brands in California that often received the highest critics' scores and commanded the highest prices in the marketplace. She led the ripeness movement of the 1990s with her own Marcassin Chardonnay and Pinot Noir and the wines of her employers and consulting clients, including Napa Valley wineries Bryant Family Vineyard, Colgin Cellars, Pahlmeyer Winery and her brother's Turley Wine Cellars.

Turley was educated at Cornell University, made her way to a job in the Robert Mondavi Winery lab, and over time became a winemaker, a consultant and a vineyard owner with her husband, John Wetlaufer, at Marcassin in the Sonoma Coast AVA. Reviewers often described her wines as very rich and bold, but also polished and showing finesse. She has been credited with mentoring several other top winemakers and with blazing a trail to high prices and critical acclaim that many wineries in California and beyond have followed.

New York Wine & Grape Foundation

Help for a state's industry during a grim period

In 1984, the future looked grim for the grape and wine industry in New York. After a decade of winery closings, vineyard abandonments, declining tourism and changes in consumer tastes, major wineries canceled contracts with growers, and grape prices fell to $105 per ton. *The New York Times* reported on the industry's challenges, and Gov. Mario

Andre Tchelistcheff received the AWS Award of Merit at the AWS national meeting in Grand Island, N.Y., November 1980.

Cuomo decided to come up with legislative assistance for the industry. Commissioner of agriculture and markets Joe Gerace contacted Jim Trezise, then president of the New York Wine Council, a small organization of grapegrowers and winery owners. Trezise drafted a potential solution that became the basis for legislation Cuomo signed in May 1984. The bill allowed the sale of wine coolers in food stores, deregulated wineries and created new marketing opportunities including tastings in liquor stores.

Legislation establishing the New York Wine & Grape Foundation passed the next year and was funded with a $2 million budget, 70% for research and 30% for promotion. Trezise was appointed the foundation's president. The research funds went primarily to Cornell University and Cornell Cooperative Extension. Trezise's promotion goals were simple: "bring the people to the wine, and take the wine to the people." The first means tourism and the development of wine trails; the second, urban marketing such as the "NY Drinks NY" program, which brings writers, sommeliers and wine store managers to the wine regions. When Trezise announced his departure in 2016, the Fingers Lakes had developed a worldwide reputation for its Riesling; there were more than 400 wineries in the state; and the wine industry was generating $5 billion in economic benefits to New York. Sam Filler is now executive director of the NYWGF, and Trezise is president of WineAmerica in Washington, D.C.

André Tchelistcheff

Brought European traditions and scientific training to Napa Valley

The Russian-born, French-educated enologist André Tchelistcheff (1901-1994) came to Napa Valley in 1938 to work for Beaulieu Vineyard (founded in 1900) and became instrumental in raising wine quality for the whole valley, the state of California and elsewhere in North America. He trained two generations of winemakers working under him and those he mentored as a consultant after retiring from Beaulieu in 1972. Nicknamed "the Maestro," Tchelistcheff was widely admired and respected, and his inspiring personality and deep knowledge of winemaking continue to influence the industry today.

Tchelistcheff brought a knowledge of European winemaking traditions combined with scientific rigor and an appreciation for winery sanitation. He wore a white lab coat while running tests at Beaulieu and for other winemakers at the private lab he operated on the side. Beaulieu founder Georges de Latour entrusted him with creating a special Private Reserve Cabernet Sauvignon named for the founder, which helped set the standard for age-worthy Napa reds and is still produced today. He used 60-gallon French oak barrels and, later, American ones in which to mature the wine, at a time when large oak ovals and upright redwood tanks were the norm. Among other innovations that have had lasting effects, he contributed to the techniques of cold fermentation, malolactic fermentation, vineyard frost protection, and the success of wineries in Paso Robles, Santa Ynez, Washington and Oregon.

Dr. Andrew Walker

Breeding better resistance to disease in cultivars and rootstocks

Professor Andrew Walker's work in grape breeding at the University of California, Davis, since 1989 is likely to be a game changer for the next 100 years. His focus has been the development of disease resistant cultivars and grape rootstocks with resistance to soil-borne pests. He has been working on resistance to fanleaf, dagger and root-knot nematodes and phylloxera. His lab studies the genetics of resistance to these pests, their genetic diversity, and interactions of these pests with grape species.

Walker's lab is also actively involved in breeding table, raisin and wine grapes for resistance to Pierce's disease (PD)and powdery mildew. His lab's work on PD-resistant grapevines is quite encouraging. The vines already are proving to be a success in Texas, Missouri and other states that had been rife with PD. Walker directs classical breeding and inheritance studies, the development of rapid resistance assays, field trials of promising rootstock and scion selections, DNA marker analysis and mapping, and genetic engineering.

Ste. Michelle Wine Estates

Largest Washington wine company and pivotal to growth

Washington's largest vintner, Ste. Michelle Wine Estates, traces its roots to 1934 and the launch of the National Wine Co. and Pommerelle Wine Co., makers of fruit wines. The companies merged to form American Wine Growers in 1954. National planted Grenache in the Yakima Valley in 1951, and *vinifera* plantings expanded to include Riesling in 1965 as a result of Walter Clore's work at Washington State University. Premium wines from *vinifera* grapes bearing the Ste. Michelle name debuted in 1967 under the direction of California winemaker André Tchelistcheff. Chateau Ste. Michelle became the company's name in 1976 when it relocated to the Stimson estate in

Woodinville. Ste. Michelle took a leadership role in the industry under Allen Shoup, who joined in 1980. It led the creation of the Columbia Valley AVA in 1984, the creation of the Washington State Wine Commission and Washington Wine Institute and initiated joint ventures that brought Tuscany's Piero Antinori and Germany's Dr. Ernst Loosen to Washington. Company revenues under Shoup increased from $5 million to $175 million. Now owned by Altria Group Inc., Ste. Michelle buys two-thirds of Washington's grape crop and distributes wine from around the world.

Dr. Albert Winkler

Father of modern-day California viticulture

Albert Winkler (1894-1989) is widely recognized as the father of modern-day viticulture in California. During his more than 60 years with the University of California, Davis, he was instrumental in the development of the Department of Viticulture and Enology into one of the world's leading research and education centers for those disciplines. Winkler performed fundamental research on the relationship between climate and grape varieties, and was the principal author of the dominant text on grapegrowing, "General Viticulture," published in 1962. With Maynard Amerine, he developed the still widely used Winkler Scale or Winkler Index that uses growing degree days as a way to calculate heat summation during the growing season, so that different climates can be compared and their suitability for different grape varieties can be assessed. This classification created Regions I through V from coolest to warmest based on their heat summations.

"Two-Buck Chuck"

Fred Franzia and family made wine (almost) as accessible as water

The Bronco Wine Co., owned by Fred Franzia, his brother Joseph Franzia, and cousin John Franzia, changed the wine game due to its huge success with "Two-Buck Chuck" wine and the family's dominance over San Joaquin Valley

grapegrowing, but also due to a penchant for breaking the rules. The company doesn't disclose the size of its vineyard holdings but is estimated to own 40,000 acres, making it among the biggest, if not the biggest, owners in North America. It is also ranked as the sixth largest wine producer, bottling 10 million cases in 2017, according to Wines Vines Analytics.

Officially branded as Charles Shaw, Two-Buck Chuck earned its nickname with a $2 retail price tag in many of the Trader Joe's locations where it was an exclusive store brand. The brand's low price, varietal content, classic

Wildfires

Changing climate could bring more destructive fires, smoke taint

In October 2017, ferocious wildfires exploded in Napa, Sonoma and Mendocino counties and spread quickly through some of the best wine-growing appellations of California. The flames burnt a quarter of a million acres, destroyed a few wineries and more than 8,000 structures overall and killed 42 people. The loss of lives and property was staggering, but wine country residents were resolute in rebuilding and focusing on the future.

Two wineries destroyed in the fires, Signorello Estate in Napa Valley and Paradise Ridge in Sonoma County, broke ground on new wineries in 2018 and the local economies have rebounded from the loss of wine-tasting tourists. What is more ominous is that more massive fires erupted in December 2017 in Southern California including the Thomas Fire, which scorched more than 300,000 acres. That fire was surpassed in size by the 2018 Mendocino Complex fires and the recent Camp Fire in Butte County killed 88 people, wiped out the town of Paradise and left a blanket of thick, acrid smoke over most of the North Coast.

The Woolsey Fire ripped through the Malibu AVA in November 2018, destroying a few wineries and vineyards in the small appellation. Fires have also left their mark on Oregon, Washington and British Columbia as the Northwest endured its worst fire year on record in 2018. Several growers complained of canceled grape contracts in 2018 because of the fear of smoke taint. Most experts predict climate change will only make such destructive fire seasons longer and more routine. After touring the destruction of the 2018 fires, Gov. Jerry Brown said it is a new threat to the state's way of life. "This is not the new normal, this is the new abnormal," he said. "And this new abnormal will continue certainly in the next 10 to 15 to 20 years."

packaging and surprisingly high quality won over many new consumers and expanded the market for wine. On the flip side, it put downward pressure on competitors' pricing and on the price of the most basic wine grapes grown in the state.

Bronco's production of wines with Napa place names in the brand names, including Napa Ridge and Rutherford Vintners, that did not use primarily Napa Valley AVA grapes spurred a fight with Napa Valley wineries that Bronco lost and which failed to overturn a 2000 California law about AVA grape content. In 1993, Fred Franzia and Bronco were indicted for conspiracy to defraud by misrepresenting grapes they sold as Zinfandel and Cabernet Sauvignon when they weren't. Bronco paid a $2.5 million fine, and Fred Franzia paid a $500,000 fine.

Philip and Jocelyn Wagner

Winery and hybrid nursery founders in Maryland

Philip Wagner's (1904-1996) interest in wine began when he became an editorial writer for the *Evening Sun* in Baltimore in 1930. The paper's editor, James H. Owens, wanted to make wine, and the two bought grapes and made wine together beginning the next year. Based on his research on how to grow and make wine, Wagner published his first book, "American Wines and How to Make Them," in 1933. At the time, it was the only book in English on winemaking.

While working in the *Baltimore Sun's* London bureau during 1936-37, Wagner visited the agricultural station at East Malling, southeast of London, and learned about French hybrid grapes. The researchers there were more interested in disease resistance, while Wagner was concerned about winter hardiness. In 1939, he imported the first French hybrid vines for wine production in the U.S. – 25 vines of Baco No. 1 from French hybridizer Maurice Baco – and planted them at his home in Riderwood, Md.

Philip and Jocelyn Wagner (1901-1994) married in 1940 and the next year started "Boordy Vineyard, J. and P. Wagner, Props." as a grapevine nursery selling primarily French hybrid vines. They added a small winery four years later. Their first order for grapevines was shipped to a winery owner in Grapeview, Wash. Until the early 1950s, Boordy was the only commercial nursery in the East selling French hybrid grapevines.

Boordy Vineyard was a source not only for grapevines, but also for grapegrowing and winemaking equipment, wine glasses, and for information on growing and making wine, both through Philip's books and in person. The Wagners sold the Boordy name and winemaking equipment to the Robert B. Deford family in 1980 but continued to operate the nursery until 1994.

Tablas Creek Vineyard

Beaucastel owners gave a boost to California's Rhône Rangers

After a yearlong search for the right place to produce Rhône-style wines in California, wine importer Robert Haas and one of his French clients, the Perrin family of Château de Beaucastel in Châteauneuf-du-Pape, in 1989 founded Tablas Creek Vineyard in Paso Robles, Calif. They legally imported Rhône grape varieties from France, propagating them in a nursery at the winery after they were released from quarantine. The availability of this new vine material helped raise the quality of Rhône grapes in the U.S. Wineries all over the country have purchased the so-called Tablas Creek Vineyard Selections (now marketed by Novavine).

The arrival of a leading producer from Châteauneuf-du-Pape also catapulted Paso Robles into the spotlight as a source of high-quality wines and helped raised the profile of other so-called Rhône Rangers on the Central Coast, like Randall Grahm of Bonny Doon Vineyard, Bob Lindquist of Qupé Wine Cellars and John Alban of Alban Vineyards.

Posing at Tablas Creek Vineyard in Paso Robles, Calif., are (clockwise from lower left) Robert Haas, Neil Collins, Cesar Perrin, Francois Perrin and Jason Haas.

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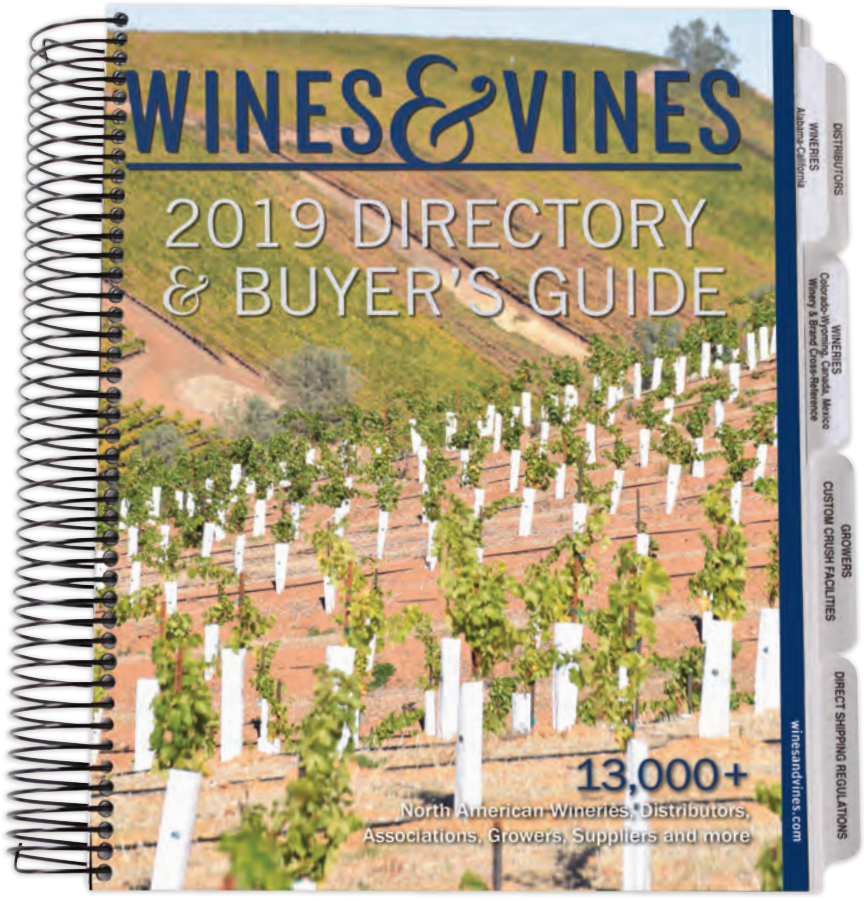

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ANDY STARR

The Top Nine Lessons Learned on What Works in the Wine Industry

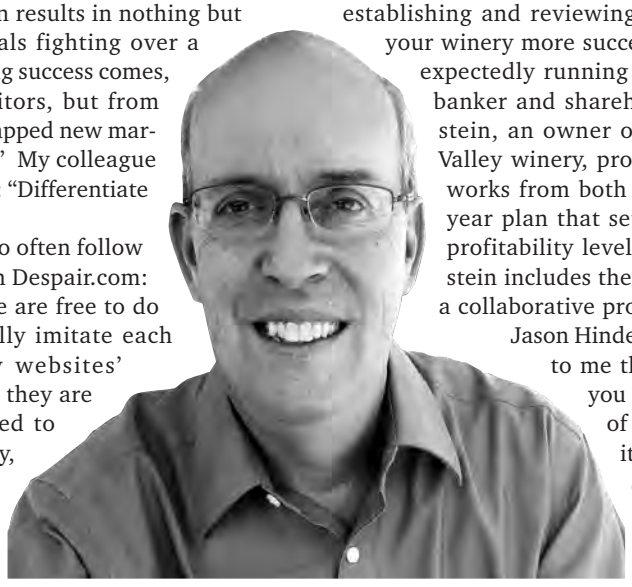
Over the last three years, I've been fortunate to write 17 columns for *Wines & Vines*. The line "Here's What Works" was deliberate, focusing on the needs of a reader who runs a small vineyard or winery, fewer than 25,000 cases, and located outside the Napa/Sonoma vortex of excellent, well-established brands (as well as a few wealthy wannabes who thought building a winery would make a better "personal shrine" than would a yacht or thoroughbred horses). I interviewed people just like you, and asked them how they incorporate new technologies and best practices into their operations, so that you could learn from their first-hand experience.

After three years of writing, and more than 30 years in this industry, these are my nine most valuable observations:

1 Differentiate or die. Avoid the mantra of "This is how it's done in the wine industry."

Blue Ocean Strategy, developed by W. Chan Kim and Renée Mauborgne, observes, "Today's overcrowded industries competing head-on results in nothing but a bloody red ocean of rivals fighting over a shrinking profit pool. Lasting success comes, not from battling competitors, but from creating blue oceans of untapped new market spaces ripe for growth." My colleague John Stallcup is more blunt: "Differentiate or die."

Yet many wineries all too often follow the satirical quote found on Despair.com: "Conformity: When people are free to do as they please, they usually imitate each other." So many winery websites' "About Us" pages note that they are family operations dedicated to quality and sustainability, that their wines are made in the vineyard. Their back labels uniformly note that their Chardonnay goes well with chicken, and Zinfandel with Italian food. All noble attributes. All well-written. And all the same. Wine is an industry where few want to lead, but everyone wants to be the first to be second.



Common wisdom states that you must revere tradition and do things the way the wine industry does it. Yet so many successful brands did just the opposite. Chardonnay "must" be dry, yet Jackson Family Wines made its fortune producing an off-dry version that consumers love and detractors still say was made "incorrectly." You must use French varieties, yet Bokisch Vineyards in Lodi, Calif., successfully specializes in Iberian varietals. The owner has roots in Catalonia, so their story is authentic and unique. Quady, a boutique winery in California's Central Valley, thrives because it's the only winery specializing in sweet *vinifera* wines. Don't let tradition be a barrier to free thinking.

2 Business planning is good.

It could be that when you hear the phrase "business plan," the first thing you think of is your previous career working at a soul-sucking large corporation. Yet establishing and reviewing a business plan will make your winery more successful, prevent you from unexpectedly running out of cash, and keep your banker and shareholders happy. Holly Finkelstein, an owner of Judd's Hill, a small Napa Valley winery, provided a great example. She works from both a one-year plan and a five-year plan that sets bigger goals, production, profitability levels and capital needs. Finkelstein includes the entire management team in a collaborative process.

Jason Hinde at Exchange Bank explained to me that without a business plan, you may be relying upon a "Field of Dreams" strategy of building it (bottling wines) and hoping Shoeless Joe Jackson (the consumer) will appear. While it is a beautiful story, it's also fictional.

3 A winery Is a food-processing plant. Run yours like one.

Externally, we talk to visitors about winemaking as an art form, but internally a winery is a food-processing operation, one that has more in common with turning tomatoes into bottles of ketchup than creating "bottled poetry."

Plan for harvest. Understand that your forecast and wine styles will dictate how you will use your facility. If you decide to add cold soaks or longer maceration, you will have fewer tank turns and need more tanks, or a relationship with a good custom-crush facility. Preventive maintenance is critical for the crush to run smoothly, every piece of equipment must be ready, every employee must be trained. Have written protocols for every important step in the process.

Plan your bottling runs. Bottling planning is a critical, complex and collaborative process, with potentially divergent criteria for each material vendor such as cost, quality and speed. Shelly Rafanelli-Fehlman, winemaker at A. Rafanelli Winery & Vineyards in Healdsburg, Calif., compares bottling to "planning a wedding" – an excellent analogy, as the wedding date/mobile bottler date is going forward whether the flowers were ordered or not. Her bottling planning begins once all the grapes are picked. Rafanelli-Fehlman emphasized the importance of planning to a delivery date, rather than a bottling date. She sees her vendors as partners who know her facility and people.

Cynthia Sterling, owner of Sterling Creativeworks, a wine-branding and packaging-design firm, sums up packaging planning best: "Winemakers must appreciate the great complexity of bottling. You are ordering a half-dozen components made in different parts of the world by completely different vendors, expecting all parts to fit together perfectly (both from a functional and design perspective) on bottling day and convey your brand image and wine quality. That's a lot of different, precise components and tolerances that all have to come together."

Plan your equipment purchases. Check out equipment in use at a local winery before you buy. Keep in mind that sometimes the more expensive option costs less, whether it's replacing your press bladder before it cracks, or buying La Garde's square stainless tanks, which cost much more than round ones, but their square shape allows you to install more tanks in the same space, saving on much larger building expansion costs.

Have a safety plan. As we saw in the 2017 wildfires, "the worst that could happen" happened. Be prepared. Boring, non-artisanal things like insurance coverage are critically important.

4 Stick to your core competencies.

Saying "we do everything ourselves here" is both dumb and impossible. You may need automated leaf pulling or cross-flow filtration, but you don't have to own and operate the leaf puller or the filter equipment. You need a cellphone, but you buy it from Samsung or Apple instead of building your own. It's the same with "outsourcing" the diesel for your tractor. Or the tractor itself.

Core competencies means focusing on the unique abilities that your business does that cannot be easily imitated. For most wineries, it's your ability to make and market high-quality wine. There are only so many hours in a day, so outsource non-core tasks. It may be lab work, bottling, filtration, equipment servicing prior to harvest or cane lifting. Someone else can do it, probably better, faster and cheaper than you can.

Avoid spending time on things that take away from other winemaking activities that are more critical to your success. There is no standardized way to optimize winery operations, except to play to your own core competencies.

5 Focus on your consumer's preference over your own.

As a winemaker, you may prefer to consume dry, brutally tannic reds, dislike moderate, fruity styles, and consider anything sweet an abomination. So that's what you decide to produce. When visitors come to the tasting room to swirl, taste and then wince in pain, too often the explanation is that *they* need "to understand what we're all about here."

No other business is run so arrogantly. Would a restaurant owner laugh at you for asking to hold the mayo on your burger, or not allow you to add milk or sugar to your coffee? I think that's why one of my favorite interviewees was George Cowie at Chautauqua Vineyards & Winery in the Florida Panhandle, who keeps his loyal customers happy with gracious hospitality and sweet Muscadine wine.

Consumer preference extends to packaging. Is your design based on what you like to look at, or whether it lines up with what your target consumer likes? Maybe you are offended by screw caps, but your customers like them, or vice versa. You can name a wine after your spouse, child or parakeet, but it will need to resonate with your target customer to be successful.

6 Labor shortages are here forever.

The average age of a vineyard worker is increasing. Fewer young people are coming to the United States to replace retirees, due to both the availability of good jobs in Mexico and increased border restrictions. And experienced immigrant vineyard workers have learned enough English to allow them to get better jobs away from heat and cold, rain and dust.

Adapt to it. Assume that there are solutions, and that a positive, methodical approach will let you automate and maintain quality and sustainability. There are many labor- and cost-reducing solutions for the small grower or winery, some you can buy and others you can hire and rent as needed.

7 Innovation is slow yet inevitable.

I offer this innovation example from my years in the closure wars. The packaging revolution of alternative closures, cans, single-serve glasses and boxes started 20 years ago with the first synthetic corks. Maybe 40% of wine is now packaged with one of these, which means that more than half of all wine *still* comes in a glass bottle with a solid wood cork or hybrid wood cork/glue stopper. To the wine industry, this level of change in 20 years is considered a "revolution," or "disruptive technology." But the rest of the planet adopts change far more quickly.

In our industry, innovations *should* be adopted slowly, in part because we need to understand the long-term effect on a long-lived product. Everything you try will either add or subtract to a wine. But going slowly isn't an excuse for not moving at all. Waiting while someone else figures it out means you will always be behind the learning curve. Instead, get involved. Invest time and resources in solutions. Support the startups who need partners like you to make their inventions work.

Sometimes just measuring things differently is an innovation. When deciding when to harvest, we look less at Brix, and more at other indicators of physiological ripeness. To determine vineyard health, many growers now focus on fruit weight per vine instead of tons of fruit per acre.

8 Data matters.

Data is generated at every step in the process, from soil moisture to vineyard sampling to weight tags to all of winemaking steps to case goods to sales to consumer data. We are buried in data, yet we often make important decisions on anecdotes, on what the winery down the street is doing, and "gut instinct."

We can do better. There are integrated systems to track and report what goes on from grapes to bottle, and others that provide data-driven sales analysis.

Michael Longerbeam, the direct-to-consumer manager at Dry Creek Vineyard in Healdsburg, would like to see the wine industry use data the way it is used in high-tech and other consumer goods companies,

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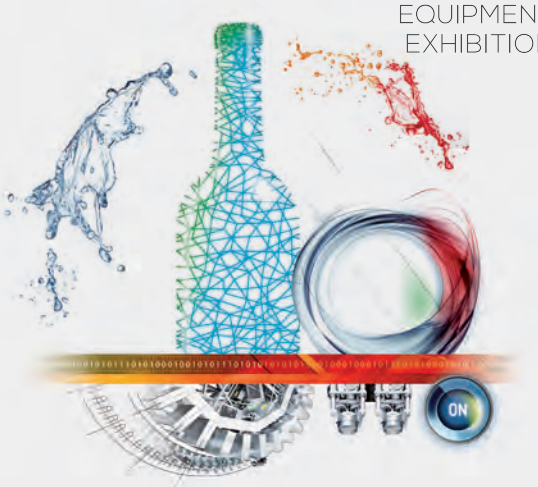

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stating: "You're sending emails to your customers anyway; you might as well learn from it. Next time you make a decision, work data into it."

9 Be a friend. Be a good boss. While many winemakers and growers are natural introverts who'd rather talk to barrels or vines than people, the best-run businesses see everyone as a friend. They treat their workers well and view their vendors as partners. They get together with their winemaking buddies to share knowledge and taste each other's wines.

Nico Cueva, winemaker for Kosta Browne Wines in Sonoma County, pointed out that one of his best vineyard "tools" is simply a strong, experienced cellar team. The low attrition rate among production staff provides him more time to walk vineyards all year long, which results in better quality. What impressed me was his deliberate linking of creating a good workplace and strong cellar team with improved wine quality.

But going slowly isn't an excuse for not moving at all. Waiting while someone else figures it out means you will always be behind the learning curve.

And sometimes those friendships help more than you'd anticipate. For example, Napa grower and all-around "good guy" Ernie Ilsley fought the October wildfires that came right up to his vineyards and home. He didn't have a water truck, but his friends at nearby Piña Vineyard Management loaned him a water truck and bulldozer, which helped save his property.

Finally, I will miss *Wines & Vines*. While it's grown harder to sustain print publications, they are being replaced by new media that will have greater positive impact on our industry. Jono, my bright 22-year-old nephew, is in the middle of his first cellar internship at Groth Vineyards & Winery in Oakville, Calif. He won't have *Wines & Vines*, but I'm confident that there will be no shortage of quality data and information sources for him as his career develops.

Andy Starr, founder of StarrGreen (starrgreen.com), is an entrepreneur, marketing manager and winemaker who provides strategy, management and business development consulting services. A resident of Napa Valley, Calif., he holds a bachelor's degree in fermentation science from the University of California, Davis, and an MBA from UCLA.

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CLIFF OHMART

What is Sustainable Wine Grapegrowing

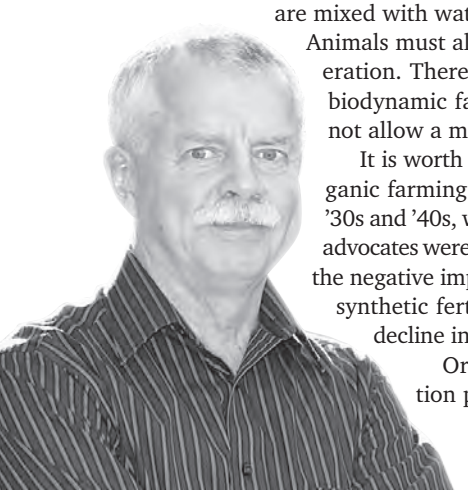
Sustainable wine-grape growing is a journey, not a destination. In the next few paragraphs, I will make the case for why using this approach for growing wine grapes is so important. I will then discuss some significant areas of tension in the wine industry that have come about as the sustainability movement has evolved, which may help growers better negotiate them

Sustainable grapegrowing as an overarching approach

There are three basic approaches to growing wine grapes: conventional, organic and biodynamic. I contend that all three fit under the umbrella of sustainable wine grapegrowing.

The three approaches have certain characteristics in common. All use labor and energy as inputs. They all require land clearance to establish a vineyard. Practitioners of each type are proud of the way they farm and feel it is the best way to farm. And they all have resulted in grapes that were made into award-winning wines as well as forgettable ones. Furthermore, all three approaches recognize the importance of healthy soil for a successful farm.

The three approaches differ significantly as well. Conventional viticulture involves the use of both synthetic and naturally derived soil amendments, nutrients and pesticides. Organic and biodynamic viticulture prohibit the use of any synthetic nutrients or pesticides, and both require soil building through addition of organic matter, using practices like cover cropping and compost additions. Biodynamic farming differs from the other two in requiring practices and inputs outlined by Rudolf Steiner in a series of eight lectures in 1924. For example, a grower must use nine plant-derived "preparations" in crop management. Most are added to the composting process, and the others are mixed with water and sprayed onto the crops. Animals must also be a part of the farming operation. There are other practices that make biodynamic farming unique, but space does not allow a more detailed discussion.



It is worth noting that biodynamic and organic farming were developed in the 1920s, '30s and '40s, when some farmers and farming advocates were becoming very concerned about the negative impacts of off-farm inputs, such as synthetic fertilizers and pesticides, and the decline in soil health as a result.

Organic and biodynamic certification programs fully addressed these concerns through specific farming practice requirements and prohibition of synthetic inputs. During the last 20 years, other important issues besides the negative impacts of synthetic fertilizers and pesticides came to our attention, such as energy use, water use, farm biodiversity, climate change and worker welfare and safety. All of which have been addressed by sustainable agriculture through the promotion of practices designed to optimize the use of energy and water, improve worker welfare and safety, and enhance farm biodiversity.

Many sustainable-farming certification programs have been established in the last 20 years and address most, if not all, of these issues through specific farming practice standards. While organic and biodynamic farmers would likely agree that these more recent issues are very important and must be addressed, their respective certification programs have not yet incorporated practices to do so.

Profits and sustainable growing

We farm in a capitalistic system and, therefore, unless a vineyard owner has a second income besides the vineyard, wine-grape growing must ultimately produce a profit for it to be sustainable. The cost of producing wine grapes varies tremendously based on location and the farming practices used. The revenue from a vineyard also varies tremendously based on location, yield and perception of the quality of the wine produced. Therefore, the cost of production for a given vineyard compared to the price per ton of grapes in the winery contract will determine to what degree sustainable farming practices can be used, such as cover cropping, compost addition, organic versus synthetic fertilizer, pesticide choice, mowing versus sheep grazing, management of hedgerows for biodiversity, and so forth. I once visited a Syrah vineyard where half went to one winery and the other half to another, each paying a different price per ton. More sustainable practices were being used on the section receiving the higher price.

Sustainable growing and pesticides

As with any human endeavor where there is more than one approach to accomplish something, there are advocates and critics of each one. Farming is no exception. Advocacy and criticism are based on a range of things, such as research results, environmental activism, experience, ideology or a combination of all of them. In my experience, pesticide use is the most controversial topic among farmers, farming advocates, environmentalists, ag input supply companies and the public.

Let's not forget that a pesticide is a material designed to kill a pest. There are many ways a chemical can accomplish this, and whether we like it or not, all pesticides are going to have side effects on workers, consumers, the farm and surrounding environment. These side effects vary tremendously in their magnitude based on the active ingredient. Unfortunately, in some circles, pesticides that are approved for use in organic and biodynamically managed vineyards have gained the reputation of being totally benign. However, a pesticide is a pesticide, even if it is approved for use in organic and biodynamic vineyards. I think it is much more useful to discuss pesticides in terms of the potential risk they present, risk being a combination of toxicity of the pesticide active ingredient coupled with the chance of exposure to it by non-target organisms.

There are many synthetic pesticides that present high risk of negative impact on one or more non-target organisms – workers and/or consumers – and there are a few organically approved pesticides that do so, too. There are also many synthetic pesticides that present moderate or low risk, as do most organically approved pesticides. The Integrated Pest Management Institute of North America has developed a web-based pesticide risk tool that anyone can use to get a scientifically based measure of the risks presented by an EPA-registered pesticide to 12 risk indices. I feel this is a much better way to decide what pesticide to use rather than the simple dichotomy of whether it is synthetic or organically derived.

Recently, a new class of pesticide active ingredients has been developed that does not directly kill a pest but stimulates the plant in a way that makes it less susceptible to insects or diseases. This is an exciting new area of pest management, but it is still too early to determine how impactful it is going to be. It is definitely not the silver bullet that will solve all of our pest-management challenges.

If we are to continue to farm wine grapes commercially, I feel we will always need to use pesticides, whether they are synthetic or organically approved. There are several reasons for this. First, vineyards are not natural systems that are inherently stable with vines that can ward off any pest problem. Second, over time pests are transported from one part of the world, where they are in relative balance with their host plants and environment, to another part of the world, where circumstances enable their populations to grow unchecked. The wine industry has several famous cases where this has happened, such as grape phylloxera, leaf-roll viruses, red-blotch virus, vine mealybug, glassy-winged sharpshooter and, most recently in the Northeast, the spotted lanternfly. The goal then is to use pesticides only when they are necessary, efficacious and present the lowest risk to workers, consumers and the environment.

Sustainable wine-growing certification

Several groups have developed sustainable wine-grape growing certification programs, all of them practice-based, as are organic and biodynamic certification programs. There are four programs in California, one on Long Island, and one that is primarily in Oregon but also certifies some vineyards in southern Washington and in Idaho. Overall, I think these programs have a very positive effect. They all address the important issues such as soil management, water management, pest management, energy use, biodiversity and worker health and safety. They all require a minimum level of implementation of sustainable-farming practices that is verified through on-site audits. And they give a participating grower a sense of community, pride and accomplishment. Some wineries in California are paying growers a bonus for certified wine grapes. Certification can have its dark sides, too, one of which is playing out right now in California's North Coast, which I think is unfortunate and counterproductive. The dark side being: "My certification program is more sustainable than yours!"

The bottom line is that no matter how we farm our wine grapes, we will not be able to eliminate the environmental and social footprints.

Farming is not natural

Implicit, if not explicit, in the definition of sustainable agriculture is that it is a "natural" approach to farming. In other words, it is trying to mimic a stable, natural ecosystem. The argument for why this is important is the assumption that a natural system is more balanced than an artificial one, and it will therefore require fewer or no inputs and/or manipulation. However, there is nothing natural about the way we grow wine grapes in the United States.

At some time in the past, natural habitat was eliminated where a vineyard was established. Most vineyards are planted with varieties of *vinifera*, which are not native to the U.S. but to the Mediterranean and Central Asia. The vines are grown in rows, and in most vineyards, they are trained onto stakes and wires. Finally, we have manipulated the vines to produce more fruit of a desired quality. In other words, no matter what farming approach is used, it leaves a footprint on the environment.

There is also a social impact – a social footprint, if you will. In most vineyards, much of the work is done by immigrants, many of them here illegally, who are paid a less-than-desirable wage under very challenging working conditions. Neighbors of vineyard or winery operations are inconvenienced by conversion of native habitat to vineyards, dust from farming operations, traffic and noise. The bottom line is that no matter how we farm our wine grapes, we will not be able to eliminate the environmental and social footprints. In other words, there is no destination we can call natural farming. Our goal, therefore, needs to be minimizing our environmental and social footprints created by farming wine grapes. Since knowledge, technologies, regulations and the marketplace continually change, our ability to impact those footprints continually changes. Sustainable wine-grape growing is therefore a journey.

What is sustainable growing and who can participate?

Sustainable wine grape growing is the journey of continually improving one's ability to minimize farming's environmental and social footprints. All farmers can participate in this journey, whether they use conventional, organic or biodynamic practices, or a combination. The population of U.S. winegrape growers can be viewed as being on a continuum of farming practices from less sustainable on one end to more sustainable on the other. No matter where an individual is on the continuum, he or she can have a goal of moving along the continuum to increase sustainability.

We are in denial if we think that one approach to farming is the only way to solve environmental and social issues related to farming. For one thing, we will never be able to get farmers to all farm in the same way. Another is that all three approaches to farming leave an environmental and social footprint. Some of us get caught up with the idea that natural or sustainable farming is a destination that is some kind of environmental and social utopia. This puts farmers in an impossible position, because there is no such destination. The journey of continual improvement in the sustainability of one's farming practices should be the goal.

Over the last 20 years, it has been a privilege and wonderful experience for me to have shared with *Wines & Vines* readers my thoughts on many aspects of sustainable wine-grape growing. In this final column, I attempted to draw some conclusions that might be useful for wine-grape growers as they continue their journeys along the path of continual improvement that is sustainable farming.

Cliff Ohmart, Ph.D., was a senior scientist for SureHarvest for eight years and author of *View from the Vineyard: A Practical Guide to Sustainable Wine Grape Growing*. Previously he served as research/IPM director at the Lodi-Woodbridge Winegrape Commission. He has been writing about sustainable winegrowing issues for *Wines & Vines* since 1998.

HUGH JOHNSON

Staying in Touch From 5,000 Miles Away

It seems a long time ago: a dinner at the archaic but splendid Palace Hotel on Market Street in San Francisco when Phil Hiaring handed me a certificate anointing me Writer of the Year. I look back on those times, and the company of Leon Adams, Maynard Amerine, Joe Heitz, Frank Prial, Frank Schoonmaker, a dozen engaged and genial commentators, and the wines of Beaulieu, Louis Martini, Italian Swiss Colony, Almaden and Wente, of course. Once I start, I could bring back hundreds of memories — of valleys in a state of golden innocence, vineyards as exceptions in the landscape, and absolutely no food joints of any kind. Except the Grapevine Inn.

I was lucky enough to be one of the first Brits on the scene in the 1960s, when California wine was just stirring. 1957 is the date of my first visit, as a hitchhiking 18-year-old. Back again in 1971, I was lucky enough to meet Bob Thompson. Harry Serlis of the Wine Institute chose him as my guide for a rapid tour of, Bob can probably remember exactly where, but the roster of wineries was not long.

Wines & Vines was one of my main ways of staying in touch from 5,000 miles away as the wine scene in California developed. It had the range of views (and the refreshing austerity) of a committed trade journal. These days, 40 years later, I wonder if I need all these full-color, full-page posed photos of winemakers, full-bleed rows of vines and close-focused barrels. Or these constantly rehashed and inherently improbable tasting notes.

Bob Thompson and I were in close touch through the late '60s and the early '70s when I was writing my "World Atlas of Wine." I was guilty of provoking him into writing, with my full collaboration, "The California Wine Book," published in 1975. There was a clear need, by the mid-'70s, for a considered, sober summary of the fast-changing scene. Sadly, our book was kiboshed by an egregious producer claiming libel. The great Nathan Chroman of the *Los Angeles Times* saved our bacon. He rallied powerful voices (Mondavi, Gallo and others) to tell our tormentor that if writers risked bankruptcy by reviewing wineries, there wouldn't be much press coverage in the future.

In 1977, I wrote my first "Pocket Wine Book." I avoided the word encyclopedia because the personal flavor was (and is) more important to me than encyclopedic comprehensiveness — though heaven knows I try. Nor did I ever guess I should still be writing the same book 42 years later. Bob Thompson was my main source in California for many years.

In many (no, most) ways California wine has got better over these many years — though in some ways less to my taste. Would Cabernets in particular have gone the way they did without the influence of Robert Parker? I don't know, but I'm sure his 100-point system (which I still don't understand) and the way it was gamed by the trade, and especially consultants, has a lot to answer for. I am certainly happy to see a return to moderation and the center ground by intelligent winemakers. There is now an infinity of places — far too many, with the offerings of the internet — to look for information on any aspect of the wine industry. *Wines & Vines* has kept its head as a voice to respect in all the hubbub.

In a sense, California (and, indeed, Oregon and Washington) has become a geographer's (and atlas-maker's) dream. Every wrinkle in the coast range can be credited with fogs or cool breezes or the opposite — open, of course, to a producer's interpretation. Jancis Robinson and I are currently working on the eighth edition of our "Wine Atlas," out in 2019, and delving deeper into the West Coast than ever before. My principle concern today about California and its wines is their prices. One hundred dollars for a decent red is ridiculous. We'll never moderate the competitive egos of aspiring producers; if we could, we could drink very well for very much less. But wine is all about upward mobility. No wonder it is conquering America.

Hugh Johnson is the author of The World Atlas of Wine, co-author of The California Wine Book and his work Vintage, The Story of Wine was produced into a television series that aired on PBS in the U.S. In 2007, he was appointed an OBE by Queen Elizabeth II for "services to winemaking and horticulture."

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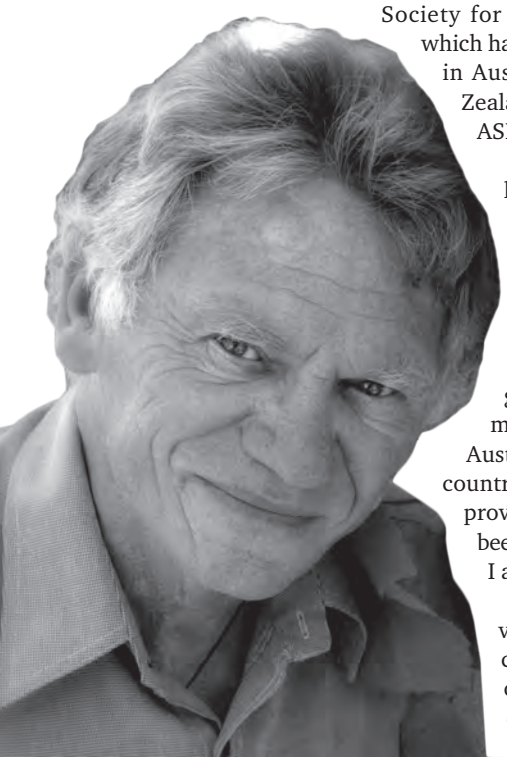
RICHARD SMART

Reflections from a 50-year Vineyard Meander

I was flattered when I was invited to contribute to the final issue of *Wines & Vines*, commemorating 100 years of distinguished service to the American grape and wine sector. As an older member of the viticultural science fraternity, I have seen many changes in my 53 years working in vineyards, and I will comment on some of these here. I have been involved in research, teaching and consulting in more than 35 countries and many wine regions of the world, so I can offer some sort of international perspective.

A vital element of a successful grape and wine industry is communication between members, especially of technical information. To go back 50 years, this was largely the purpose of trade magazines such as *Wines & Vines*. I recall that when I began my career, I was a devout reader of the Australian equivalent. Now trade meetings are more frequent, and there are many other sources of information, but the printed word still has an important place. Trade magazines remain an important information source, and most grape and wine scientists still use them to get their message out to industry practitioners.

Another important American legacy is the American Society for Enology and Viticulture, which has spawned similar societies in Australia, South Africa, New Zealand and Japan. Well done, ASEV.



While I was born in Australia and spent much of my life there, I have been a frequent visitor to the United States over my professional career, for education, speaking engagements and consulting. I have visited most grape-growing states of the U.S. To my mind, the United States and Australia have been important countries so far as technical improvements in viticulture have been concerned, some of which I acknowledge here.

I wondered about a relevant approach to this historical review and decided on a classification of "what had changed" in this period from 1966 to 2016, and "what has not changed," some of which maybe should have! After I wrote this column, I came across Cliff Ohmart's colum in the August 2018 issue of *Wines & Vines*, "Twenty years of sustainable winegrowing," where he took a similar approach. Some of our conclusions are similar.

What has changed?

I wonder if there may be another period of 50 years with more changes than have occurred over the period of, say, 1966 to 2016, which I am discussing. I am no historian, and maybe others will comment, but it seems to me this has been a period of very substantial change. The following entries are listed in no particular order, but I would hope that some of the more significant from a global point of view are included higher up on the list.

Irrigation

Grapevines have been irrigated for millenniums, as it was practiced by the ancient Egyptians. The 1960s saw the introduction of drip irrigation, developed in Israel but subsequently widely adopted in Australia and elsewhere. This irrigation system presented enormous benefits. It could be applied on undulating topography and does not wet foliage and fruit. Precise control was possible, and water application could be combined with soluble fertilizer. Compared to flood and sprinkler irrigation, the introduction of drip irrigation was truly revolutionary. In the late 1960s, I compared drip and furrow irrigation in one of the first global experiments; few then would believe that wetting only a small soil-root zone would be sufficient under arid conditions, but it was!

Mechanization

At the beginning of this period, there was virtually no mechanical harvesting nor pruning. These two tasks were traditionally the largest labor requirements in viticulture. Interestingly, the relevant technologies for both were developed in the U.S., and not, as one might imagine, on the West Coast but in New York State. Viticulturist Nelson Shaulis and engineer Stan Shepherd at Cornell University developed prototype harvesting and pruning machines, which were subsequently commercialized.

Of the two, machine harvesting was the more complex operation, and the machines were by nature expensive and have remained so. Interestingly, many of the world's machine harvesters are now manufactured in Europe, not in the U.S., where the technology was developed! Machine harvesting has had a major impact on vineyard and winery design.

ROB BURNETT

Recent New Zealand research has even credited machine-harvesting action with improvement in wine quality by the release of volatile thiol compounds from Sauvignon Blanc grapes.

The first mechanical pruners were relatively simple cutter bars, and many have retained this format. Australia quickly adopted mechanical pruning, including use of circular saws; mechanical pruning is now quite universal there, and some vineyards are not pruned at all. Mechanical pruning is being adopted in parts of California with concerns of labor availability and cost. Robotic pruners are being evaluated but have yet to be commercialized.

Pests and diseases

Over this 50-year period, there have been substantial developments in terms of pest and disease control. There are now in-field weather stations with models to predict disease onset for major fungal diseases. This was also a period of active research into virus disease, with virus-free planting material made available to nurseries for propagation. In the 1990s, many California vineyards were replanted due to use of a rootstock, AxR1, with insufficient resistance to phylloxera biotypes from the East, a fact long known to Europeans. When field-grown grafted vines were introduced from Eastern nurseries to meet shortages in California, the inevitable widespread destruction of AxR1-rooted vineyards occurred.

The 1990s were also the period of increased awareness about grapevine trunk diseases (GTD). While Eutypa had been long recognized in U.S. vineyards, newly planted grapevines in the 1990s suffered from "young vine decline." This problem came to be recognized as Petri disease, which was associated with a group of fungal pathogens. California surveys early in 2000 demonstrated the presence of other fungal diseases affecting grapevine health, which are yet to be diagnosed and controlled in many vineyards of the world, including in the U.S. In Eastern vineyards, GTD symptoms are found in vines with "winter kill"; maybe it is misdiagnosed. Grafting to phylloxera-tolerant rootstock has been practiced for almost 140 years to control phylloxera. However, the adoption of bench-grafting machines in the 1980s has caused the problem of trunk disease infection of grafted vines and hence spread in newly planted vineyards from nurseries worldwide. This GTD epidemic is a greater problem now than phylloxera ever was, in my opinion.

Canopy management

The 1980s and 1990s were periods of active canopy-management research. One practice that has emerged and has been widely adopted is fruit-zone leaf removal, although it is typically and excessively done by hand. Divided canopies were fashionable for a while, and many of the lyre designs are found on the North Coast of California. The Geneva Double Curtain developed by Shaulis in New York state and the Scott Henry system of Oregon have not been widely adopted, despite research and commercial experience showing their many benefits.

Why is it, when we have such a wide range of grape varieties, aromas and flavors, that we continue to present to consumers such an increasingly limited range of grape varieties

Organic, biodynamic and sustainable systems

These systems have become more fashionable, largely in response to perceived environmental damage with conventional viticulture. Agricultural chemicals are seen to be the worst culprit, and undoubtedly the general public is becoming more chemophobic. Adoption of these systems is considered by many to be a wine-marketing strategy, since such producers receive disproportionate press attention. However none of these systems address the greatest and most pressing environmental challenge, that of climate change.

Spray application

There have been improvements in machine design, but dense canopies still cause problems of spray penetration to a target. Unfortunately, sprayers that recycle off-target material are not used nearly as much as they might be.

What has not changed?

In some ways, this list is more difficult and more subjective.

No definition of wine-grape quality

Despite much research on this topic, it is still not possible to simply (and cheaply) measure the quality potential of wine grapes. Imagine how the wine industry might be transformed if the quality potential of grapes could be determined at the scale or the crush pad. I see this as a holy grail of viticulture and enology research, and in my opinion it receives too little research funding and attention.

Planting "international" varieties

I term this the "Coca-Cola-ization" of the wine business. Global planting statistics reinforce this trend toward making wine from fewer and fewer varieties, those 10 or so so-called "international." Why is it, when we have such a wide range of grape varieties, aromas and flavors, that we continue to present to consumers such an increasingly limited range of grape varieties, and mostly French ones at that! Varietal labeling was developed in California as an alternative to generic labeling, to encourage the planting of better wine varieties after Prohibition. Prohibition is long since over, but the winemaking use of more than a handful of grape varieties effectively seems prohibited by varietal labeling around the world. The world needs more variety in grape varieties.

How might this restrictive tendency be overcome? The answer lies in convincing consumers that they are being shortchanged by the present boring tendency. A concerted effort needs to be made by enlightened producers and the wine press alike to argue for 30 or so international varieties, for a start. Maybe then we can stretch it to 52 international varieties, one for each week of the year. Why not? We are certainly not limited by candidate varieties.

Use of heavy tractors and machinery

A California study compared the long-term vineyard environment with that of adjacent pasture land. The biggest difference between the two was not in applied chemicals, as some might imagine, but in soil compaction. We have the technology to reduce compaction by use of semi-track tractors. Why are they not more used? Soil compaction is environmental degradation, but sadly is out of sight, out of mind.

Traditional beliefs, or are they myths?

These mostly originate in Europe, and some are in encoded in legislation. The classical example is that of "high yields causing low quality." I am amused and amazed how fervently this is believed by enologists the world over, even by recent graduates from science-based courses.

Conclusion

The major influences on wine quality for any one vineyard source are the weather and vineyard and cellar management. Why is it we only read about "winemakers"? I always thought anyway that yeasts made wine. The more things change, the more they are the same, to quote an old French proverb.

This brief summary indicates how viticultural practices have changed over the last 50 years, and modern grapegrowing has been forever modified. I wonder what changes the next generation of viticulturists might see? &

Dr. Richard Smart is a qualified and experienced viticulturist. Contact him at vinedocto@smartvit.com.au.

100 Years of Covering the Wine Industry

As the North American wine industry evolved and expanded, so did Wines & Vines

By Tina Vierra

When Horatio P. Stoll debuted his *California Grape Grower* in 1919 on Geary Street in San Francisco, Prohibition loomed. On the first page of that first issue, grapegrowers were urged, "Don't dig up your vines! A permanent market must be developed for every wine grape grown in California!" A detailed Summary of the National Prohibition Enforcement Law, effective Jan. 16, 1920, was published.

Stoll, who had worked for the *Wine and Wool Register* paper, which folded under Prohibition, described the formation of an association of grapegrowers to keep the grape industry alive. E.M. Sheehan of the State Viticultural Board talked up alternative uses for the 400,000 tons of grapes produced annually in California. By June 1920, he would be president of the new 350-member Grape Growers Exchange.

The harvest at Pioneer Vineyard in Santa Cruz County, California. (Wines & Vines, July 1922)

1920

Farming advice for vineyard issues in the 1920s came from the University Farm at Davis, Calif., and other experts and ran side by side with articles and homemaker recipes for how to make juices, sodas, jellies and compotes. WearEver Company advertised aluminum steam-jacketed kettles sold to Welch's and others to make their grape juices. Asti's Italian Swiss Colony advertised pasteurized and frozen grapes, juices and concentrates, while Stoll and his writers told growers how to move their grapes to markets out of state and overseas by rail and sea.


THE CALIFORNIA GROWER

Vol. I JULY, 1920 No. 1

Published monthly in the interests of an industry program for California's Grape and Deciduous Tree Fruit Growers

The President of the United States who gave us Farm Relief


CALIFORNIA GRAPE GROWER

Vol. I San Francisco, California, December 1, 1919. No. 1

NOW FOR THE 1920 GRAPE CROP

By Horatio F. Stoll

"Thank God the vintage season is over and I have disposed of my grapes somehow," said one of our representative wine grape growers when he visited my office a few weeks ago. And he added: "I wonder how we will get rid of our grapes next year."

That question is bothering nine-tenths of the vineyardists of the State, for if they take time to reflect, they must realize the disposal of their 1919 crop of grapes has been little short of a miracle.

During the last weeks of August, the writer visited practically every grape district in the State in an effort to arouse the growers to an understanding of the critical situation. He was amazed to find them making absolutely no preparations for the disposal of their crop in case the wineries were not permitted to operate. They turned a deaf ear to the suggestion that they should try to develop other avenues of escape than wine-making. They had no patience with those who suggested costly driers; they laughed (particularly in the dry wine districts) at the idea of having stock to make boxes, so that they might ship their wine grapes out of the State in refrigerator cars.

The winemakers, too, refused to consider installing improvements that would enable them to make grape syrup, grape juice or any other product. Lulled into a sense of false security by well-meaning but mistaken friends, they announced they were going to make wine, because the ban would surely be lifted before the crop was ready to be harvested.

Then came the unexpected demand for fresh wine grapes from Eastern cities and buyers began to appear offering from $25 to $30 per ton. Before the season was over, $65 per ton was gladly paid.

It is safe to say half of the total wine grape crop of 600,000 tons could have been sold outside the borders of our State if sufficient cars had been available during September and October. It is too early yet to learn how many carloads of wine grapes actually left the State, but it is believed the shipments in refrigerator, ventilated and box cars will reach the 4,000 mark, which means something like 65,000 tons.

There is no use trying to hide the fact that this demand came from wine drinkers in every nook and corner of the country who wanted to make a limited quantity of wine for home consumption.

Thousands of tons of grapes were used in the manufacture of grape juice, which, it was expected, might later be fermented into wine.

A considerable quantity of grape syrup also was manufactured and it will be interesting to see how the American public takes to this excellent product.

Last, but not least, was the dried wine grape output. Most of these grapes were sundried, but a sufficient tonnage was handled in different types of dehydrators, evaporators and dryers to make us realize that evaporation is one of the most promising "outs" for the growers.

There is no doubt the vintage of 1920 will take on an entirely different complexion from that just ended. National Prohibition will be in effect and the manufacture of any beverage over one-half of one per cent will be prohibited. Just how far the Government will go in enforcing the drastic enabling act remains to be seen.

Having learned by experience that only a limited quantity of fresh wine grapes can be shipped out of the State within 60 days, the growers must begin at once to develop other legitimate avenues that will stabilize the industry.

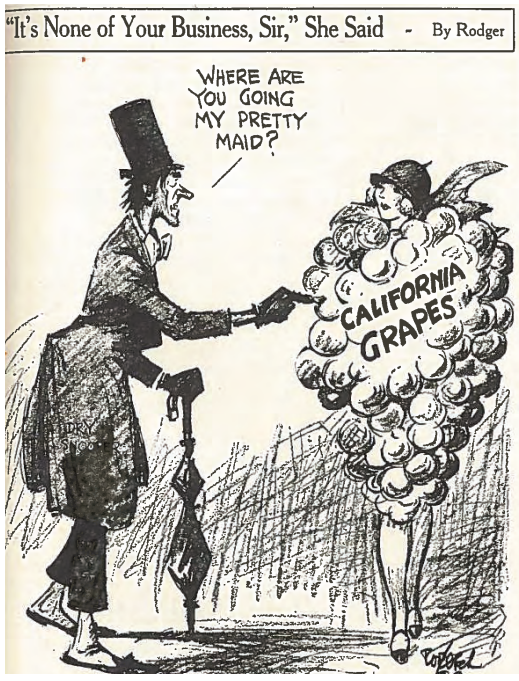
Already plans are forming to organize a co-operative marketing association to insure the prosperity of the wine grape growers.

I hope when the movement is launched, after the first of the year, every grape grower will fall in line and give the association his heartiest support.

In the meantime, my advice to the growers is:

INTERPLANT IF YOU CAN, BUT DON'T DIG UP YOUR VINES!

A PERMANENT MARKET MUST BE DEVELOPED FOR EVERY WINE GRAPE GROWN IN CALIFORNIA!


"It's None of Your Business, Sir," She Said - By Rodger

WHERE ARE YOU GOING MY PRETTY MAID?

CALIFORNIA GRAPES

SAN FRANCISCO BULLETIN


WINES AND VINES

California's Choice Bottled Wines

OCTOBER, 1935


Wines & Vines

H.F. Stoll, Editor

FORMERLY CALIFORNIA GRAPE GROWER

VOLUME 16

JANUARY 1935

1934 WINE CONSUMPTION
ROBERT D. ROSSI

CLASSIFICATION OF GRAPES
PROF. E. W. HILGARD

NEW WINE GRAPE PLANTINGS
CARL BUNDSCHU

CALIFORNIA'S WINE GRAPES
H. F. STOLL

OBSERVATIONS ON TANNIN
PROF. W. V. CRUESS


THE CALIFORNIA GROWER

NOVEMBER, 1930

Grapes of every type and clime flourish in California

1930

By 1930, the pages of *California Grape Grower* showed the frustration of an industry that hoped Prohibition would be short-lived, with cartoons mocking Prohibition enforcement commissioners as the new criminals. The FDR administration passed the Farm Relief Act, and the CGG pages advised and cautioned growers on how to make use of these new government assistance funds.

In Tulare County, a new grapevine decline problem was noted by a man named Newton B. Pierce and, as it spread, was given the name "California vine disease." The condition would later be renamed Pierce's disease.

At last, in 1933, Prohibition was repealed, and the pages of *California Grape Grower* rang with the good news. In 1935, Stoll renamed the publication *Wines & Vines*. The Golden Gate International Exposition at Treasure Island hosted the largest display of vintners since 1915, featuring such notable producers as L.M. Martini, Wente, Korbel, Cribari, Beaulieu, Beringer and Inglenook. Grape prices rose to $19.75 per ton, going up 33% per year in the 1930s as wine production rose once more.

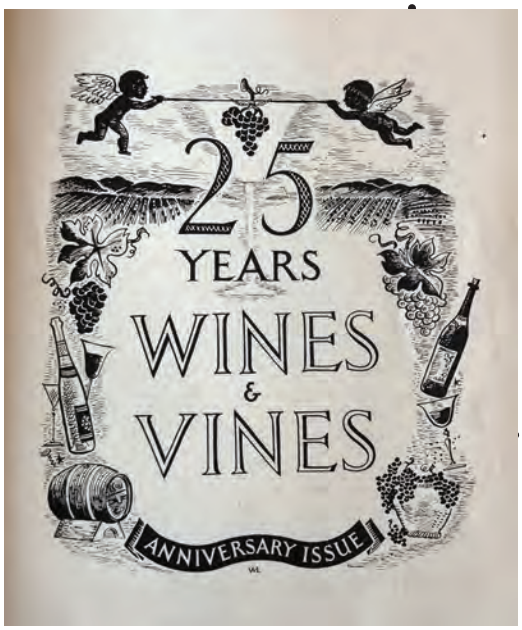
The Wine Institute was founded in 1934 to advocate for the wine industry, and the Wine Advisory Board launched in 1939 to further promote the industry. The first directory of the grape and wine industry appeared in December issues of *Wines & Vines* starting in 1938, and statistical tracking of the industry became more detailed and frequent in the magazine's reporting.

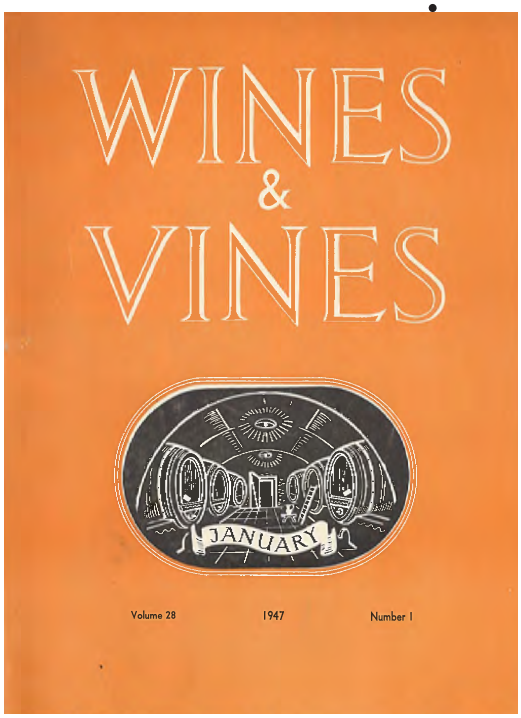
1940

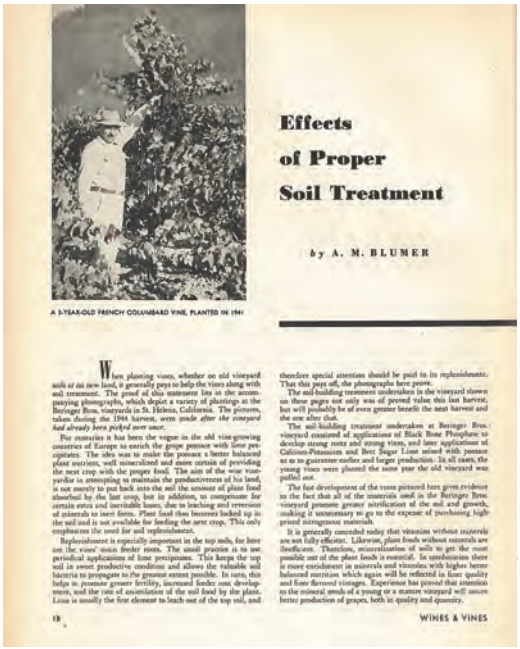
Science came to winemaking in the 1930s and 1940s and stayed for good. Maynard Amerine at the University of California, Davis began writing for *Wines & Vines* on topics such as distillation, color extraction and sterile filtration. Andre Tchelistcheff (then a research chemist at Napa Valley Research Laboratory) and Bard Suverkrop of Beaulieu Vineyard wrote a definitive primer for readers on the do's and don'ts of malolactic fermentation.

On the farm side, viticulture became less anecdotal and more scientifically methodical. By the 1940s, A.J. Winkler was identifying new grape varieties, educating readers about soils, climate and regional variation and the use and effects of fertilizers. Harold P. Olmo was working on breeding programs and launching Ruby Cabernet, Calzin and other strong breed crosses. Phylloxera was emerging, and breeders were working on nematode-resistant stocks.

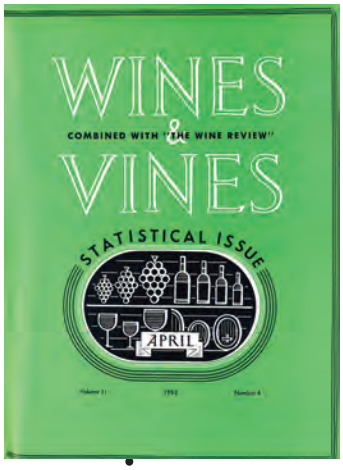
During the war years, wine production dipped by half as the government required grapes to be dried for raisins and shipped to feed troops. *Wines & Vines* reported how some producers were bringing base material such as molasses into their empty production facilities to produce any alcohol beverage they could manage to sell.







1950



In 1950, the American Society of Enologists (ASE and today the ASEV) was founded, with Charles Holden of Peralta Winery elected president and *Wines & Vines* technical editor Walter Richert as its first secretary and treasurer. Louis R. Gomberg, attorney and the industry's first full-time statistician and market analyst, wrote his first column in the magazine.

Olmo and UC Davis released new grape varieties like Rubired, Royalty, Flora and Helena and planned for a range of Muscats next. Growers and researchers were fighting Drosophila. The Wine Advisory Board was fueling the postwar boom with articles and advertising promoting the health benefits of wine, recapped in 1959 for *Wines & Vines* by Dr. Milton Silverman. The Medical Friends of Wine studies found that wine was full of vitamins, a nice liver and kidney stimulant, aided insulin in the control of diabetes and was full of "unknown compounds requiring further study" that seemed to aid in tissue repair and convalescence.

By the late 1950s, wine production was continuing its growth, with 145 million gallons on the market (compared to wartime lows of 50 million gallons), though dessert wines were giving way to drier table wines, and states other than California were entering the market. On its 50th anniversary in 1969, longtime editor and publisher Irving Marcus sold *Wines & Vines* to editor Philip Hiaring, and the Hiaring family would produce the magazine for the next 33 years.

Some frequent subjects of coverage included harvest procedures like the use of 2-ton containers to deliver to crush pads, quality inspection, sugar testing, filtration and sanitation practices from many leading wineries.

1960

1970

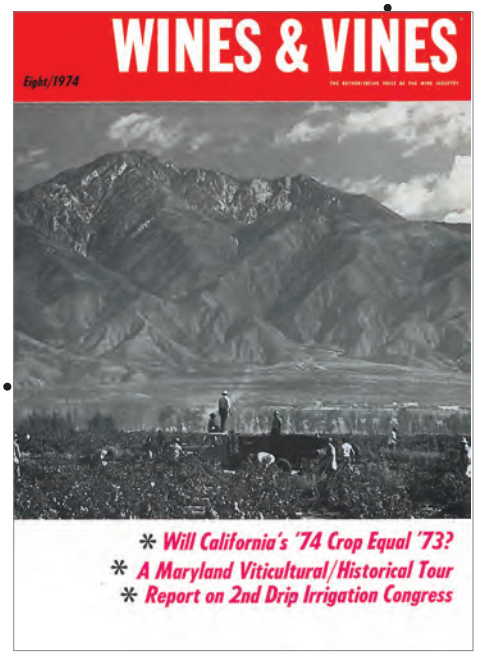
The 1970s were boom years for wine, and the notion of "wine tourism" began to take hold. The Wine Advisory Board was disbanded in 1975, and producers wondered how to market their wines without that guiding force. Leon Adams published his groundbreaking book "The Wines of America" in 1973 and wrote in the magazine about "changing the language of wine."

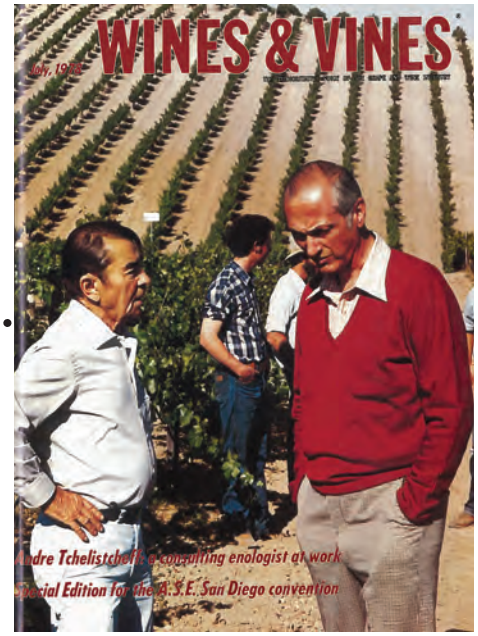
In 1976, the now-famous Judgment of Paris tasting took place, but at *Wines & Vines* the impact didn't show until a few paragraphs from George Taber appeared in *Time* magazine, and wine sales statistics began to jingle some bells a year or two later.

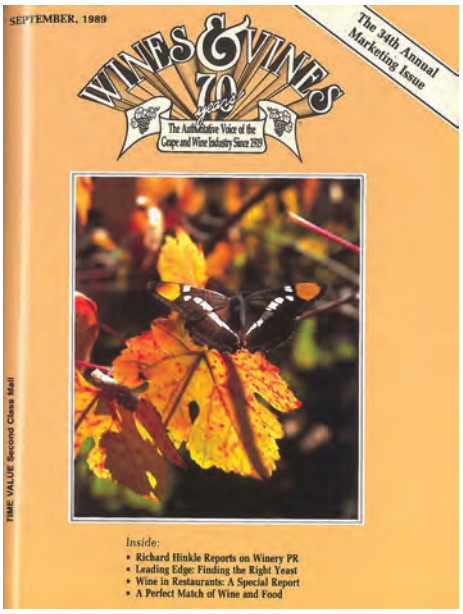
That year, the magazine's main focus was Bureau of Alcohol, Tobacco and Firearms regulation disputes and the disputes between the United Farm Workers, led by César Chávez, and E. & J. Gallo Winery. The total grape harvest reached 4.74 million tons in 1979. During these years, many reports focused on the increase of mechanical harvesting in Australia and North America, and whether it affected wine quality.

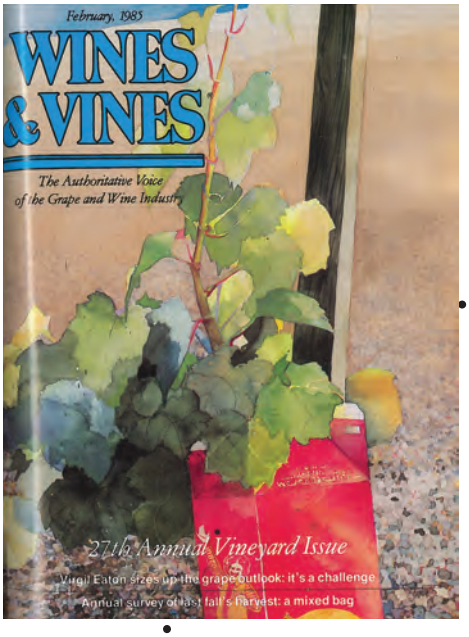
In the winery, *Wines & Vines* covered a lot of ground in the 1970s. Leon Peters of Valley Foundry (founded in the 1880s and seen in the pages of the magazine every year of its publication) said that the biggest moves forward in that decade were stainless steel tanks, screw conveyors and better sanitary practices. The magazine's monthly Technical section covered concrete floors, better pipes and drains, wastewater systems and other fittings of modern winery facilities.

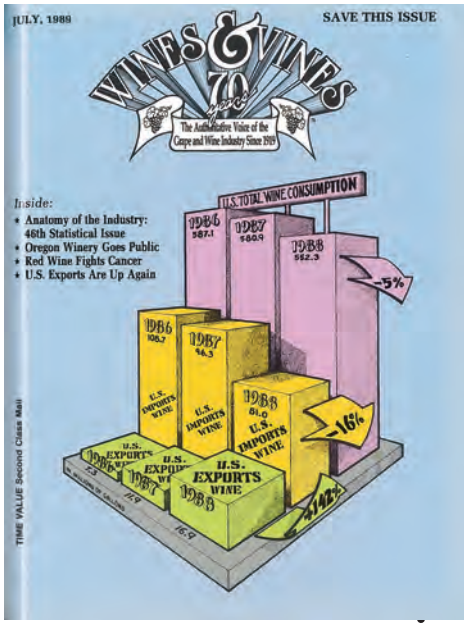
Vincent Petrucci, a gifted teacher at then-Fresno State College since 1948, obtained funding in 1974 (the majority of it from Gallo, Valley Foundry and the Petrucci family), broke ground in 1977 and opened the Fresno State University Viticulture Research Center and Library in 1979. He would lead as director there until 1994.











1980

The 1980s were a quieter decade. Grape prices rose to $2,000 per ton from the most desirable vineyards, and growers were focused on practices such as deficit irrigation and new drip systems. In the winery, the magazine covered oxygen scavengers in the packaging process, leading to study and adjustment in bottling practices. Yeast strain development multiplied, and winemakers enthusiastically tried new ones. Cellar managers upgraded processing equipment and piping systems. Tasting rooms opened in large numbers, and winery sales teams tried to figure out how to monetize them.

From 1987 to 1994, phylloxera dominated the attention of vineyard managers, and it showed in the pages of the magazine. Replanting from the insufficiently resistant AxR1 rootstocks to new ones that could hold off the new Type B strain was widespread. Rhonda Smith — who remains the University of California advisor in Sonoma County, Calif. — wrote a 1994 recap that ended with the bright side. "The silver lining to all of this replanting," she wrote, "is that it has led to the use of new and better trellis systems, more thoughtful vine orientation and architecture and planting densities."

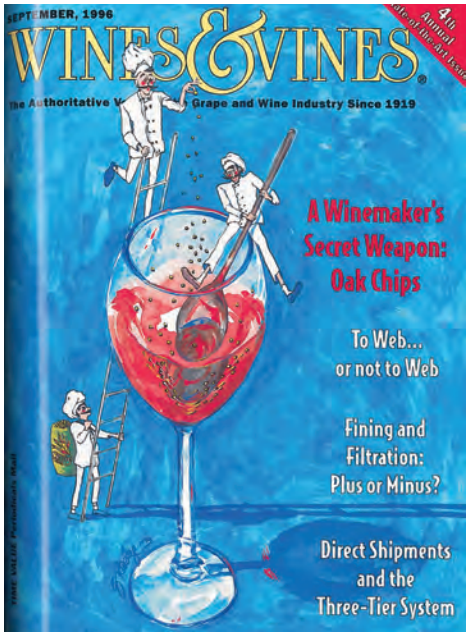
1990

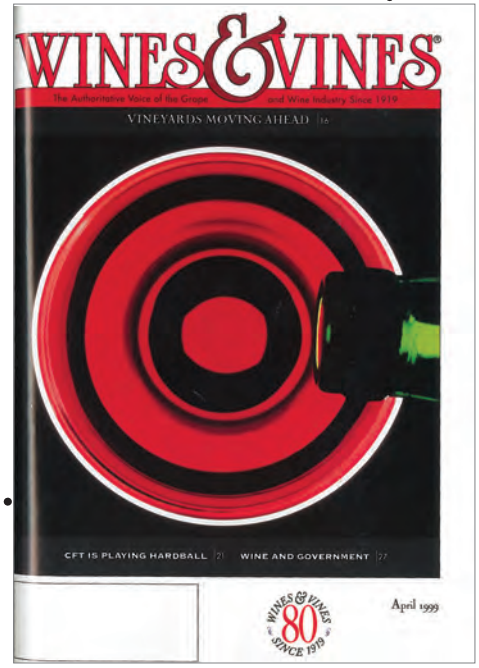
In 1994, the legendary André Tchelistcheff died, and Petrucci retired as head of the viticulture and enology program he helped build at Fresno State.

Wine marketers in the 1990s pondered how to bring aboard the new "Generation X" as consumers. Wineries such as Wente broke ground in marketing to China. The Wine Institute stepped up its lobbying efforts in Washington, D.C., with President John Deluca and colleagues fighting tax increases on wine that the Clinton administration wanted to use to fund its planned programs.

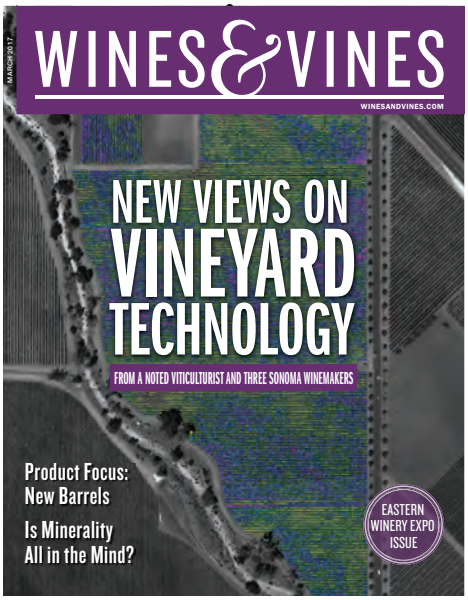
I joined *Wines & Vines* in the early 1990s, as did our current president and publisher, Chet Klingensmith.

Winemaker Richard G. "Dick" Peterson (the father of critically acclaimed winemaker Heidi Peterson Barrett), began a regular column answering winemaking questions with a very frank, highly informative and often funny style. Larry Walker, who had a great eye for talent, wrote several of the magazine's feature profiles on the most talented up-and-coming or well-established winemakers; Richard Paul Hinkle and Dan Berger offered industry outlooks; and Al Cribari, whose family wine company was featured in some of *Wines & Vines'* earliest issues, looked back each month at a slice of wine industry history.





2000



In 2002, Philip E. Hiaring (son of Philip Hiaring and editor for many years) died, and the family sold the publication to Wine Communications Group. Correspondents in Europe and Asia joined the staff as overseas markets for wine expanded. The company also acquired and incorporated the publication *Wine East,* headed by Linda Jones McKee and Hudson Cattell, which was focused on the grape and wine industry east of the Rockies.

Global warming began to appear in the pages of *Wines & Vines*, and writers began to cover such topics as sustainable and organic growing techniques, climate shifts, biodiesel, solar, recycling and lightweight glass. Legal skirmishes over appellations and labeling continued with government agencies. The word "millennials" entered the marketing lexicon.

In 2004, with the resources brought by Wine Communications Group, the company launched the Wines Vines Analytics division, hiring researchers and a team to digitize the industry data that had been part of the magazine's coverage for decades.

When the recession hit in 2008, Jim Gordon (coming from previous posts at *Wine Spectator* and other publications) was editor and oversaw coverage of industrywide worry about sales declines and the rise of bulk and less expensive wines from high-volume producers. When the economic recovery began to unfold, consumption began to rise again, and the industry bounced back.

In 2013, Don Neel sold his publication of 30 years, *Practical Winery & Vineyard*, to Wine Communications Group and came aboard to publish his technical content inside *Wines & Vines*.

The Gomberg-Fredrikson Reports joined the family of publications in 2016. Started by Lou Gomberg back in 1948, continued with Jon and Eileen Fredrikson for more than 30 years, the leading statistical reports added a wealth of information about pricing and wine sales into wholesale channels to our Wines Vines Analytics portfolio.

In August 2018, Wine Communications Group announced *Wines & Vines* would merge into the pages of *Wine Business Monthly*, while the Wines Vines Analytics division would launch a new digital publication called *Wine Analytics Report*. The new report will feature industry data, news and commentary while Wines Vines Analytics and Gomberg-Fredrikson will expand and focus on database marketing services, pricing analysis and distributor marketing services. &

thank you

Wines & Vines thanks all our subscribers, advertisers and contributors for an amazing century. We wish you great success in the coming year and decades to follow.

WINES & VINES

A CONVERSATION WITH

Jordan Wente and Niki Wente

Fifth-generation winegrowers at Wente Family Estates in Livermore, Calif.

By Jim Gordon

For this Collector's Edition of *Wines & Vines*, we thought that a youthful perspective from family members of the oldest continuously operated family-owned winery in the United States would be appropriate. Sisters Jordan Wente and Niki Wente are the youngest family members now involved in running Wente Family Estates, a 750,000-case winery and dining, golfing and concert destination founded in California's Livermore Valley in 1883.

Jordan, whose title is fifth-generation winegrower and project manager, procurement, joined the business in 2015 and has worked in project management and supply-chain roles. Currently she supports ongoing custom- and private-label projects. She earned a B.A. in political science from the University of Colorado, Boulder, and an MBA from California Polytechnic State University (Cal Poly) in San Luis Obispo.

Niki, whose business card says fifth-generation winegrower and viticulture supervisor, joined the business in 2017 and now manages the buying and selling of grapes and winegrower relations. Niki graduated from Cal Poly in June 2014 with a B.S. in wine and viticulture. One of her interim jobs was a role in grower relations and viticulture at Napa-based Huneeus Vintners.

Both are daughters of Phil Wente, who with his siblings Carolyn Wente and Eric Wente are the senior members of the family ownership structure. Jordan and Niki are first cousins of Karl Wente and Christine Wente, who have been involved with the family business for about 15 years. The sisters sat for the interview at the Wente winery on Tesla Road in Livermore on Oct. 15, 2018, when their grape harvest was about 40% finished.

Niki Wente (left) and Jordan Wente

Q What's it like to be the youngest family members working at a 135-year-old family winery? Do you feel pressure?

Jordan Wente: Really there is not a lot of pressure on us. Our family has always shared so much and developed us so much that it's a really comforting feeling to have that support. You never feel like you are under a ton of pressure, or at least I don't. Because I know that they're there to coach me and to teach me and grow me and support me.

Niki Wente: For me, I think that it is a lot of pressure. I've worked at other businesses in the wine industry, and coming back here I feel a lot of pressure that I really want to perform well, and I want to make this a wonderful place to work for everyone around me as well as kind of continue to move forward in this industry. But we have such a good support system. I call my dad almost daily and can talk to him about any issue we're going through in the vineyards. He's there to listen and talk me through it. It's never an overwhelming pressure. It's more of an exciting thing, because I'm excited to come to work every day. I want to see us succeed. I want to see my kids have the opportunity or option to come here and work.

Q As a person in your 20s now working in a mature industry, what does the wine business look like to you? Is it staid?

Jordan: I find a lot of excitement in it because I deal with a lot of our new projects, new initiatives, new brands and new labels we're developing, so there's a lot of possibility out there and excitement that's happening in the market that's really fun to see. Sometimes it's not fun to see, as the classic brands like Wente Vineyards aren't getting as much attention as I'd want as a family member who wants to put all of her life and family and energy into developing the core brand. It's interesting that the traditional is not always the go-to, but there are such fun and exciting things that we do get to work on.

Q What's a brand you're working on that's taking Wente in a different direction?

Jordan: We just launched Ravel & Stitch, which is a Central Coast Cabernet selling solely at Safeway for the first year. It was just really cool going through the whole product-development process with the marketing team and telling the story about the vineyards and the wine.

Q What techniques and technologies are you using now in the vineyard that are future-oriented?

Niki: We do a lot, especially this time of year, to see what kind of quality we can expect from each vineyard. We partner with a company called Fruition Sciences who have a lot of new technologies coming through on the grapegrowing side. This year

we did Multiplex mapping. Basically, we go through the vineyard with what looks like a scanning gun, scanning clusters across the entire block, and they will get you a plot of where the highest anthocyanin complex is in your block. You'll be able to look at a map of your vineyard and see where you're going to get the highest color out of the vineyard. Then we can selectively pick different parts of the block for our different programs. Maybe our Nth Degree (high-end) Cab is coming from that highest-color portion. We also use Enologix, which is a laboratory that will do similar things, but on more of a broad basis. Multiplex mapping is very specific. We are literally just scanning the fluorescence in the berry. We've done it in 15 or 20 blocks, and we're just trying to get a lot of our Cabernet blocks on this program.

And then we use another Fruition Sciences tool called Dualex that reads the nitrogen in the leaves during the growing season so we can kind of monitor how our nutrient uptake is and to not overapply nitrogen because that's a huge issue, especially in the Central Coast, around the Monterey County area, where they have nitrogen leaching into the water supply. It's another one of our sustainability efforts.

Q What about innovations in the winery?

Niki: In the winery they just changed over, and they're no longer doing cold stabilization for tartrates. They got a new machine called a STARS (from Oenodia North America), and it eliminates the cold stabilization and also saves a lot of energy. So that's really cool. We have a new method about 4 years old called WineX-Ray that goes back to measuring the anthocyanin and tannin complex to help us see where we can stop our fermentations in order to get the highest bound anthocyanin and the best color. Those two innovations we use on every single wine that we make. Because we want to make sure that we're getting that high quality on everything we make.

Q The same question about innovations in packaging.

Jordan: We've looked at a lot of forward-thinking packaging and label ideas. We're currently doing a package refresh for the Wente Vineyards label, and we were able to use an ink instead of a foil (from G3) for the single-vineyard label that gives it the same feel as a foil, but it's really ink. I don't know if that's supercrazy or innovative, but it's kind of cool for us.

We continuously try to look at technology around TCA detection to be sure that the quality of our wine is as great as it can be. Several suppliers do the TCA testing. There isn't one that's 100% effective for natural cork, but we just continue to look at the technologies there, and look at screwcap. Now we're looking at the dry soak method (by Cork Supply USA) for our Small Lot wines. It's sensory tested.

Niki: And for the rest we switched to DIAM cork because it's 99.9% right.

Q What does sustainable mean in your vineyards?

Niki: All of our vineyards are Certified California Sustainable. We were one of the first, I believe, eight wineries, and we helped to write the rules on it because we've been living sustainably for a long time. It's a family value of ours.

Because sustainability goes further than just taking care of the land. It's taking care of your people. It's taking care of your customers. It's taking care of your neighbors. We are farming in communities. We have vineyards that are surrounded by houses, so you've got to be super-careful about what you're putting out in the vineyard, and we want to be sure that kids and dogs and our workers and myself are safe, as well as our soils.

Q Have you given up sulfur dust as a fungicide?

Niki: We use a couple of synthetic fungicides (Kaligreen by Otsuka Agritechnica and Vivando by BASF) in conjunction with (JMS) stylet oil, which is an organic product. It's just a natural oil that can smother mildew, and the synthetic fungicides that we do use are all really, really soft chemicals. We don't use anything with a higher than 12-hour re-entry level so that it's safe for people to go in. On our reds, we use stylet oil more often than not, but Chardonnay is just a little more susceptible, so you have to put something else on there in conjunction with the stylet oil.

Q How do you tell the trade and customers about your sustainability credentials?

Jordan: We are also a certified sustainable winery as well as vineyards, so we're now able to use the certified sustainable wine and vineyard logo on our packaging. It's a cool thing to be able to put it out there in a marketplace that has become more and more conscious of sustainability.

Q You both are in the millennial generation. Do you see your cohort embracing wine in a way that could keep wine sales strong for another generation?

Jordan: My age of millennials? Absolutely. I'm in the older end of the millennial scale, and I think that it's definitely wine purchasing to stay.

Niki: I'm probably a mid to young millennial. My friends all drink wine. A lot of my friends from this area drink wine about the price point of Wente Vineyards. Somewhere between $15 and $35 is their sweet spot. And then friends from San Francisco tend to be drinking cheaper wine, probably because rent is higher (laughs), but all of my friends do drink wine.

Jordan: I think the adventure component and the experience really speak to the millennials as well. You can come out and see this beautiful property, experience these things, have a great wine-blending experience. It's not just a drink that you pick up in the supermarket but a full vacation experience that the millennials tend to embrace.

Q Do you see Livermore Valley moving toward specializing in grape varieties in the way that Napa has with Cabernet Sauvignon or Sonoma has with Pinot Noir and Chardonnay?

Niki: There are a lot of different varieties planted here. Just Wente Vineyards has 26 varieties planted across our own acreage here. But Cabernet, Chardonnay and Petite Sirah are for sure the top three planted in Livermore Valley. I do see a lot of people specializing in Cabernet Franc right now, which from Livermore Valley is delicious. But I mean every winery you go to is going to have a Cabernet Sauvignon and a Chardonnay.

Jordan: I think for the winemakers it's really about artistic expression. It's not really about "we're going to be known for Cab," it's really about creating their expression of who they are as a winemaker in the bottle, whatever variety that may be.

Niki: I think that our climate here in Livermore Valley really allows for it to be an elegant style of Cabernet across the board. It's a little harder to get a super-overpowering fruit bomb here. We have this reputation for being very hot, but you talk to climatologists and Fruition Sciences, who measure across California and across the world, and we are seen as a cooler climate in their eyes. We have shorter days, our heat spikes are shorter generally than most other regions in California, so we have this weird rap of being hot, but we're really not that hot. I wish it was a little warmer this year, honestly, because then we would be done with harvest (laughs).

A new brand takes Wente in a different direction.

Jordan: It makes the wardrobe essentials interesting when you're dressing for all seasons in one day. It's going to be 85 today, but at nighttime it's going to be 50 and windy and cold. But I guess that's what makes the wine really balanced.

Q Many family wineries turn over to another company or another family after one or two generations. It's happening all over California right now. How has your family been able to continue in the wine business so long?

Niki: I think it starts with a no-pressure attitude from all our family. We were never expected to be here. Our parents gave us all the opportunity in the world to do whatever we want in college and were supportive of letting us go to other places to work and learn and develop ourselves. When we figured out what we loved and what we wanted to do, they were supportive of letting us come back to the company.

I think that it's also been really helpful that we've all found a niche that is separate. I love grapegrowing and viticulture and being outdoors, and that was where I went. Jordan is in project management because she's organized and driven, and she's pushing us through and making sure we're getting our work done.

Q Some multigeneration wine families have split up over disagreements about running the business. What are Wente disputes about?

Niki: Our family's biggest fights are always over our shared vacation home. It's nothing to do with the business, it's like who is going to get the vacation home on Christmas this year.

Q I understand that the family has defined Wente company values.

Niki: Our company values are respect, integrity, sustainability and excellence. It's RISE, I know it in my head. We've really stayed true to our values over the years. You've got to trust that your family has your back and that we'll always be there for one another and respecting each other's decisions, and that really gets us through.

Jordan: We also did an exercise in coming up with our own values for the family, not just for the business, and it's funny because we ended up in the same place. Those business values *are* the family values. Even though we spent this time doing the exercise, we just came full circle, which is a great place to be. And it's not just our family. The company is our family, the employees we've had, some for over 40 years, have become even more a part of our family and our support and the reason we've been able to sustain ourselves.

CORK BY THE NUMBERS

100% CORK
APPROVED BY NATURE

70%

of the world's wines
are sealed with cork.

88%

of Wine Spectator's 2016 & 2017
Top 100 Wines are sealed with cork.

6x

more wine drinkers say
natural cork indicates high quality,
as compared to screw caps.

9x

more wine drinkers say
screw caps indicate low quality,
as compared to natural cork.

CORK, IT'S MORE THAN A DETAIL.

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TECHNICAL SPOTLIGHT

The Hess Collection Winery

Extensive renovation of historic cellar in Napa Valley enhances red wines and visitor experience

By Jim Gordon

A completely refurbished 3,884-square-feet fermentation room and hospitality center occupy the Lion's Head Cellar at The Hess Collection Winery.

The Hess Collection Winery completed a major renovation of its estate winery on Mt. Veeder near Napa, Calif., in time for the 2018 harvest. It had been four years in the making, prompted by major damage to tanks and other equipment and the resulting loss of 42,000 gallons of spilled wine during the 2014 Napa earthquake — then delayed by a harrowing wildfire drama during the 2017 harvest.

What emerged from the disasters is a totally refurbished and newly equipped 3,884-square-feet, two-story fermentation room in the space formerly known as Cellar One when the Christian Brothers made wine in this facility from 1930 to 1986. The Hess Collection team, now led by fifth-generation Hess family members Sabrina and Timothy Persson, has renamed it the Lion's Head Cellar.

Goals for the renovation were to ensure seismic safety before the next big earthquake, convert the cellar from a focus on old, large tanks to new, well-equipped small ones and create new visitor facilities including a commercial kitchen.

Before the renovation, two dozen large tanks remaining from the Christian Brothers era dominated the cellar, capable of holding 300,000 gallons total. One tank alone could have held the refurbished cellar's entire 25,000-gallon capacity. So even without an earthquake, the winemaking team led by Dave Guffy knew they needed to better adapt to today's ultrapremium winemaking approach for the Napa Valley and Mt. Veeder AVA wines made here, which average $77 a bottle retail.

The new cellar has 10 Westec double-wall, insulated tanks that can handle 1 to 3 tons, and another 10 that start at 3 tons and go up to 5 tons. "I think it answers a need that many wineries have, for more small red-wine fermentation tanks," Guffy said. "The way we pick grapes these days, especially up on the mountain, is all in small lots because things ripen so differently. We do the best we can as we redevelop the vineyards to create smaller irrigation sets, smaller vineyard blocks, than we did back in the old days.

"It's important on Mt. Veeder because we have so many different soil types and the ground literally can change in just a few feet," Guffy said. "We end up with a lot of small, small lots. The ability to keep those separate and not compromise on that is a quantum leap for quality. So when you take that, coupled with the Pellenc optical-sorting system that we've been using for three years, we look forward to a nice, elevated quality level across the board in all of our Napa and Mt. Veeder wines."

International estates

Guffy is senior vice president for winemaking and viticulture at The Hess Collection, which is a division of Hess Family Wine Estates. The estates group in California includes the brands Hess Select, Artezin, MacPhail and Shirttail Ranches, an on-premise-only brand. Elsewhere, the Hess family owns Bodega Colomé and Amalaya wineries in Argentina and Glen Carlou winery in South Africa.

Before joining The Hess Collection in 1999, Guffy served as winemaker for Cambria Estate in the Central Coast of California and had made wine at Corbett Canyon winery. He studied food science at California Polytechnic State University, San Luis Obispo and transferred to California State University, Fresno to complete his B.S. degree in viticulture and enology.

Working with Guffy is winemaker Randle Johnson, who joined The Hess Collection in 1983 before it had its own winery, plus winemaker Alison Rodriguez and assistant winemaker Stephanie Pope. Johnson is in charge of winemaking for Artezin, a Hess brand that produces Zinfandel, Petite Sirah and other traditional California red wines along with white Verdelho, mostly from vineyards outside of Napa Valley.

Johnson described how the Christian Brothers had built "cold boxes" around their massive tanks in the Lion's Head Cellar, basically surrounding them with walls and ceiling so that cold air could be pumped into the rooms to keep the tanks cool. Today

KEY POINTS

The 2014 Napa earthquake caused major damage to tanks, barrels and wine at The Hess Collection's headquarters on Mt. Veeder.

The newly refurbished Lion's Head Cellar ensures seismic safety, focuses on new, well-equipped small tanks and creates new visitor facilities.

The winery's 1903-era stone buildings used for founder Donald Hess' art collection and hospitality facilities were also upgraded after the earthquake.

the cold boxes are gone, and the concrete tank foundations and floor have been demolished and replaced with a new floor by North Coast Concrete, Pennacchio Tile and Eureka Valley Floor.

Only one tank from the Christian Brothers era remains in the Lion's Head Cellar. It's a twisted, crunched, deflated-looking stainless steel reminder of the earthquake. At 3:20 a.m. on Aug. 24, 2014, a magnitude 6.0 tremor centered a few miles south of Mt. Veeder in the Carneros district shook the southern part of Napa County and nearby Sonoma County. It was the strongest quake in the San Francisco Bay Area since 1989 and rocked the Hess winery and many others in a dramatic and damaging way.

Barrel mayhem

Barrel stacks in one of Hess' three barrel cellars fell over, and some of the barrels split open to spill wine. Nearly all the barrels in a small cellar in an old section of the winery rode out the quake well because that cellar had been seismically retrofitted in 1988. Only two were damaged. In the detached warehouse-style barrel room, however, 3,000 barrels were stacked up to six barrels high. Here was where the mayhem occurred.

Guffy recalled that some barrels spilled off the top of stacks, some stacks fell over completely, and when he and his crew arrived a few hours later, 100-120 barrels were too damaged to save. "Half of the room was a big pile. The barrels on the bottom were demolished. Some of the barrels broke open, and some had their bungs knocked out and half their wine was gone. It took us 10 days to get through the stacks."

Seven thousand gallons of wine were lost, including what spilled on the floor plus the wine in half-empty barrels that was oxidized or dirty by the time the crew could reach it. One lesson learned from the disaster was to be more careful with the barrel stacks. Now the Hess crew stacks them only four high and straps the top two racks on each stack together to prevent them from tumbling the next time.

In what is now the Lion's Head Cellar, one tank alone — the twisted relic — lost 10,000 gallons of red wine. As the ground heaved underneath, the tank buckled and twisted, Guffy said, and the bottom manway lost its seal. Wine gushed out, flowing across the floor, under the cellar door and flooding the garden visitor area outside. Since wine was escaping through the manway faster than a breather valve at the top could let air in, a powerful vacuum formed in the tank and sucked the sides and top inward.

Later, when Mervin & McNair Architects was perfecting the renovation plans, CEO Timothy Persson chose to save the damaged tank and re-erect it in the cellar after construction was completed. This was an engineering challenge in itself, but Andrews & Thornley Construction solved it by skewering the entire tank on a steel beam before placing it back inside the cellar and standing it up.

Now the disabled tank serves as a sculpture in the middle of the Lion's Head Cellar, an arresting reminder of the earthquake but also a work that's perfectly suited to The Hess Collection winery. The oldest section of the winery houses a spectacular collection of modern art paintings and iconoclastic sculpture collected by the winery's founder, Donald Hess, and open to the public as part of the visitor experience.

Wildfires interrupt harvest

The second part of nature's double whammy hit the winery on Oct. 8, 2017, when wildland fires erupted in Napa and Sonoma counties that would ultimately kill 40 people and destroy thousands of homes and other buildings. The Partrick fire started within a few miles of Hess, burned through the steep, forested hillsides and came right up against the Hess vineyard properties including Veeder Crest and Veeder Summit at about 2,000 feet.

Authorities closed the roads leading to the winery and vineyards and banned people from the area for 10 to 12 days. No winery infrastructure was destroyed, but this was in the middle of the red wine harvest and many fermentations were underway. The Hess property became a temporary base for about 100 firefighters while they were working to stop the spread of flames. They filled their water trucks with about 200,000 gallons from Hess' tanks while helicopters also pulled water from Hess' 40-acre-foot reservoir.

Guffy said he eventually obtained permission to enter the fire zone and come to the winery. Electricity was restored before the winery's wells could replenish the water in tanks that the firefighters depleted. Surprisingly, most of the new wine was not lost despite what was minimal human intervention, to say the least.

"Only one out of 20 fermentations stuck. Some of the reds were a little lighter than usual because they didn't get pumped over, but they were not that bad," Guffy said. These lots became part of the Hess Select Cabernet Sauvignon, a $19 North Coast AVA wine that's usually produced at the second, larger, warehouse-style Hess winery in nearby American Canyon, Calif.

No smoke damage was detected among wine lots in the cellar. However, grapes harvested after the fire from some vineyard blocks did show smoke taint and had to be declassified to lower AVAs or disposed of, Guffy said.

A relic from the 2014 Napa earthquake towers over winemakers Dave Guffy (left) and Randle Johnson.

A year later, with that drama over and the new facilities ready for use, the winemaking team started its crush with a much better-prepared winery and a relieved frame of mind. The first grapes to come in, on Sept. 18, were Zinfandel from the Rockpile AVA in Sonoma County.

High-tech crush pad

It was the third harvest using a grape-processing operation featuring mostly Pellenc equipment. Grapes arrive in MacroBins, and a receiving hopper and incline conveyor supplied by P&L Specialties move them to the top of a Pellenc Selectiv Process Winery M destemmer. Once removed, the berries flow through a Pellenc Selectiv Process optical-sorting machine that uses a high-speed camera to find MOG and berries that don't meet pre-programmed settings for size and color and then removes them with an air knife.

Guffy and Johnson were enthusiastic about the performance of the equipment. They were especially happy last year when the fire was closing in and Pellenc brought a "pop-up" set of similar equipment to the Hess winery in American Canyon so the crush could continue during the fire emergency.

After sorting, the crew dumps bins full of berries into the tops of the removable-lid Westec tanks for usually a two-day cold soak. The crew then uses the tank's built-in heating

The Hess Collection Mount Veeder

4411 Redwood Road, Napa, CA 94558 • (707) 255-1144 • www.hesscollection.com

OWNERS/PRINCIPALS
Sabrina and Timothy Persson, Fifth generation Hess family members

SENIOR VP WINEMAKING AND VITICULTURE
Dave Guffy

WINEMAKERS
Randle Johnson and Alison Rodriguez

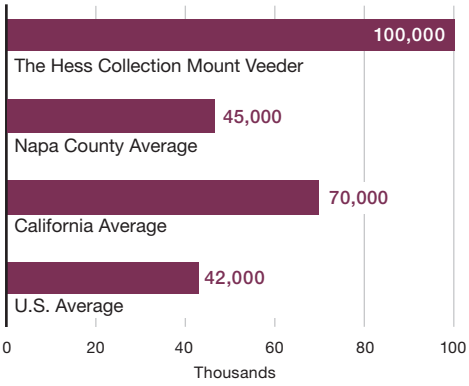
ASSISTANT WINEMAKER
Stephanie Pope

YEAR BONDED
1986

DIRECT-TO-CONSUMER SALES:
10%

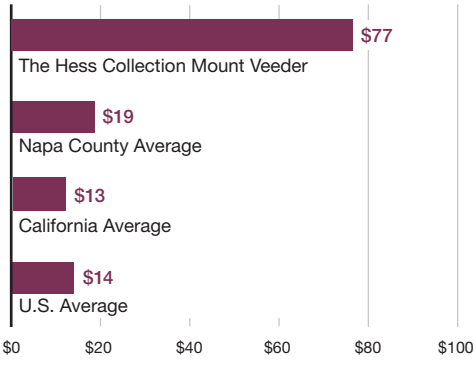
VINEYARD ACREAGE
900 planted

WINERY CASE PRODUCTION



Source: Wines Vines Analytics

WINERY AVERAGE BOTTLE PRICE



Source: Wines Vines Analytics

The Technical Spotlight is a regular feature highlighting wineries in North America that have recently opened or undergone major renovations and improvements. *Wines & Vines* seeks to report how facility design and winemaking equipment is used to achieve a particular winemaking style while also exploring new trends and techniques being used in the industry.

BUILDING THE WINERY

Architect	Alissa McNair, **Mervin & McNair Architects,** mervinmcnair.com
Contractor	Tom Andrews, **Andrews & Thornley Construction,** atconstruction.com
Engineering	**ZFA Structural Engineers,** zfa.com/office/santa-rosa
Landscape architect	Carlos Paniagua, **Carlos Landscape,** carloslandscapeinc.com
Mechanical engineering	**Peterson Mechanical Inc,** petersonmechanical.com
Concrete/flooring	**North Coast Concrete,** northcoastconcreteinc.com; **Pennacchio Tile,** pennacchiotile.com; **Eureka Valley Floor Co.,** eurekavalleyfloors.com
Catwalks, metal fabrication	**Ogletree's,** ogletreecorp.com; **Wolff's Welding & Fabrication,** wolffswelding.com
Wastewater	**Summit Engineering,** summit-sr.com
Financier/Lender	**US Bank,** usbank.com
Interior Designer	Scott Butcher, **MSA Architecture + Design,** msasf.com

PACKAGING

Glass	**O-I,** o-ipackagingsolutions.com; **Gallo Glass Co,** galloglass.com
Closures	**Nomacorc,** vinventions.com; **G3,** g3enterprises.com; **Lafitte Cork & Capsule,** lafitte-usa.com; **Portocork,** portocork.com
Capsules	**Enoplastic USA,** enoplastic.com; **Ramondin USA,** ramondin.com
Label printing	**Multi-Color Corp.,** mcclabelnapa.com; **G3,** g3enterprises.com; **Paragon Label – Resource Group,** paragonlabel.com; **Tapp Label,** tapplabel.com

MAKING THE WINE

Receiving hopper and incline conveyor	**P&L Industries,** pnlspecialties.com
Destemmer and optical sorter	Pellenc Selectiv Process Winery & Vision M, **Pellenc America, Inc.,** pellencus.com
Basket press	**Carlsen & Associates,** carlsenassociates.com
Fermentation tanks	10 1,000-gallon and 10 1,700-gallon double-walled, insulated tanks with internal screens, **Westec Tank & Equipment,** westectank.com
Barrel filling, racking and washing system	**Tom Beard Co.,** tombeard.com
Ozone	**Carlsen & Associates,** carlsenassociates.com
Pumps	Centrifugal dedicated pumps for each tank for pump overs, **Process Engineers,** peiequipment.com
Other cellar equipment	Lotus pump over sprinklers, **Vintuitive Winemaking Tools,** vintuitivewmt.com
Barrels	**Demptos Napa Cooperage,** demptosusa.com; **Saury Tonnellerie,** saury.com; **Tonnellerie Sylvain,** tonnellerie-sylvain.fr; **Tonnellerie Taransaud,** taransaud.com; **Tonnellerie Orion,** tonnellerieorion.com; **TW Boswell,** twboswell.com
Bottling line	**Signature Mobile Bottlers,** signaturebottlers.com
Winemaking management system Winemaking software	**The Winemakers Database,** wmdb.com; TankNet, **Acrolon Technologies,** acrolon.com
Analytical equipment	Alcolyzer, **Anton Paar,** anton-paar.com; Autotitrator, **Metrohm USA,** metrohmusa.com

and cooling system to warm the must from the range of 50° to 60° F to 85° or 90° F in about two days. "We pitch yeast and go for a really warm start to the fermentation," Guffy said.

"We keep that heat for a day or two so it will drop from about 25° Brix down to 12°, and then we'll back off and study it. We're really looking at extractions quite heavily to see what kind of anthocyanins you're getting, what kind of tannin you're getting, and making decisions on that as well as the old-fashioned way of just tasting. That's how we decide when to take it to press." That press is a Carlsen basket unit.

Hess outsources the tannin assays to Enologix, but for other testing the winery's lab is equipped with an Anton Paar Alcolyzer and Metrohm Autotitrator, among other instruments.

What happens in the tanks during the extraction period is critical, Guffy said, and that's why they chose dedicated heating and cooling jackets for their tanks, plus an insulation layer between the inner and outer stainless steel skins. "We've gotten jacketed tanks before, but without the insulation you always get that little dip (in temperature) before the pumpover comes. You can see it on the graph. It spikes up, and then over time it cools down, but the insulation holds it nice and steady, and we're seeing that with these first fermentations."

A Pellenc Selectiv Process destemmer and optical-sorting machine get red grapes ready for fermentation.

The new tanks have dedicated centrifugal pumps by Process Engineers and Lotus sprinklers by Vintuitive to wet the caps. Westec built the tanks with a hose connection through the side of the top manway rim so the manway can be closed while pumping. A big internal screen catches pieces of skins and seeds to keep them out of the pump.

The fermenters use TankNet technology to monitor and manage fermentations, wet the caps and distribute the heat even when no one is in the cellar. Guffy and crew can program each tank from a phone, an iPad or a computer for as many pumpovers as they want, when they want and for what duration. They per-

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formed virtually all the pumpovers automatically for the 2018 harvest.

Guffy said typical skin-contact time is 10-14 days. "It's not like we used to do back in the day, with 30 to 40 days on the skins." After pressing, red wines go into barrels by Demptos, Saury, Sylvain, Taransaud, Orion and Boswell for 22 months of aging. The percentage of new oak in the reds varies, but the $185 flagship wine, the Lion Cabernet Sauvignon, gets 60%. The winemakers try to fine and filter cautiously, he said, and the Lion is bottled unfiltered.

Lions and a lioness

For the white wines, most Chardonnay undergoes barrel fermentation and partial malolactic, while the luxury-level Lioness Chardonnay gets 50% new French oak for almost 16 months and full malolactic. Hess also makes an unoaked musqué clone Chardonnay. The Albariño and Grüner Veltliner are fermented in steel and aged in neutral barrels on the lees.

The "lion" references pop up frequently in the winery's marketing efforts, beginning with a lion image that's part of the company logo. The winery website states that a lion has been the family's symbol for nine generations. Besides the Lion's Head Cellar, the Lion Cabernet Sauvignon and Lioness Chardonnay ($65), Hess also makes the Napa Valley Lion Tamer red blend ($45).

A THRIVING WINERY IN EARLY 20TH CENTURY

The property on which The Hess Collection Winery sits has hosted grapegrowing and winemaking activity since the first settler, H. Hudemann, arrived in 1876, according to the winery's research. He created a garden resort, planted a 12-acre vineyard and built a small stone winery. The next owner, Rudolph Jordan, was a winemaker, too.

But it was German immigrant Theodore Gier who established the property as an important commercial wine venture. He owned it from 1900 to 1929, planted more vineyards and completed in 1903 the three-story stone winery that today houses the art gallery and one of the barrel cellars. A published account from 1914 stated that the Theodore Gier Wine Co. controlled 1,000 acres of vineyards in Livermore, the Mt. Veeder site, St. Helena and elsewhere in California, along with multiple wineries producing as much as 300,000 gallons a year.

Gier's ownership ended with the financial crash of 1929. The Christian Brothers, a Catholic monastic organization devoted to education, bought the winery and surrounding property in 1930 and operated it until 1986, when Donald Hess leased the winery buildings. The brothers built a spiritual and educational center here with a Mission-style chapel and other facilities that remain in use by the order as an administrative headquarters, and as a retreat for public groups.

The Christian Brothers wine and brandy operation was among the biggest in California during this period, operating at Mont La Salle, at the Greystone winery in St. Helena and other locations in California.

The "tamer" in Lion Tamer is Malbec, Guffy said, because he prefers Malbec as a blending grape with Cabernet Sauvignon over the other Bordeaux red grape varieties. "We like to run about plus or minus 15% Malbec every year, and the reason is that it's got a super-high anthocyanin level like Petite Sirah or Syrah. They're always big wines, but they're not heavily tannic wines, so you get that big, unctuous middle palate without drying tannin."

The team also makes several other wines for distribution and a Small Block Series of 15

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wines for direct-to-consumer sales, including some from other counties, but also several Mt. Veeder AVA wines such as a varietal Malbec, the Albariño and Grüner Veltliner. The Hess Select brand offers three whites and three reds priced in the teens.

The founder

Winery founder Donald Hess is Swiss. He developed the popular mineral water brand Valser Wasser in that country. He discovered California wine in the 1970s while looking for mineral water sources in the state and was very impressed with the quality of some wines. In 1978, Hess began buying vineyard land. In 1982, he completed the purchase of 900 acres on Mt. Veeder and began vineyard development while also setting aside more than 600 acres to support wildlife and biodiversity.

In 1986, Donald Hess leased the current winery site from the Christian Brothers order of the Catholic Church and established The Hess Collection Winery. He renovated the winery, moved in his personal art collection to fill 13,000 square feet in the oldest section of the winery, and opened the winery and gallery to the public in 1989.

Three years later he signed a long-term lease with the Christian Brothers for 125 acres of vineyard adjacent to the winery. In the years since, The Hess Collection has added vineyards in other parts of Napa County and in Monterey County for its various wine programs.

20 fermentation tanks from Westec are jacketed, insulated and equipped with centrifugal pumps from Process Engineers.

Donald Hess, his family and staff have long been enthusiastic stewards of their land. The Hess Collection was one of the first certified Napa Green wineries in 2008 and started a goat herd that now numbers more than 150 to help with weed control and minimize tractor passes and tilling. In 2010, the winery become one of the first 17 wineries to be third-party certified as sustainable through the California Sustainable Winegrowing Alliance.

As much as the winemakers are proud of Hess' green credentials, at the beginning of the 2018 harvest they were obviously most thankful for a near-ideal growing season and their brand-new winemaking and hospitality facilities. The ground was not shaking, no nearby fires were burning, and they had a beautiful, well-equipped home for all the grapes that were about to arrive.

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PRODUCT FOCUS

Evolution of the Basket Press

Winemakers discuss their preference for basket presses; manufacturers reveal new press tech

By Stacy Briscoe

Barbara Lauterbach presses Syrah grapes in a 1-ton Enorossi Idropress basket press at Lauterbach Cellars in Windsor, Calif.

Comstock Wines in Healdsburg, Calif., is one of Sonoma County's newer wineries, having opened its doors just three years ago, in August 2015. But Bob and Sandy Comstock had been selling grapes for well over a decade from their family vineyard near Geyserville, Calif., and it's from that personal estate that the two began their winemaking venture.

Today, the couple owns a 20-acre vineyard along Dry Creek Road, which also includes a 21,000-square-foot facility, featuring a large tank room, multiple barrel rooms, a lab, cold room, crush pad and, of course, hospitality areas. Yet, despite all the state-of-the-art, modern equipment that adorns the winery permitted to produce 35,000 cases a year, there sits in the corner a memory of simpler times.

Meet Bertha. She's the Comstocks' original press, an Enorossi Idropress basket press. She can press no more than 1 ton at a time and produces 70% less juice than the winery's newer Puleo SF-50 open drain membrane press. Bertha's more of an inside joke than a serious piece of winemaking equipment. Though she's so-named because she was, in fact, the largest piece of winemaking equipment the Comstocks had in their basement-turned-winery just 15 years ago, she's now one of the smallest in their new facility and used only for a select few pressing jobs.

But talk to Comstock's winemaker, Chris Russi, and there's still some love for the old girl. Russi said that of the 300 tons of grapes Comstock brings in, Bertha presses about 3. "We really only use her for a small percentage of experimental lots. For example, we may do 1 ton of Merlot completely whole cluster and then use the basket press," he said. "You don't really get the same efficiency as from the bladder press, but the quality is better."

Russi said that in his previous winemaking position, he worked exclusively with a basket press from Carlsen & Associates for his production of Zinfandel and Pinot Noir. It was a press he really enjoyed, calling it an old-school press with new-school technology. "I really loved the versatility and the readout display," Russi said. "You could see exactly what the pressure inside was as opposed to relying completely on tasting."

But besides Bertha, Comstock doesn't have a basket press in regular use, instead relying on the Puleo Drain Press bladder press. "I'm one of those winemakers that has had access to a basket press and know what they can offer," Russi said. So his solution, when he wants to get the quality of a basket press's pressed juices but is pressing larger quantities than the 1 ton Bertha can handle, is to run the winery's bladder press "like a basket press."

"What I do with specific lots is I'll do one press, hold it and repeat, maybe three times without tumbling in between presses," Russi said. Working the bladder press "manually" and preventing the tumbling between pressing sequences inhibits the organoleptic material from breaking up and producing a more phenolic and tannic wine. Russi said he uses this technique for some of his "bigger" varieties and said it works particularly well with his Grenache.

Comstock may invest in a new basket press in the future. "Right now, we're starting off very small, only making 6,000 to 7,000 cases a year," Russi said. "Once we hit the 10,000 to 15,000 mark, we'll probably get a basket press." He has his eyes set on another Carlsen.

Small lot at Lauterbach

Not every 1-ton basket press is resigned to the corner of the winery. At Lauterbach Cellars in Windsor, Calif., it's quite the opposite. When you pull up to Stu and Barb Lauterbach's winery, the place looks more like a house than a traditional production facility — except for the Idropress basket press that sits in front of the building.

The 1-ton basket press is the very same Enorossi brand press Comstock has, but it is used on a regular basis at Lauterbach Cellars. "It's very simple and easy to use," said owner and winemaker Stu Lauterbach.

The Idropress has an interior elastic membrane, or bladder, which inflates with water pressure up to about three bar. The press is

KEY POINTS

"Old-fashioned" basket presses still have a place in modern wineries.

Newer basket presses allow for both quantity and quality of pressed juice.

Diemme Enologia brings horizontal press to Scheid Family Wines for practice run.

controlled by turning water on through a valve with a pressurized gauge. "You turn the water on until you get to a certain amount of pressure, shut it off and let it sit," Lauterbach said. It's all done manually, and Lauterbach said there needs to be at least two people manning the press to rotate out the full bucket of press juices for an empty one until the pressing is completed. Each press cycle lasts about an hour or two.

The couple produces only 200 to 300 cases of wine annually, working exclusively with Syrah and Pinot Noir grapes from estate vineyards.

"After harvest we destem, and our destemmer fits on top of our T-bins," Lauterbach said, explaining that the T-bins are about 4 feet in length and height and about 3½ feet wide. "We fill the T-bins about eight-tenths of the way full to make room for fermentation, and that exact amount fits into the press," he said.

The couple purchased the used Idropress in 2003 from neighboring winery Pax Mahle Wines, which made the original purchase just three years earlier. "It was just like new, but they'd already outgrown it," said Lauterbach.

Lauterbach said the results are good, providing him with both the quantity and quality of pressed juices he needs to produce his boutique batches of wine. He warns that a press like this can fail: The bladder can break and leak, and it's about $600 to replace the whole membrane.

Newer Idropresses are more frequently sold with a stainless steel basket, said Lauterbach. Though he said these may be faster to clean, he doesn't find cleaning his wooden basket press all that difficult. "We just use a pressure washer with 180° F water and wash it down when we're done. Before we use it again, we ozone sterilize."

The "Ferrari of basket presses"

"This basket press is so incredibly gentle, the pressed juices almost taste like free-run," said Jesse Giacomelli, assistant winemaker at Zialena Winery in Geyserville, Calif., during an interview for *Wines & Vines'* August technical spotlight. He's pointing to the winery's Bucher Vaslin JLB automated basket press. "It's the Ferrari of basket presses."

The Bucher Vaslin JLB basket press has been on the market since 2002, and the company's sales and marketing director, Mea Leeman, says it is the first to be fully self-contained, running on a closed-loop hydraulic circuit, resulting in a compact, mobile press. The JLB comes in 5-, 12- and 20-hectoliter capacities with pressing cycles lasting between 45 and 60 minutes.

What makes the press "so incredibly gentle" is what Leeman calls the "respiration aspect." Instead of pressing the pomace all at once at a continuous pressure or tumbling the pomace in between presses as in a bladder press, the JLB releases tension between successive pressing cycles, allowing the pomace to "breathe" or "bounce back." This gives more room for the pressed juices to flow during the next pressure cycle without any unnecessary added force.

While the general functionality of the press is consistent from year to year, Leeman said the one thing that's always evolving is the JLB's touchscreen PLC unit. The PLC system includes nine adjustable program options, which adjust pressure on pomace and pressure holding times.

"With the intuitive communication system, you can see where you are during any part of the pressing process," said Leeman, explaining that the readout display provides real-time pressure updates that can be viewed as either a number or a graph. "And you can get text message alerts when the set pressure has been reached," she said.

At Quintessa Vineyards winery in St. Helena, Calif., the production facility is home to three basket presses — all of which are Bucher Vaslin JLB presses. Winemaker Rebekah Wineburg said Quintessa currently produces 10,000 cases annually of the Quintessa red blend. The winery also helps out with the red wine production of sister winery Faust. In all, Wineburg said, the winery presses about 1,000 tons of grapes per harvest, with about half of that coming from their estate vineyards and the other half coming from Faust.

"Multiple presses help with the multiple brands," Wineburg said. "If you're harvesting really fast, then logically you'll be pressing very quickly."

Quintessa uses two JLB 20 presses, purchased in 2003, which Wineburg said help her press a larger volume of grapes at a faster, continuous rate. But when she wants to press smaller lots, keeping them separate and exclusive to certain higher-tier wines, she uses the third, a JLB 12, which Quintessa acquired from Flowers Vineyards & Winery in Healdsburg, Calif., in 2017. Quintessa, Faust and Flowers are all owned by Huneeus Vintners.

"For production of Bordeaux varieties, I really like the basket press for ease of use and quality," said Wineburg, explaining that JLB's basket press can be placed directly under the pomace door or under an incline conveyor if the pomace door is too low. The pomace can then be shoveled directly into the basket. "It's an efficient process as well as allows for delicate handling of the pomace." An important component for Quintessa, which is home to 70 tanks.

Wineburg said she uses the PLC system to split her press cycles into three customized fractions: "The first is the lightest press, which actually has the highest lees; the second is the core of the press, which is the highest quality and volume of press; the third is the heavy press. … The second is the most useful for adding midpalate density to the final blend," she said.

SIRIO

This automatic vertical hydraulic press by the Italian equipment vendor SIRIO is designed to work with both white and red wine grapes. The piston-adjusted chromed steel cages come with latches or hydraulic lift cylinders; the supporting frame press is mounted on rotating wheels; and a pull cart with wheels and the collection tank is made from 100% stainless steel. Operated by a digital touch screen, the press can run in both manual and automatic modes with preset or customizable programs and includes automatic pressure recovery sets in either mode.
cepitaly.com; valleypipe.com

Carlsen & Associates

CARLSEN & ASSOCIATES

This 8-hectoliter basket press, with all stainless steel frame and gantry, can hold 2¼ tons of pomace and includes a 60-gallon drain sump with screen. The press pan includes three-way forklift pockets for easy loading and unloading. Using the automatic control system, users can reach pressures up to five bar. The Carlsen Basket Press is available in 208, 220, 240 AND 480 volts.
carlsenassociates.com

The *Wines & Vines* Product Focus feature is not intended to provide a definitive listing of all available products in a particular segment or provide any comparative analysis, but rather serve as an overview of what's new or available and also of potential interest to readers as determined by the magazine's editorial staff.

DIEMME ENOLOGIA

This vertical hydraulic press includes a mounting plate and head made of painted steel connected by pressing cylinders. According to the manufacturer, the configuration helps ensure pressing uniformity, allowing for easier transport of dried pomace. All parts are made of AISI 304 stainless steel or food-grade rubber. The electronic control panel has intelligent programming with the ability to adjust the pressure program and/or program steps in real time based on pressure decay.
diemme-enologia.com

Diemme Enologia


Coquard

COQUARD

The Bucket Press is a hydraulic press by French manufacturer Coquard and is designed to be lightweight and portable, easily transported and filled directly from tanks, reducing movement of pomace. The wine is collected into a settling tank below the bucket after draining through a gentle, gravity-flow draining system. According to the manufacturer, the bucket holds the pomace of 2 tons of red grapes, allowing for annual production of 300 to 500 tons.
coquardpresses.com; premierwinecask.com

BUCHER VASLIN

Available in 5-, 12- and 20-hectoliter capacities, the Bucher JLB basket press is controlled by a PLC with nine programs available to manipulate both speed of pressing plate and pressure control. Users can choose between "pomace breathing" or a constant pressure program. Using the PLC unit, the press can sequence customized programs as well as modify program parameters during the press sequence. PLC provides real-time display of hydraulic pressure, pressure on pomace, elapsed time and program in progress.
buchervaslin.com

Bucher Vaslin

Wineburg said she simply started with the manufacturer's recommended pressure settings and then adjusted until she found the press cycles that work for her wines' profiles.

The JLB also includes two pressing cages, allowing for continuous demolding and pressing. The cages have what Wineburg calls an ample reservoir. "It's nice because it allows you to start the press or close the valve and switch tanks without pausing the press cycle or making a mess. It sounds simple, but I've had other presses overflow, causing an annoying mess and loss of wine," she said.

The reservoir also allows Wineburg to see how much wine is coming out of the press, gauging the effectiveness of her press program.

Looking toward the future

Collopack Solutions in Napa, Calif., represents Italy-based Diemme Enologia, which is currently testing its Diemme QC620 continuous basket press. Already installed at wineries in South Africa, Italy, France and Romania, the press was set up at Scheid Family Wines in Greenfield, Calif., for a trial in October.

The Diemme QC620 is a horizontally mounted basket fed by a 20-bar peristaltic pump. Initial pressure is built by the pump feeding pomace against a closed door. Once that pressure is built up and the cage filled, the door opens (expelling the dried cake) and the pressure continues to build up against the cake remaining in the cage, continuing the cycle. According to the technical sales representative for Collopack Solutions, Adam Bloom, the throughput is 15 tons to 45 tons per hour.

"A traditional basket press is typically seen as something that only high-quality red wine producers have the luxury of using," Bloom said. "This press supplies the same quality as a traditional basket press with a higher throughput."

Bloom said there's been a significant amount of interest in the press here in the states, but before anyone actually invests, winemakers will want to see how it runs. So, during the month of October, Scheid ran the Diemme QC620 for its red wine program. Diemme representatives were on staff, and the team tested for yield, phenolics, color, sulfur, pH, rate of throughput and the humidity of the resulting cake.

"The reason we are working with Diemme and their new continuous press is to see if this equipment will improve our overall quality and throughput capacity for red grapes," said Dave Nagengast, vice president of winemaking at Scheid Family Wines. He said the winery is currently using the Diemme 430 presses, which have produced great-quality wines for the winery. "But these presses are also used for white grapes, so there is competition for the use of these presses while we are busy bringing in both at the peak of harvest."

Nagengast said that the Diemme QC620 is just "one of several options" for the Scheid winemaking team to increase their red-grape processing throughput. "We will be running trials on all phases of the red-fruit processing to see what options it might offer us for improving both efficiency and quality."

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2016 emBRAZEN California Cabernet Sauvignon

Treasury Wine Estates

Napa, Calif., tweglobal.com

Founded: 2011

Case Production: 5,800,000

Vineyard Acreage: More than 32,000 acres of estate and leased vineyards around the world.

Average Bottle Price: $7

The emBrazen label was created by Treasury Wine Estates (TWE) as an opportunity to market their wines to women "looking for something a bit different," but that could equally appeal to the male demographic. The Take Up The Torch program, which, according to the company, is an integral addition to the brand, looks to bring attention to women who have made a difference in the world.

The wines, made by Olivia Teutschel, have women involved at every step — from winemaking to packaging and design. All the labels are intended to be bold and eye-catching at-a-glance, but also engage the consumer through augmented reality technology: with TWE's Living Labels app, bottle art comes to life.

Nellie Bly, featured on the 2016 emBRAZEN Cabernet Sauvignon, was a female reporter who helped change societal norms by refusing to cover "lady-like" subjects such as fashion or gardening. Instead, she chose to report on harsher topics, including the daily struggles of women factory workers and the brutality and neglect at a facility for women with mental illnesses.

— *Stacy Briscoe*

SOURCE: WINES VINES ANALYTICS WINERY DATABASE

SCREWCAP: **Amcor, Capsules** amcor.com

GLASS: **O-I,** o-i.com

BOTTLING: In-house bottling with **BC Magik** filler model 63/90/16; **Nortan** (nortan.it) model Prisma 20+24 foil spinner; and **Krones** (kronesusa.com) labeler with front and back aggregate.

LABEL PRINTER: **Eurostampa California** eurostampa.com

CAPSULE AND LABEL DESIGN: **Stranger & Stranger,** strangerandstranger.com

CAPSULES: Polylam from **G3 Enterprises,** g3enterprises.com

CORK: **Diam Closures USA,** g3enterprises.com

GLASS: **O-I,** o-i.com

BOTTLING: In-house at Matchbook Winery, Zamora, Calif., with a **Colbert Packaging** 25 head filler (colbertpkg.com), **Bertolaso** 4-head corker (bertolaso.com), Robino capsuler (serviced by **Collopack Solutions**, collopack.com), and an **Impresstik Labeling Systems** vacuum in-line label applicator (impresstiklabelers.com).

LABEL DESIGN: **Carole Goulding Brand Design,** carolegouldingbranddesign.com

LABEL PRINTER: **Grigsby Label,** grigsbylabel.com

UNPACKING PACKAGING

A new look with a 'modern twist'

2016 Chardonnay
Matchbook

Zamora, Calif., matchbookwines.com

Founded: 2005

Case Production: 135,000

Vineyard Acreage: 1,600

Average Bottle Price: $15

"After 11 years it was time for a label refresh," said John Giguiere, co-owner of Matchbook Wine Company in Zamora, Calif. "We are constantly looking at ways to improve the quality of our vineyards and wines. Tweaking the appearance of our packaging highlights our innovative focus and keeps us current with consumer trends."

The Dunnigan Hills AVA winery's full-paneled, burnt-edged label has been replaced by a wrap label highlighting the estate offerings.

Giguiere said the new label is recognizably Matchbook, with "a modern twist." The vertical logo has been flipped to horizontal and highlighted by a red foil flame. The burnt notch on the upper right remains as an homage to the original burned edge. The label has a "matchstick x" boarder treatment and the "Estate Bottled" designation is prominently displayed.

— Stacy Briscoe

SOURCE: WINES VINES ANALYTICS WINERY DATABASE

Sbragia Opens Lounge on Sonoma Plaza

By Stacy Briscoe

In the first week of September, Sbragia Family Vineyards opened its new tasting lounge at 520 Broadway on the Sonoma Plaza.

The city of Sonoma, Calif., enacted a moratorium on new tasting rooms in the Plaza in December 2017 that has barred any winery from being granted a license for a tasting room in the Plaza Retail Overlay Zone. Although the initial moratorium was scheduled to expire Sept. 30, a city council meeting held Sept. 24 resulted in a 4-0 decision to extend the moratorium for seven months, until May 1. "It is the city's intention to complete the analysis and have final regulations in place by the first part of 2019," stated the county clerk's summary of the meeting.

But there's a loophole: New licenses can be granted to businesses taking over a space previously occupied by a tasting room.

Sbragia's new tasting lounge takes the place of Enkidu Wines, which has moved to its new location on Eighth Street East. "We consider ourselves lucky to have secured this spot with the 'work around,'" said Sbragia's sales and marketing manager, Audrey Posl. Despite some controversy within the community, Posl said Sbragia hasn't experienced a lot of pushback. "We're making a huge effort to be a fun experience and an event-centric community meeting spot, not just another tasting room," she said.

Posl said the renovation and decoration — a "fresh, modern farmhouse look," intended as a nod to the Sbragia family's farming history — was completed entirely by winery staff. "Our handyman spent days installing a corrugated tin ceiling, wooden backdrop behind the bar, sliding barn door and new light fixtures. Even our COO spent days painting walls," she said.

Sbragia also operates a tasting room at the estate winery on Dry Creek Road in Geyserville, Calif. Owner Ed Sbragia founded his eponymous label in 2001, after 32 years as "winemaster" for Beringer Vineyards in Napa, Calif. According to the Wines Vines Analytics winery database, Sbragia Family Vineyards produces 16,000 cases annually from 52 acres of estate vineyards in the Dry Creek AVA.

Posl said one of the main motivators for opening this second, centrally located tasting room was to increase the winery's direct-to-consumer (DtC) sales. "The majority of Sbragia's business is DtC, and as a still-growing medium, we are hoping to increase the amount of wine club members and repeat customers to our two locations and website," she said.

Since the opening of the Sonoma Plaza tasting room three months ago, Posl said, she's already seen an increase in DtC numbers.

Posl said DtC best-sellers are slightly different than what's popular at wholesale. "In our tasting room, guests like to seek out bottles they can only get at the winery, such as our Dry Creek Valley Sauvignon Blanc, Merlot and special-label bottles reserved for wine club like Nonno's Zinfandel," she said.

The two main wines found in distribution, the Home Ranch Chardonnay and Gino's Zinfandel, are less popular in the DtC market. "This is because we have a much broader selection of wines being sold (DtC) online as well as in the tasting room," Posl said.

Currently, Sbragia's Sonoma tasting room is staffed by two full-time employees. "We intentionally sought out people who already have a connection to the Sonoma Plaza community and wine scene," Posl said. This, she said, has helped the brand build a foundation for outreach and authenticity.

Staff members are rewarded for club sign-ups and meeting DtC goals but are encouraged to ask for sales and wine club sign-ups in authentic, personal ways. "We learned some time ago that uniform scripts don't work," Posl said. "A satisfied customer telling 10 friends about their great time at Sbragia is just as valuable as a club sign-up."

Tools of the trade

Sbragia uses eCellars as its point-of-sale system. Posl describes it as a full-service system that allows her and her staff to send emails and track club shipments. It also serves as a reservation calendar.

Upon opening the new tasting room, Sbragia invested in new stemware, the Stolzle Revolution glasses. "We also do have some classic decanters but are still looking for some more interesting ones to display on our tables as a statement," Posl said.

Bust the Top 10 Sales Myths

In reviewing the experiences of more than 4,000 mystery shoppers in tasting rooms and working actively with wineries every day, we've heard some remarkable myths out there. Most of the myths we hear are about why it's a challenge (or "impossible") to sell wine, sell wine club memberships, or ask people to join a winery mailing list.

Since most of us tend to remember our failures more vividly than we remember our successes, we dwell on all the reasons why we can't sell. More often than not, we just have to get out of our own way and brainstorm ways to counter the objections, which may be mostly in our heads. Let's bust these myths and see them for what they really are.

People aren't buying because of the economy.

This was true in 2009, but today the economy is doing well. Unemployment is so low in California that we have trouble finding staff. People have money and are willing to spend on treats – like your wine.

People are sick of hearing about wine clubs.

We find that staff present the wine club about 55% to 60% of the time in a typical tasting-room experience. This is higher in some markets (Napa and Sonoma counties) but even lower in other markets. This means nearly half (45%) or more of the people visiting wineries aren't even hearing about wine clubs. Customers might be sick of hearing about wine clubs that are simply discount programs but would be interested in hearing about clubs that have other benefits beyond the discount. If you're selling it in a brand-appropriate way, when you tell your guests what's in it for them and invite them to join an authentically special club, they will!

Wine club members don't buy.

Club members are the bread and butter of the typical direct-to-consumer program because of how much they really do buy. Perhaps not all winery staff understand how important they are. While they may not buy every time they visit, they do bring their friends, take regular shipments, and often use the winery as part of their celebrations. Their friends will join, too, if we remember to invite them.

No one wants to give their email address out, especially to a winery.

Most people will sign up to receive an email with at least one business that they love getting updates on. Everyone wants to be an insider, be the first to know about events and new product releases, and get special deals on things they want most. Email is still one of the best ways to do it. Instead of simply asking for the email address, you need to explain what's in it for the customer. They will not be able to resist your compelling pitch due to fear of missing out.

You have to use discounts to sell wine or wine clubs.

Strong brands tell stories that make people want to be part of something that cool. What stories should you be telling to convince your guests that they want to be part of your story? If you focus on what makes you special, using discounts is not as important.

People only buy wines that are highly rated.

Guests who are focused on ratings are looking for validation that this is a wine they will be proud to buy or serve. But ratings aren't the only way to validate. Such customers will also be interested to know which wines are club member favorites, which restaurants pour the wines and other accolades.

People from no-ship states shouldn't be asked to join a club or buy wine.

Maybe they can't have wine shipped to their homes at present, but they have friends and family to send gifts to. They might move to a state where shipping is allowed. They might buy your wine at stores in their home state, and that's good for your brand, too.

Single/young/old people don't buy.

Nor do people with black/brown/red/blond hair. Nor do bald people or people with tattoos. Actually, no one buys anything anymore. Just ask Amazon. Remind your team not to negatively profile guests. The only way to find out if a customer is interested in buying is to ask enough open-ended questions to figure out their interests.

Phone campaigns aren't important. People don't want to be called.

Everyone wants to hear from a winery about amazing deals selected just for them. They simply don't want to be called by someone who doesn't understand their needs and interests.

Incentive compensation by individual team member doesn't matter.

Sure, we'd be happy if we all got paid the same, but the advantage of an individual incentive program is the recognition it gives team members for their efforts, and it motivates the top performers to keep it up. Set up correctly, the incentive should be one that encourages work-friendly competition in order to motivate each team member to do his or her best.

The next time you hear an excuse for not being able to sell — in a brand-appropriate way — ask yourself if it's valid or simply a myth. If it's a myth, look at the challenge a little differently, and find a way to get to "Yes!"

WISE Academy (Wine Industry Sales Education) offers a comprehensive curriculum designed specifically for wine industry professionals, and celebrated its 10th year in 2018. Learn more at wineindustrysaleseducation.com.

The Limitations of the Winkler Index

By Patrick L. Shabram

The Winkler Index or Winkler Scale is a standard for describing regional climates for viticulture in the United States. Developed by A.J. Winkler and M.A. Amerine at the University of California, Davis in the first half of the 20th century, the index was constructed to correlate wine quality with climate, focusing on California viticulture. Wine-producing regions of California were broken into five climatic regions using heat summations above 50° F, or growing degree days (GDD). Heat summations are a way of looking at accumulated temperatures over a given time period. Despite the common usage of the Winkler Index, the classifications offer greater uncertainty than the system suggests.

An obvious drawback to the Winkler Index is the focus on temperature alone. Winkler's groundbreaking resource "General Viticulture" notes the influence of "rainfall, fog, humidity and duration of sunshine," but Amerine and Winkler's work and subsequent research found that temperature plays the greatest role in the development of wine grapes. As the focus of Winkler and Amerine's wine-grape research was on California viticulture, their climatic regions had the luxury of ignoring precipitation, as little rain falls during the growing season. Indeed, Winkler et al. in "General Viticulture" suggest that the *vinifera* grape "is not suited to humid summers, owing to its susceptibility to certain fungus diseases and insect pests that flourish under humid conditions."[9]

Advances in viticulture have expanded the range of successful commercial *vinifera* production, while more recent research notes the importance of wind on photosynthesis rates.[2] Winkler et. al. also point out the importance of ongoing refinement of local variations, stating, "It is hoped that refinements will be developed so as to delimit subregions within the present regions, thereby ensuring the greatest potential for quality when the most favorable climatic subregion for a given variety is planted to that variety."

Therefore, the Winkler Index was designed at a state scale, and not necessarily intended for smaller viticultural subregions or single vineyards.

Methodology of the index

Modern-day calculations of GDD most often utilize daily accumulations of degree days. That is to say that they sum the total degrees of average daily temperatures above 50° F (10° C) for every day from April 1 to Oct. 31 [$\sum_{Apr\ 1}^{Oct\ 31} daily(T\_mean\text{-}50,0)$]. If the average temperature for a given day is 75° F, then the total degree days added to the total sum for that specific date would be 25° F. Any average below 50° F constitutes zero GDD for the given day.

An initial problem with some calculations is how "average" is determined. In most cases, average is calculated as the mean of the lowest recorded temperature and the highest recorded temperature, so a high temperature of 85° F and a low temperature of 65° F would produce 75° F [$(T_{max}\text{-}T_{min})/2$]. Another method to calculate average temperatures is to take the mean of all temperature readings for a given day. If a weather station reports hourly temperature readings, the mean of those temperature readings would constitute the average of the 24 daily temperature readings, while if a station reports in 15-minute intervals, the average temperature would be the mean of the 96 daily temperature readings. The simple difference in methodology for calculating average temperatures can have an impact on GDD readings. A recent study of five weather stations in the Livermore Valley AVA, for example, found variations in 10-year average GDD as high as 206 based on the methodology utilized.[6] As many weather stations have software generating GDD figures for the user, the methodology deployed is not always obvious. Further, many software programs will vary on GDD calculations, including but not limited to growing season, threshold (e.g., 50° F or some other number), and how temperatures below that threshold are handled. Some weather station software programs, for example, will not include temperatures below 50° F in the average temperature calculation.

Daily accumulation methodologies, however, are not consistent with the methodology deployed by Winkler and Amerine. Rather, Winkler and Amerine used monthly means. Specifically, the mean monthly temperature above 50° F was multiplied by the number of days in the month for each month from April to October, then summed for the entire growing season [$\sum_{Apr}^{Oct} monthly((T\_mean\text{-}50)\bullet 30)$].

Further, a 1998 assessment of temperatures in the city of Sonoma, Calif., determined that Amerine and Winkler's original calculations may have been simplified to account for only 30 days in each month.[7] Hence, GDD originally calculated in 1944 may have had four fewer days figured into the equation than what modern assessments typically apply.

The discrepancy between daily accumulation of degree days and monthly accumulation of degree days is most pronounced in early-season and late-season numbers, when mean daily temperatures may be below 50° F. As a simple example, assume that the average temperature for each day from April 1 to April 15 is 48° F and mean temperature for each day April 16 through April 30 is 54° F. Using the daily accumulation method, each day from April 1 to April 15 would have a degree-day total of 0, while each day from April 16 to April 30 would have a degree-day total of 4, for an April total of 60 degree days. With an average monthly temperature of 51° F, using the monthly average would yield a GDD total of 30 degree days for the month.

Even with consistency in methodology, other factors impact the overall GDD total, and hence the climatic region assigned to that total. Equipment and placement of weather stations are considered, although most government and research weather stations, and even most

FIGURE 1: GDD (°F) AT CAMINO, CALIF. USING TWO METHODOLOGIES

	Daily Accumulation	Monthly Accumulation
Lowest (1998)	2889	2752
Highest (2017)	4034	3932
30-Year Average	3439	3300
10-Year Average	3583	3465
5-Year Average	3821	3639

30-year average GDD based on 2017-1987 excluding 1988 because of incomplete data in 1988.

10-year average GDD based on 2017-2008. 5-year average based on 2017-2013.

commercial weather stations installed in vineyards, are assumed to be placed to limit variables that may impact climatic data. The duration of the data (i.e., number of years of data), however, can have a significant impact on numbers. Typically, meteorological normals (i.e., what is considered to be the average weather for a particular location) are based on 30-year averages, updated every new decade (e.g., 2010-1981, 2000-1971, etc.). Finding complete data sets covering 30 years in a given area can be difficult, so GDD averages used in viticulture are most commonly given in some significantly shorter duration.

Further complicating data sets is what happens around a given weather station during that 30-year period. Urban development can create warmer conditions that, combined with a changing climate, lead to migration from one climatic classification to another over the course of historical data sets. Further, academic studies are often done in Celsius, with the Winkler climatic regions converted to Celsius equivalents. For example, Region II is converted to 1,389-1,667° C (from 2,501-3,000° F), giving the impression that the climate-region breakdowns are based on something more accurate than the convenience of even 500 degree day intervals. (Since the original region breakdown is in Fahrenheit, and this article is a discussion of those regions, Fahrenheit is used throughout this article unless otherwise noted.)

To demonstrate how varied GDD numbers can be for a given location, data were assessed from a California Irrigation Management Information System (CIMIS) station at Camino in El Dorado County, Calif. This station was chosen because it is one of the longest continuously operating CIMIS stations, having been installed Oct. 19, 1982. Data from this station are also nearly complete, especially after 1989. The station is not near a growing urban center. Camino is listed in "General Viticulture" (Region III with 3,400 GDD). This station is not the same weather station used in the Winkler calculations but offers some historical context for the Camino area in general. Thirty total years of data were assessed from 2017 to 1987, with 1988 removed from the analysis, as data were incomplete. The results in Figure 1 show that daily accumulations led to higher GDD totals than using monthly means.

Variations in averages

Both the daily accumulations and monthly accumulations totals at the Camino station are relatively consistent with the total found in Winkler et al., although the numbers are 139 degree days different, based on methodology. If a grower had been given a single year's data, however, and that year happened to be either the year with the lowest GDD (1998), or the year with the highest GDD (2017), very different conclusions could have been reached about the climate of Camino.

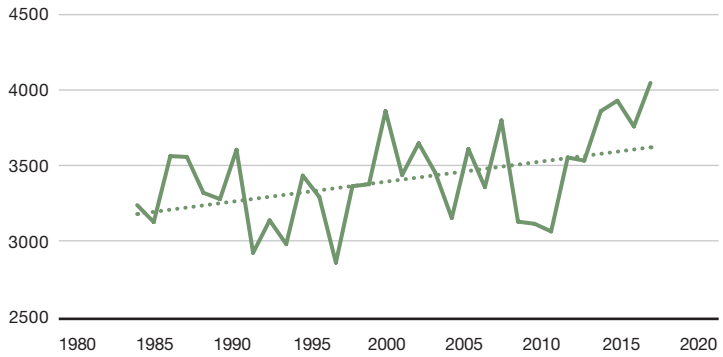
The averages for the five most recent years show both a warmer climate than the 30-year average would suggest and greater variance between methodologies. Keeping with standards of climatology and meteorology would discredit the five-year average as insufficient, as weather varies season to season, and climate is a long-term averaging of weather. Yet getting five years of data is often much more achievable than obtaining 30 years of data. The climate is also warming. Figure 1 demonstrates the long-term temperature trend in GDD for Camino, with every academic indication that this trend will continue. The prospects are very likely that ongoing climatic conditions at Camino will more likely reflect GDD above the 30-year average. Which Winkler Index climate region is most appropriately applied to Camino? Any interested party could have a choice between Region III or Region IV, or if they were really looking to cherry-pick, Region II or Region V.

Comparative analysis is where a more appropriate usage of GDD may come into play. How does Camino compare to other nearby areas? A CIMIS station is also located at Diamond Springs, approximately nine miles southwest of Camino. Diamond Springs is a much newer station, installed Sept. 20, 2010, so a 30-year average is not possible. The five-year average at Diamond Springs based on daily accumulations is 3,997 degree days compared to 3,821 at Camino. The seven-year daily accumulation average (2011-2017) at Diamond Springs is 3,913 compared to 3,679 at Camino. Every year with the exception of 2017 shows higher GDD at Diamond Springs than at the Camino weather station (2017 shows Camino 30 degree days higher than Diamond Springs). Even if you could not give a good long-term average GDD for Diamond Springs, it would be safe to say that the climate at the Diamond Springs station is warmer than at the Camino station. As viticultural growing districts become more defined at subregional levels and as we test new environs for commercial viticulture, local comparisons are valuable.

Duration of high temperatures

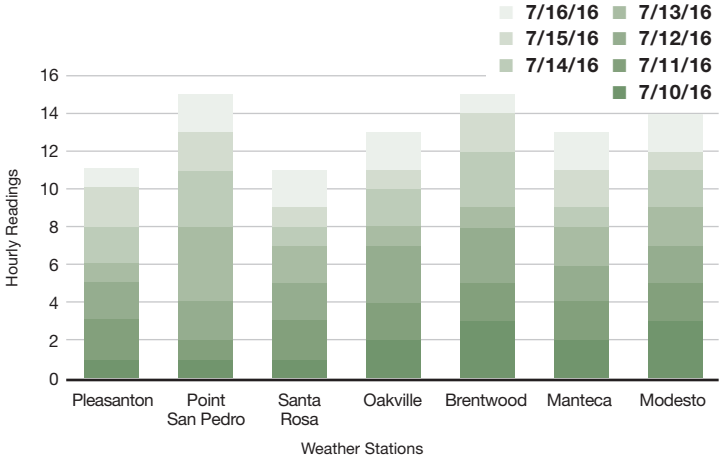
Another consideration with Winkler climatic regions is the duration of high and low temperatures. GDD calculations based on mean daily temperatures treat high and low temperatures equally, even if the high temperature is reached for only for a few minutes, but the low temperature persists for several hours. Areas impacted by afternoon marine inversions may be especially susceptible to briefly maintained high temperatures. Figure 3, created for a study done in the Livermore Valley AVA, shows the cumulative number of

FIGURE 2: GDD TREND APRIL 1-OCT. 31 AT CIMIS 13 CAMINO 1984-2017



Using daily accumulation method based on daily mean temperature. Data for 1986 and 1988 are incomplete and are not included in the graph.

FIGURE 3: HOURLY READINGS AT HIGH TEMPERATURE



Adopted from Shabram, 2017. All data collected from California Irrigation Management Information System. Temperature reading within 0.3°C or 0.5°F of the daily maximum temperature were counted from July 10-16, 2016.

hourly readings at or near the daily high temperatures for several CIMIS weather stations in Northern California over a one-week period in July 2016. Cumulative high temperatures were maintained for a shorter period at Santa Rosa and Pleasanton, two areas known for variable summer marine intrusions, than at Point San Pedro, Brentwood and Modesto. Point San Pedro, at the immediate coast, has greater consistency in marine stratus layers than Santa Rosa and Pleasanton, which experience fluctuations in coastal fog. Brentwood and Modesto, both inland from the coast, are known to be relatively free of coastal fog. Many areas transitioning from coastal to inland may show GDD numbers similarly influenced by brief durations of high temperatures. Comparatively, similar GDD summations for areas at higher latitudes or greater elevations may show greater total hours near high temperatures or longer periods of solar radiation. Using average air temperature rather than daily mean temperature may create more accurate comparative numbers, assuming that the methodology is consistent across the areas being assessed.

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Variations in growing season

A final consideration is the April 1 to Oct. 31 growing season used in GDD calculations. In areas of the West Coast, bud break typically occurs in March, sometimes as early as February, while harvest dates in August and September are more common than in October. Grape variety and microclimatic conditions in individual vineyards also play a role.

A review of 50% bud break from 2013 to 2018 and harvest dates from 2013 to 2017 was conducted in seven vineyards in the Livermore Valley AVA, three planted to Chardonnay, three planted to Cabernet Sauvignon and one planted to Sauvignon Blanc. The average 50% bud break ranged from March 28 to April 5, depending on vineyard, for the three Cabernet Sauvignon vineyards, but the Chardonnay vineyards had average dates of March 14 to March 15. The Sauvignon Blanc vineyard experienced 50% bud break around March 26. Harvests for Cabernet Sauvignon approximated Oct. 8 to Oct. 21, depending on the vineyard. Chardonnay saw average harvest dates of Sept. 20 to Oct. 7. The vineyard with Sauvignon Blanc saw average harvest dates around Aug. 28. In many cases, bud break began prior to the April 1 growing season start, while harvest was most often completed prior to the Oct. 31 growing season end.

The rationale for calculating heat summations from April 1 through Oct. 31 are not clear, at least not in Amerine and Winkler's best-known works on the subject. The 50° F threshold is based on shoot growth, so April 1 may represent an approximate estimation of bud break, but harvest for many varieties occurred, even in the first half of the 20th century, prior to Oct. 31. Amerine and Winkler also calculated heat summations from bloom to harvest and noted the role of heat summations in the 30 days preceding harvest, therefore not limiting their assessment to just April through October. Heat summations based on bloom and harvest are only possible when grape production already exists within an area and would be difficult to use as a tool to match varieties to an area yet to see vines. Differential timing and lengths of growing seasons across North America further complicate the equation.

Is there a better index?

Other indexes also exist for assessing temperature. The Heliothermal Index, also known as the Huglin Index (HI), was introduced by Pierre Huglin in 1978. HI is the April 1 to Sept. 30 sum of the mean of the daily mean temperate above 10° C and the high temperature above 10° C, multiplied by a coefficient indicative of the latitude. Other indices include Average Growing Season Temperatures (GST) and Biologically Effective Degree Days (BEDD), along with several other formulas for calculating heat summations.

A 1999 study by Jorge Tonietto and Alain Carbonneau suggests that a multicriteria system of calculating HI, a dryness index (DI), and a cool night index (CI) are needed to account for potential water balance in soil and nocturnal temperatures in grape development.[8] Gregory Jones and others used PRISM climate models to assess spatial climatic distribution across California, Idaho, Oregon and Washington based on the four most commonly used indices in viticulture.[3,4] The results suggested that GST and GDD had the greatest correlations, but HI and BEDD demonstrated better differentiation of climate types. A similar study by Rosalyn Francine MacCracken and Paul R. Houser used the PRISM model to predict how well these four indices, along with a modified version of the GST accounting for the common length of a growing season (Modified-GSTavg or Mod-GSTavg), performed in U.S. states east of California, Oregon and Idaho.[5] The MacCracken and Houser study found all common indices to be less than perfect at predicting the viability of successful viticulture when comparing the indices' results with existing viticulture. Mod-GSTavg showed more promise as a predictor of successful viticulture by taking into account the length of the growing season.

The Jones et al. study and the MacCracken and Houser study looked at viticulture on a super-regional scale, albeit using climatic models with 400m to 400m resolution. One could argue that the Winkler Index was never meant to be utilized on a super-regional scale, but rather as a statewide guide specific to California. The original 1944 paper looked only at California locations, with Winkler later introducing other U.S. and international locations into the scale for comparison. Winker et al. are clear that the regional scale was not meant to be definitive at a subregional scale: "These divisions into climatic regions should be considered as general demarcations."[9]

Winkler et. al. suggest more extensive work be conducted on more local areas and specifically note the work of Robert Sisson, who, during his 35-year career as viticulture farm advisor to Sonoma County from the 1950s to the 1980s, created a climate classification system unique to Sonoma County. Sisson's model broke the county into Marine, Coastal Cool and Coastal Warm climate types, based loosely on heat summations of hours spent between 70° F and 90° F. While much work has been done to delineate subregions of viticultural areas, both formally through the creation of new, smaller AVAs and informally through the identification of subregional districts by winegrowing associations, work to create climatic classification systems at more local levels unfortunately is scarce.

Use of the Regions I-V designations of the Winkler Index presents several limitations and errors. GDD calculations, on which the Winkler Index is based, can be a valuable tool for comparing growing areas, but GDD is just one aspect of climatic analysis that alone gives an incomplete picture (as are other indices designed to summarize heat summation). The methodology, daily climatic patterns, period assessed and length of growing season can all tell a different picture of mesoclimates that might otherwise appear to be similar by Winkler designation. Ideally, each viticultural region would find a climatic classification system that best suits the unique characteristics that define it, while reserving simpler indices like the Winkler Index for broader generalizations. Alternatively, GDD makes a good comparative tool when consistency in methodology and comparison are made within regional locations.

Patrick Shabram is a geography professor at Front Range Community College in Colorado and an expert on American Viticultural Areas (AVAs). He conducts geographic research on wine-grape growing regions and is a consultant for growers interested in establishing new AVAs or modifying boundaries to existing AVAs.

The references for this article are available online at winesandvines.com

Drawing Inspiration From Innovation

2019 Unified Symposium set to feature trends, tech and packaging to help build better brands

By Stacy Briscoe

Wine economist Mike Veseth speaks during the state of the industry session during the 2018 Unified Wine & Grape Symposium.

"I've attended Unified for the past 22 years, and it's been a part of my professional career since the beginning," said Lance Winters, master distiller at St. George Spirits in Alameda, Calif., and the 2019 Wine & Grape Symposium keynote speaker.

With a professional career in distilled spirits, Winters promises to provide a unique perspective on innovation within the wine industry. "The distilled beverage sector is heavily steeped in tradition, even more than in our own (wine) industry," said Tom Collins, assistant professor of grape and wine chemistry at Washington State University and co-chair of the 2019 symposium in a statement. "Sometimes, breaking with tradition can lead to successes."

In an interview with *Wines & Vines*, Winters said he believes that many people enter either the wine or spirits industry because of tradition, but then rely too heavily on traditional practices. "Think of it as a conversation," he said. "If you say the same thing as everyone else, no one will listen. But if you jump in with a new inspiration, you can be a conversation starter in the industry."

Winters said his keynote speech will cover where he's drawn inspiration and how he's used that to build the St. George Spirit brand. Since joining the distillery in 1996, Winters has helped expand the business from a dedicated *eau-de-vie* distillery to one that includes a complete portfolio of spirits, including single-malt whiskey, absinthe, rum, gin and vodkas, among others. "I learned distillation as a medium for self-communication, self-expression. I thought about what I wanted to express and used distillation to get my message across," Winters said.

He acknowledged that there are those in the wine industry who have done the same, citing Dave Phinney as an example. "Think about The Prisoner. There's no winery or vineyard associated with that wine. All Phinney had was an idea for a non-traditional blend and a non-traditional label, flying in the face of all conventional wisdom," Winters said, pointing out that The Prisoner has been bought and sold as an identity only, several times over. In 2016, the Prisoner and a few other brands created by Phinney were sold by Huneeus Vintners to Constellation Brands for $285 million. "There are no assets, just a label and the goodwill that comes behind it," he said.

But, Winters warned, to be real, genuine and sincere has to come from whoever is trying to break into the business. "I can only ask, 'Have you found something that really turns you on?' And if you have, work with that," he said.

Symposium program

While past symposiums have featured an overarching theme or focus, this year Collins and his co-chair, Nichola Hall of Scott Laboratories, said in a conversation with *Wines & Vines* that

they specifically chose not to do so for the 2019 event, to be held in Sacramento, Calif. "Our focus is on keeping the program topical, current and relevant," Collins said.

"There's no set overlying theme," added Hall. "But if there were, it would be about looking forward: rosé as a section of the market and not just a fad; implementation of technology in all sectors of the industry; innovations in packaging and branding design; and just continuing to be a successful industry."

Rosé for more than a day

Hall said that during the 2018 symposium the discussion about the growing popularity of drinking pink revolved around The Nielsen Co.'s market research data report, which found a 64% increase in rosé wine sales within the last five years, growing it to a more than $300 million market and proving the wine style is more than just a passing trend.

As such, the Unified board decided to highlight rosé during this year's joint tasting session. The session will dive deep into how the upward trend of rosé in the consumer marketplace has influenced both grapegrowing practices and winemaking techniques. "There's a lot of material we can cover that will be helpful to attendees," Collins said. "Rosé can be a range of varieties, so there's a lot of information about how growers should approach farming — if rosé is the goal. And then there's a lot of winemaking techniques that can be used, and those approaches will be discussed as well."

For each wine presented during the session, a winemaker and a sales and marketing person from the winery will be there to discuss both sides of the rosé production process — from soil to shelf-talkers. Jason Haas, partner and general manager of Tablas Creek Vineyard in Paso Robles, Calif., will be on the panel representing his winery's Dianthus (a southern Rhône-inspired blend of Mourvèdre, Grenache and Counoise) and Patelin de Tablas (a Provence-inspired Rhône blend of Grenache, Mourvèdre, Counoise and Syrah) rosé wines.

The two are very disparate rosés, with the Dianthus appearing much darker and "traditional pink" in color and the Patelin de Tablas exuding a much more subdued, faded-peach hue. When asked about the marketable differences between the two and whether Tablas Creek crafts either of these wines to either meet consumer expectations or to challenge the palate, Haas said the answer is a complicated one.

"In the market, there's definitely a bias against darker-colored rosés," Haas said. Thus, he said, most of what Tablas Creek sells in the wholesale market is the lighter Patelin de Tablas rosé. However, in the tasting room, where both rosés are offered, the winery sells more of the darker Dianthus ($30) than the Patelin ($25), even though it is slightly more expensive.

"I would say we fall on the spectrum toward making the wines purposefully different from one another and explaining which (Rhône) traditions we're riffing on with each wine and letting the customers make their decisions," Haas said. "I don't know that our job is to challenge the wine consumer. But to enlighten them? Definitely."

Haas, along with Tablas Creek senior assistant winemaker Chelsea Franchi, will discuss their specific vineyard and winemaking techniques during the tasting session.

Tech "TED Talk"

Another new session to the Unified program is Thursday's general session discussing technology in the wine industry. From drones in the vineyard to computer analysis in the winery and even chatbots and digital sommeliers interacting with wine consumers — again, every sector of the wine industry will be represented on the panel and in the discussion.

"The new 'TED Talk' format is new this year to keep the discussion lively and moving," said Collins, who will also be moderating the session. "We'll have talks that will cover four industries: winemaking, grapegrowing, business and marketing."

Speakers will discuss products that are currently used or will be available in the near future, and where technology is headed and where there will be opportunities to use it in each of the four basic industry sectors.

Winters said from a distilling standpoint, he's always interested in the latest technology regarding measurements such as mass flow meters, alcohol content analysis and filtration. "It takes away the grunt work and gives us a better sense of confidence when reporting our numbers for federal purposes," he said.

In regard to the wine industry, Winters believes technology that can assess vineyard health will become increasingly important. "With the way climate change is starting to take hold, anything that's able to give good soil moisture readings on an ongoing basis so vineyard owners can take care of the grapes properly will prove beneficial," he said. "The problem is only going to get worse, so monitoring soil and vine health is a priority."

Package and brand design

Winters said what initially enticed him to attend Unified was the opportunity to find new, innovative companies that supply the products he needed to help expand his business — from bottle suppliers to label designers and even marketing experts. "To me, this is where it (building a brand) starts," he said.

Trade floor vendor tours at the symposium have always included grapegrowing- and winemaking-specific tours. The 2019 Unified Wine & Grape Symposium will be the first to include a marketing-specific tour, focused on packaging and brand design. "According to our (the symposium's) marketing subcommittee, there's a strong interest in the innovation of packaging," Collins said. "And given our discussion about the rise in rosé, it seemed like a timely thing to include," he added, referring to the sheer numbers of rosés in the marketplace and the need for wineries to stand out on the shelves.

According to Nielsen's market research data report, 4,289 new wine items have been launched within the last year, and 80% of wine-purchasing decisions are made at the shelf. "Walking down the aisle is like walking into a singles bar," Winters said. "Everything is based on appearance."

Winters advises wine and spirits brands that want to stand out in the consumer marketplace to consider the bottle and label design as a kind of invitation. "What's inside the bottle is a party, and I want as many people to come," he said.

CHANGE OF VENUE IN 2020

The Unified Wine & Grape Symposium will be celebrating its 25th year Jan. 29-31, continuing to draw professionals from all sectors of the wine industry in what is touted as the largest wine industry event in the Western Hemisphere.

While the total number of attendees isn't officially released until the last day of the event, according to the event's records, Unified has hosted between 12,000 and 14,000 wine industry attendees and showcased more than 650 wine industry suppliers each year for the last decade.

"We've actually been constrained by the size of the venue and have had to be creative, finding additional places for supplier booths," said the events co-chair Tom Collins, referring to the Sacramento Convention Center, where Unified has been held since 1996.

Following the 2019 symposium, the convention center is scheduled to undergo a major renovation and expansion. "We expect the venue will be a tremendous improvement regarding space," Collins said. The 2020 Symposium, scheduled for Feb. 4-6, will be held at Sacramento's Cal Expo (site of the state fair). According to Unified's event coordinators the 2021 Symposium will return to the Sacramento Convention Center.

VINTAGE 2018

BOB MCCLENAHAN

Despite regional challenges, most vintners across U.S. consider this year's harvest a success

By Stacy Briscoe

Fires to the west, hurricanes to the east, extremes in temperature variation within the central states and continuing labor struggles throughout North America — the 2018 growing season kept grapegrowers around the country on their toes. Yet almost across the board, industry experts agree that 2018 proved to be a fruitful year and predict successful winemaking.

"2018 will go down as a good vintage that should make balanced wines with good acidity, mature tannins and great tastes that are very capable of aging," said Glenn McGourty, the University of California Cooperative Extension (UCCE) farm advisor for Lake and Mendocino counties.

McGourty was one of several advisors, academics, growers and winemakers who participated in *Wines & Vines'* annual vintage report. Regional write-ups were provided by experts throughout North America, including California, the Pacific Northwest, Midwest and eastern states, as well as Canada.

Each region faced its own challenges, due to the unforeseen acts of Mother Nature. In California, as in 2017, smoke proved to be a concern, as wildfires spread throughout Lake and Mendocino counties. The effects continue to be assessed and, while neighboring regions like Napa and Sonoma reported no notable impacts, some growers within fire ravaged, or smoke-filled areas did see their fruit rejected by buyers fearful of smoke taint.

However, on the whole, California vintners reported a slow and steady growing season, resulting in excellent fruit structure. A dry winter, cooler-than-average spring and the absence of heat spikes in the summer months seemed to be the pattern throughout the state, resulting in what many are calling a "normal" harvest after so many years of excessive drought conditions.

Overall, pests and vine diseases appear to have been less of an issue in 2018 than in previous vintages in most California regions, though some growers needed to switch fungicides, as certain strains of mildew became resistant to those used in the past.

Mumm Napa was one of the first to harvest grapes in Napa County with a Pinot Noir pick on Aug. 15.

There are, of course, exceptions to the rule. Monica Cooper, UCCE farm advisor for Napa County, reported that August and September were marked by spreading populations of vine mealybug, widespread potassium deficiency symptoms, late-season mites and variegated leafhoppers. She also stated that leafroll and red-blotch disease symptoms were more severe and appeared earlier in the season than in past vintages.

According to Lynn R. Wunderlich, the UCEE farm advisor for the Sierra Nevada foothills region, cooler temperatures brought on frequent instances of powdery mildew. When and where heat stress occurred, mites became a problem, especially in Zinfandel blocks.

Yet the 2018 crop was fruitful across California, with vineyards producing higher yields than early-season estimates.

On the east side of the country, 2018 proved to be a difficult year, marked by a lack of sun and heat and an overabundance of rain from hurricanes Florence and Michael sweeping through many states. "By the end of September, New Jersey had already received a year's worth of rain," said Gary C. Pavlis, associate professor at Rutgers Cooperative Extension.

The excessive moisture led to an increase in vine disease such as sour rot, botrytis and various kinds of mildew. "Growers had to be on top of their fungicide spray schedule and canopy management plans to minimize the risk of disease," said Michela Centinari, assistant professor of viticulture at Pennsylvania State University.

But even those who were on top of crop management reported that red wines will be lighter in color, as many grapes did not reach optimum ripeness, with some varieties barely reaching 20° Brix in certain regions. "Some winemakers chose to utilize more red fruit for rosé-type wines than an average year," said Tremain Hatch, extension associate at Virginia Tech.

Overall, East Coast correspondents were less enthusiastic about the 2018 vintage than vintages past but remain optimistic that those growers who remained diligent in the field and were able to bring in clean fruit will produce good wines.

In the Midwest, a warm spring and dry summer meant less disease pressure than usual, but a few areas, such as Indiana and Iowa, reported that Japanese beetle infestation was extremely bad during the 2018 growing season. Late-season rainfall also meant more instances of downy and powdery mildew, as well as sour rot due to harvest and post-harvest rains. And Bruce Bordelon, professor of viticulture at Purdue University, stated that Indiana farmers are seeing more instances of trunk disease across the region, causing major concern for growers.

Herbicide drift, especially dicamba, continues to be an issue for Midwestern farmers where wine grapes are grown alongside other crops, such as soybeans.

For the past three years, Missouri has been experiencing intermittent drought patterns, resulting in problems with irrigation. "Missouri would benefit from fall rains or winter snowfall to replace much-needed subsoil moisture," said Dean S. Volenberg, viticulture and winery operations extension specialist at the University of Missouri Grape and Wine Institute.

"New Mexico's … wide variation in quantity is due to the state's range of mesoclimates," said Gill Giese, extension viticulture specialist at New Mexico State University. This included April frosts, heat spikes in the summer months and excessive rainfall during the harvest season.

Growers in Texas have reported another successful harvest, despite extreme drought conditions in most of the state. Berries were smaller, Brix took longer to develop, but overall yields and quality are good.

The one concern throughout North America is a lack of available labor, which has compelled many growers to mechanize vineyard operations. Those growers who want to continue the use of hand-harvesting are utilizing the federal H-2A visa program to ensure labor is available throughout the growing season.

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CALIFORNIA

FRESNO COUNTY

George Zhuang
Farm advisor
University of California
Cooperative Extension

2018 yield is about average in Fresno County, with approximately one or two weeks of delayed ripening. Overall, the fruit quality is excellent across different regions and types of grapes. The growing season of 2018 started with the dry winter and cold early spring. It was reported that there were several incidences of winter freeze and frost damage on various locations and some earlier varieties, like Pinot Gris. In the middle of the growing season, there was an extended period of smoky days due to the wildfires. Disease pressure is relatively low compared to last year. Heavy canopy with less spray coverage and certain disease-prone varieties are most likely to suffer from powdery mildew and bunch rot.

With the continuing vine removal in the southern San Joaquin Valley, particularly Thompson Seedless, it seems that we have reached a shortage of grape supply. We have seen a historical high raisin price of $2,150 per ton in 2018, as well as high juice price. Due to the ongoing vine removal and not many new grapevine plantings, raisin prices may well stay high in the foreseeable future.

This year I have seen the most raisin vineyards harvested by machine at varying degrees, and it indicates that increasing labor costs are really starting to change the farming practices on grapes. Mechanical leafing is also becoming more and more common in the valley, largely because right now we have an affordable way to meet the demand of wine premiumization with less cost. Water scarcity and increasing labor cost are and will still be the two biggest challenges for grapegrowing in the San Joaquin Valley (SJV). Ongoing research projects on irrigation innovation and vineyard mechanization are promising to make SJV grapegrowing competitive and sustainable.

Currently, I have five field projects on Pinot Gris with various clones, rootstocks, crop load and mechanical pruning in the SJV. Pinot Gris has started to get popular in the past few years, and the biggest challenge of growing Pinot Gris in the valley is to achieve the economically sustainable yield with better fruit quality and less rot. I am currently also working on Cabernet Sauvignon, the king variety of California, in SJV. Focusing on irrigation and mechanical leafing, hopefully I can improve the fruit quality, particularly the color, of Cabernet Sauvignon, even in the hot climate of SJV.

LAKE AND MENDOCINO COUNTIES

Glenn McGourty
Farm advisor
University of California
Cooperative Extension

2018 will go down as a good vintage that should make balanced wines with good acidity, mature tannins and great tastes that are very capable of aging.

It was a very nice harvest, with grape yields above average in size and quality. Fruit ripened evenly, at a moderate pace with good hang time, and had great balance of acids, sugar and phenolic maturity. Standouts include Chardonnay, Pinot Noir, Cabernet Sauvignon, Zinfandel, Sauvignon Blanc and most cultivars.

The growing season started late and finished late. Spring was cool, but when bloom occurred in

BOB MCCLENAHAN

Harvested Pinot Noir grapes on the crushpad at Mumm Napa.

late May and early June, weather was ideal for pollination. There was some heat in the middle of the summer, but by harvest, temperatures had moderated and allowed for good ripening conditions. There were just a few instances of mildew due to strains of powdery mildew resistant to fungicides. Harvest proceeded fairly smoothly. More vineyards are being harvested with machines, as labor continues to be tight.

Spot markets shrunk, with few wineries wanting any fruit beyond the contracted amounts. Smoke issues were a factor due to horrific wildfires in Lake and Mendocino counties. The impact is still being assessed. Some fruit was rejected by larger companies. Many smaller wineries worked with growers to process fruit and clean it up. Other vineyards were definitely affected and were a loss due to smoke flavors.

MONTEREY, SAN BENITO AND SANTA CRUZ COUNTIES

Larry Bettiga
Viticulture farm advisor
University of California
Cooperative Extension

There was concern after the cool spring that yields could be lower due to poor set and smaller berry size. As the harvest progressed, it became apparent that most vineyards were producing near average yields, with the occasional block producing crop at slightly above average. Quality was very good, with good balance that should bring great complexity to the wines.

The 2018 growing season was a return to a more typical weather pattern for the northern central coast. Cool spring temperatures stretched both the bud break and bloom, and moderate summer

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temperatures with no heat spikes continued through harvest, producing a long hang time and slow, even ripening. Harvest started in late August for sparkling wines, with most grapes picked during September and into late October. The season was not plagued by any severe pest pressure. Powdery mildew pressure was lower than in previous seasons. An early October rain did not seem to increase bunch rot levels, as the typical afternoon winds and dry conditions after the single rain event quickly dried the canopies and fruit.

Growers in Monterey County have begun an areawide approach to reduce the spread of grapevine leafroll virus by its main vector, mealybugs. Vine removal and mealybug controls are being coordinated on a volunteer basis between neighboring vineyard properties.

NAPA COUNTY

Monica Cooper
Farm advisor
University of California Cooperative Extension

Overall, we experienced favorable growing conditions in 2018, including a noted absence of the heat spikes that have characterized recent seasons — disappointing for those folks hoping to get data from shade-cloth or sprinkler-cooling trials! Precipitation patterns through the winter were sporadic, as a high-pressure ridge sat over Northern California in December 2017 and February 2018, resulting in dry soil conditions by mid-February. The sixth wettest April in the last 30 years put us at 63% of mean annual rainfall by the end of that month. Following a normal bud break, the growing season progressed mostly uneventfully.

> Wind-driven wildland fires once again became a concern, sending high-level smoke into the skies over Napa.
>
> *Monica Cooper*
> *Farm Advisor*
> *University of California*
> *Cooperative Extension*

Concerns developed for our neighbors in Lake and Mendocino counties in late July and early August, as wind-driven wildland fires once again became a concern, sending high-level smoke into the skies over Napa. August and September were marked by ever-spreading populations of vine mealybug, widespread potassium deficiency symptoms, late-season mites and variegated leafhoppers, as well as concern about sugar accumulation disorder. Unlike 2017, leafroll and red-blotch disease symptoms were also quite severe in 2018, appearing earlier than expected in the growing season. Harvest returned to a more average start date compared to recent years, and it proceeded sporadically with periods of high and low activity, continuing into mid-November. Yields were high all around, with initial estimates up 20% over average, and some longtime growers reporting this as one of largest-yielding vintages in their memory.

SAN JOAQUIN COUNTY

Lodi AVA, River Junction AVA and Tracy Hills AVA

Paul Verdegaal
Farm advisor *emeritus*
University of California Cooperative Extension

The 2018 harvest began later than in previous

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years and was about on long-term average in early August. Yields were average to slightly below average, with a few exceptions; overall crop was down about 10% to 15%. The maturity of varieties didn't overlap to any extreme, and harvest was well-paced, allowing for orderly deliveries to wineries. Quality was very good to excellent, with ripe flavors and good fruit composition. A harvest rain in early October was very heavy but erratic in pattern, with stations reporting anywhere from no rain to 2 inches.

The growing season started with a dry winter, but late rains resulted in just slightly below-average total rainfall. Fewer-than-average 100° F days and cool nights slowed maturity slightly and induced scattered mildew problems. Some cases were severe, with more indications of increasing resistance to older fungicides. Vineyard mealybug was not severe and most other pest problems were limited, except more red-blotch virus was evident.

Grape prices softened for some varieties such as Zinfandel and other reds, but overall were stable. Demand was moderate but weaker in some varieties such as Zinfandel for red. Yields, for the most part, were average at best, with most sites 15% or more below average.

More interest is developing in mechanization of all aspects of vineyard management. Increased use of drones or aerial imagery is being adopted. Soil-moisture monitoring has increased, as well as experimentation in monitoring of evapotranspiration by newer technology.

Biggest concerns for growers and winemakers are labor availability and cost and regulation increases for labor, water and production practices. Also of concern are increased costs in taxes, assessments, fees, permits, licenses, surcharges and penalties. At the same time, foreign competition, subsidized by governments, is a concern. Removal and replanting of old vineyards began two years ago and continues, due to old age and low yields, newer varieties, to reduce labor of head-trained vines, and red-blotch virus effects.

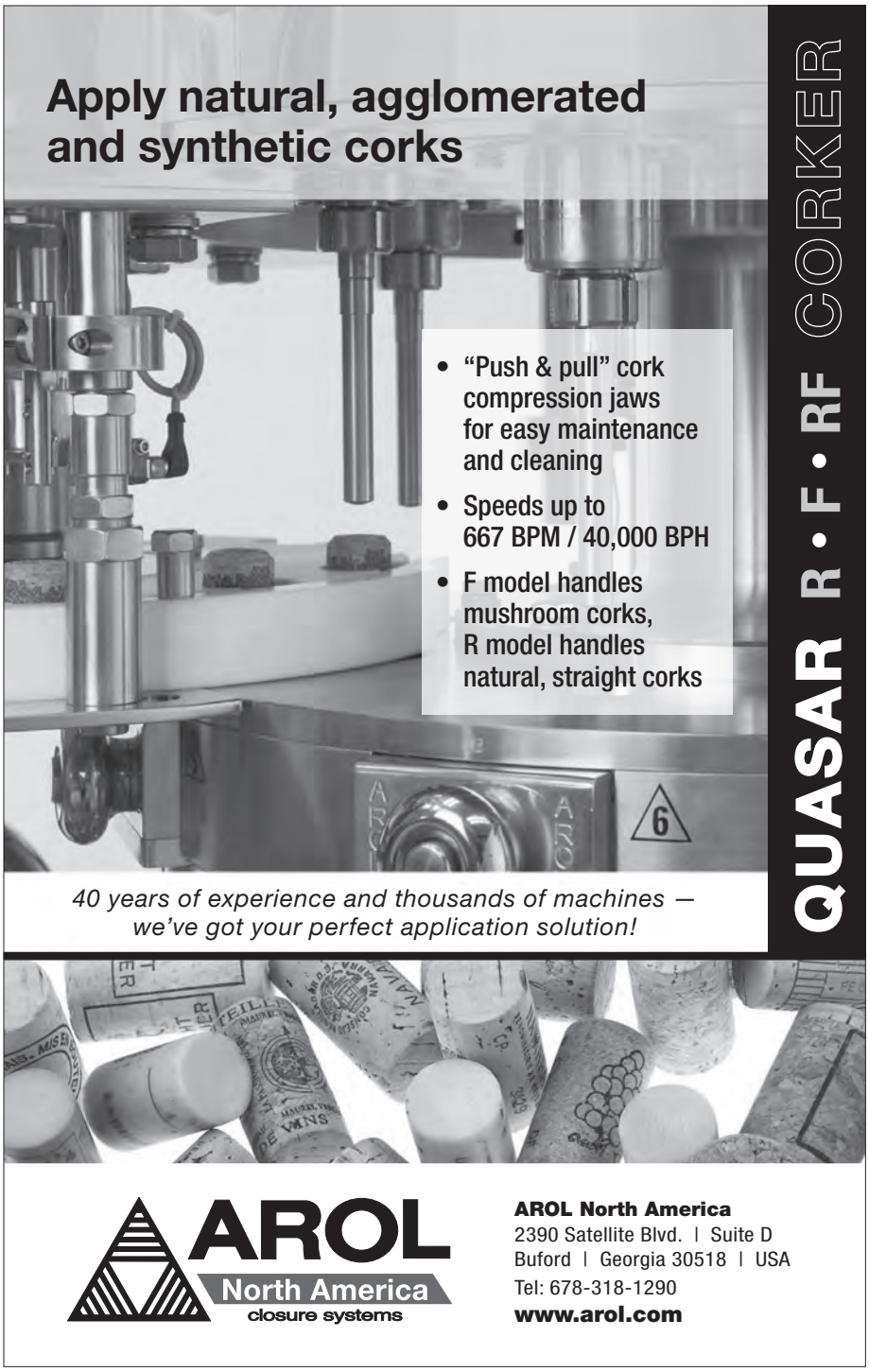
Challenges include navigating an increasingly complex and punitive regulatory landscape, competition for water use with urban and environmental use, labor availability and capability. Successes include more recognition for wine quality at reasonable prices and further strengthening of grower organizations such as the Lodi Winegrape Commission, Lodi District Grape Growers and Farm Bureau. These organizations are helping both growers and consumers appreciate that the region is well-suited for sustainable production of quality fruit and wines, while contributing to the economy and environment.

SAN LUIS OBISO COUNTY

Jason Haas
Partner and general manager, Tablas Creek Vineyard
Chairman, Paso Robles Wine Country Alliance

Quality looks to be outstanding, with great color, rich texture and vibrant acids. Quantity was down 7% from our near-record levels of 2017, but still about 10% above our long-term average. It seemed as if late-ripening varieties (Roussanne and Mourvèdre, principally) were down in yields, while the earlier-ripening grapes (like Grenache, Syrah and Viognier) did better, but everything looks strong. Although we started harvest late (about two weeks later than our average this decade), the excellent conditions meant we never had to pause, and we finished more or less at our average time, on Oct. 25. So a short, concentrated harvest that appears to be making powerful, concentrated wines.

Most of the year was moderate to slightly cool, except for a scorching six-week stretch be-



Machine harvesting in Santa Barbara County. California's Central Coast enjoyed good growing conditions and recorded average to slightly higher than normal yields.

tween the second week of July and the middle of August. July was our hottest month ever, and August warmer than normal thanks to a hot first two weeks, but the rest of the year was not. So, while the overall picture suggests a warm year, with about 7% more degree days than average, it's important to remember when and how the heat came, and just as importantly, when it didn't. We had a cooler spring (1% fewer degree days than normal) and harvest (1.5% fewer degree days than normal) surrounding the hot midsummer (20% more degree days than average).

Disease and pest pressure was less this year than last. Leaf hoppers, which were a big issue last year, were much less severe this year. There was a little mildew pressure early (before the July warmup) but nothing particularly troubling.

SIERRA NEVADA FOOTHILLS

El Dorado, Amador and Calaveras counties

Sierra Foothills AVA, Fair Play AVA and California Shenandoah Valley AVA

Lynn R. Wunderlich
Farm advisor
University of California Cooperative Extension, Central Sierra Region

Average to slightly above average yields and high quality due to a slower ripening period characterize the 2018 season. Cooler temperatures at higher elevations in late summer allowed for slower ripening and good accumulation of both acids and flavors. The slower harvest calendar reminiscent of "how it used to be" gave most wineries time to process.

Rainfall was more normal and much lighter than in 2017. We received 27-33 inches during the "hydro-year," about half of the previous year. A frost event hit lower-slope areas in mid-April, causing severe losses for some and reducing yields in those blocks; growers reported looser clusters in those blocks. Plymouth's maximum monthly average air temperatures were the coolest

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they've been in June for the past five years, and the monthly minimum temperatures were the lowest they've been in September for the past five years, allowing for perfect harvest conditions.

This was a year to pay attention to your own site considerations. Cooler temperatures at higher elevations brought nearly constant powdery mildew pressure there, while lower elevations had enough heat to keep the model at zero for most of July and August. Mites appeared with heat stress in many blocks in late summer, especially in Zinfandel. Red-blotch virus continues to spread and be a major concern for the industry.

Demand for Zinfandel varied across the region. Many Zinfandel growers were left with beautiful fruit unharvested, and some are considering replanting with alternative varieties. Others reported renewed interest in Zin, especially from local winemakers and for organically grown. Some old-vine Zinfandel blocks are finally giving way to phylloxera, providing an opportunity to replant with appropriate rootstocks or explore other varieties such as the heat-loving Italian grapes. Rhônes still reign, and El Dorado is considered "ground zero" for Gamay.

Mechanical harvesting is growing in the foothills for the larger and less-steep blocks. Growers reported the usefulness of the powdery mildew index; we now have seven stations across the foothills, all publicly available on the University of California Statewide IPM Program. This was a year you could save a spray, or spray every 10 days, depending on your location.

A drier water year meant paying close attention to the soil water profile. Labor shortages continue to be a major concern, though fruit held on better in blocks where harvest was delayed. The Mendocino Complex fires sent smoke over midsummer that was rough on crews working outdoors. Many were sent home midday in August when air quality was unhealthy.

JORDAN VINEYARD & WINERY

A crew picking Bordeaux varieties on Sept. 21 for Jordan Vineyard & Winery in Sonoma County.

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Winemaker Steven Urberg oversees pressing during the first day of harvest at Gloria Ferrer Wines in Sonoma County.

SONOMA COUNTY

Rhonda J. Smith
Viticulture farm advisor
University of California
Cooperative Extension

For many Sonoma County growers, the 2018 crop was big but not huge, with those vineyards producing higher yields than early-season estimates. Some growers bumped up against the contracted maximum they could deliver to buyers; thus fruit was either left on the vine or picked for the bulk market. Small overages were often able to be sold to other buyers, yet sometimes at a reduced price. Smoke-taint concerns returned with this vintage due to the wildfires in neighboring Lake and Mendocino counties, although grapes were not impacted in Sonoma County.

Maximum daily temperatures in July and August were at or slightly lower than in recent years, resulting in a longer ripening period. In August, warmer regions rarely saw temperatures in the 90s, and due to a deep marine layer, highs in the 70s were common during the last three weeks of the month. The absence of heat spikes for several days of maximum temperatures near 100° F allowed for consistent fruit maturation. As a result, fruit hit sugar- and acid-maturity targets later in the season than in the recent past. Harvest dates for some sites were delayed until the acid levels dropped.

Grape powdery mildew was held in check with very few exceptions. Following a bad mildew year in 2017, in 2018 more sulfur applications were made up until the grape contract required growers to switch to a different fungicide. Botrytis bunch rot presented some challenges due to light to moderate rainfall over a six-day period that ended in the first week of October. One to 2 inches of rain fell on unripe fruit. Most growers were able to prevent fruit loss by immediately opening up the canopies to take advantage of dry, breezy conditions that followed.

Labor continues to be a concern in the area. An increasing number of growers utilized the federal H-2A visa program to ensure that labor was available over the growing season.

NORTHWEST

BRITISH COLUMBIA

Peter Mitham
Northwest correspondent
Wines & Vines

British Columbia experienced largely favorable conditions throughout a growing season that saw pest and disease pressure kept in check and supporting hopes of above-average yields that could push this year's harvest toward 35,000 tons. Wildfire smoke was a concern, and several wineries tested fruit for signs of taint. There are minimal concerns for the 2018 vintage, however, given the lack of taint from wildfire events in previous years. A crisp end to the season allowed good flavor development combined with a crisp acidity that promises stellar wines.

> Reported quality is very high across the region, and many think it will be one of the best vintages in recent history.
>
> *Patty Skinkis*
> *Associate professor and viticulture extension specialist*
> *Oregon State University*

A warm spring delivered a blast of heat in late April that culminated in localized flooding in early May. However, the moisture disappeared as hot weather continued through May and accelerated budbreak. The season seemed set to deliver another early harvest until wildfire smoke settled over the southern half of B.C. in late July and into August, reducing sunlight and contributing to moderation in temperatures. The first grapes for sparkling wine came off in late August, with harvest beginning in earnest after Labor Day. Harvest continued into November.

Good yields will help address growing demand for red grapes, for which prices are approaching $3,000 (all figures in Canadian dollars) a ton. Cabernet Sauvignon averages $2,800 a ton versus $2,300 a ton for Chardonnay, based on the industry's 2017 crop report. Many varieties have posted double-digit increases. Several wineries have met demand by expanding plantings, sometimes into new, high-elevation sites. An established vineyard can fetch $200,000 an acre.

While wildfire and water management are on the minds of many growers, labor is an ongoing concern. Many wineries source workers through Canada's temporary foreign worker programs, which continue to see changes. Several applications faced delays in 2018, adding to concerns regarding the shortage of domestic workers.

IDAHO

Snake River AVA, Lewis-Clark Valley AVA and Central Idaho

Moya Dolsby
Executive director
Idaho Grape Growers & Wine Producers Commission

Yields for 2018 were up, primarily for two reasons: bounce-back year from the freeze in 2016 and 2017, and the Pacific Northwest in general had a higher-yielding growing season. Higher-end fruit was higher-yielding, but also kept up the quality. This is primarily due to a Goldilocks season (not too hot, not too cold), as well as vineyard practices to keep quality high.

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Brandon Moss, assistant winemaker at Gramercy Cellars in Walla, Walla, Wash.

OREGON

Patty Skinkis
Associate professor and viticulture extension specialist
Oregon State University

The growing season started off warm and early, but then cooled off a bit and slowed down. We had a warm summer that wasn't too hot, and the nice weather extended into the fall for some good hang time. Vineyards with low spots were challenged with some frost in late September and mid-October. With good spray programs, mildew shouldn't have been an issue. A mild winter and ideal conditions during the growing season led to high pressure for both bud mites in the early season and spider mites during the summer. Birds during harvest were extremely bad. The level of starlings eating grapes in our vineyards was mind-blowing.

Higher yields created tank space issues for wineries, which is a good thing compared to last year. As always, labor availability is an issue and will continue to be an issue for all agriculture in the United States.

Yields were higher than average across all of western Oregon, including the Willamette Valley and valleys of southern Oregon. Reported quality is very high across the region, and many think it will be one of the best vintages in recent history. The majority of the spring, summer and fall were warmer than the long-term average but on par with the past few years. We did not have major heat spikes near *veraison* this year as in 2015 or 2017. The harvest window was long, as we had ideal September and October weather (warm and dry), and due to the dry summer and fall, disease pressure (specifically powdery mildew) was low.

Grape yields have been increasing gradually each year, leading to extra fruit on the market. Grape prices have remained steady or increased slightly, depending on cultivar. Wineries have been at max capacity. Labor availability is always a concern, but larger companies are mechanizing more to accommodate. In fact, there was more use of mechanical harvesting in 2018 than in prior years, and many are reporting excellent fruit quality from mechanically harvested fruit.

WASHINGTON

Vicky Scharlau
Executive director
Washington Winegrowers Association

The 2018 harvest was good and big and plenty — big berries, big clusters and super high quality across all tiers. Overall, the growing season was warm and frost-free. We had a late, wet spring, followed by a warm summer. The days were routinely warmer than normal, but nights were refreshingly cool, with 45° F to 55° F temperature swings.

Growers who were on top of early-season sprays were successful, while those who skipped or extended spray windows paid the price — as always. There were not a lot of changes in grape prices, but demand is significantly lower, so prices will most likely follow. Yields were above average, with unsold fruit remaining after harvest.

Because yields were higher than average, and labor is still tight, it was another big year of additional mechanization efforts and a lot more selective harvest, destemming and mechanical harvesting.

Deer in a vineyard in Okanagan Valley, British Columbia, where growers had to contend with spring floods and summer wildfires.

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CENTRAL

COLORADO

Grand Valley (Mesa County) and West Elks (Delta County) AVAs

Horst Caspari
Professor and state viticulturist
Colorado State University

The 2018 harvest saw the biggest crop ever produced in Colorado and excellent grape qualities due to outstanding growing conditions. So far, we have received information from about one third of the industry. A comparison to the 2017 survey shows that the yield per acre is up about 11%. Taking into account non-respondents, we estimated the 2017 crop production to be around 2,300 to 2,500 tons and (actual reported tonnage was 2,016 ton). 2017 may have been the biggest crop ever, or maybe not. There was only a 20-ton difference to the 2015 harvest, too close to call. Either way, it looks like 2018 will come in at around 2,500 to 2,800 tons and will set a new record.

The growing conditions were very dry and hot. There were drought conditions throughout the state, reaching exceptional level for the south-western part of the state, and extreme for much of Western Colorado. Harvest started very early. Most grapes were already harvested by the end of September. Rain and much cooler temperatures finally arrived in the first week of October, but with few exceptions did not cause any disease problems.

The hot and dry growing season resulted in minimal disease pressure. From a disease perspective, this was about as ideal a season as one can imagine, with some

FRITZ WESTOVER

The Blanc du Bois harvest was particularly bountiful in Texas causing tank space issues at some wineries.

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growers reporting zero fungicide applications even for highly susceptible varieties.

The 2018 vintage will most likely turn out to be the biggest harvest ever in Colorado. Winery demand for grapes was strong but supply much higher. A very significant amount of grapes were left hanging on the vines, especially Riesling. Overall grape prices appear to be unchanged from 2017. Very good yields meant large surplus for certain varieties, especially Riesling and many cold-hardy (aka hybrid) varieties. Other varieties with surplus production include Cabernet Franc, Chardonnay, Gewürztraminer, Syrah, Viognier, and many others.

Extreme, even exceptional, drought conditions led to early water restrictions in parts of the main grape growing areas. Some growers lost irrigation water as early as June. Nevertheless, impact on vine growth, yield, and fruit quality appears to have been minimal. Labor availability continues to be a major issue.

INDIANA

Ohio River Valley, Indiana Uplands AVA

Bruce Bordelon
Professor of viticulture
Purdue University

Overall, the harvest was good across the state and region. Yields were up, and quality overall was excellent. It was a warm growing season in the Midwest, and that led to a full crop of high-quality fruit. The winter was relatively cold in the northern part of the region, with temperatures as low as -20° F. That caused some bud damage to tender varieties, so growers had to adjust pruning to compensate for losses. The spring started slow with a cool April, but May brought record heat and vines grew rapidly. Fruit set was excellent due to warm temperatures. Summer was hotter and drier than normal. But beginning the last week of August, measurable rain fell statewide for six weeks. That created issues with diluted flavors and fruit rots on thin-skinned varieties. A very warm September and October allowed late-ripening reds to fully ripen by harvest.

A very warm spring and drier-than-normal summer resulted in very low disease pressure, but Japanese beetles were extremely bad this year, similar to 2017. There was more late-season downy and powdery mildew this year than normal due to late-season rainfall. Sour rot and ripe rot were not uncommon due to harvest season rains. We are seeing more occurrences of trunk diseases across the region, which is a concern for growers.

Widespread planting of herbicide-tolerant row crops, especially dicamba-tolerant soybeans, is leading to widespread herbicide drift. This a major concern for specialty-crop growers, as they anxiously await EPA's decision on registration for 2019. Labor also continues to be a major concern for all specialty-crop growers. Many are turning to mechanization out of necessity.

Demand for locally grown fruit far outpaces supply in the Midwest. More acres are needed of all varieties.

IOWA

Michael L. White
Viticulture specialist
Iowa State University

The Iowa grape harvest was normal, but with some poor quality due to heavy rainfall in the eastern and northern parts of the state. Eastern and northern parts of Iowa had very high rainfall during the summer, causing disease and pest problems, specifically Japanese beetles and spotted-wing drosophila (fruit flies) during harvest.

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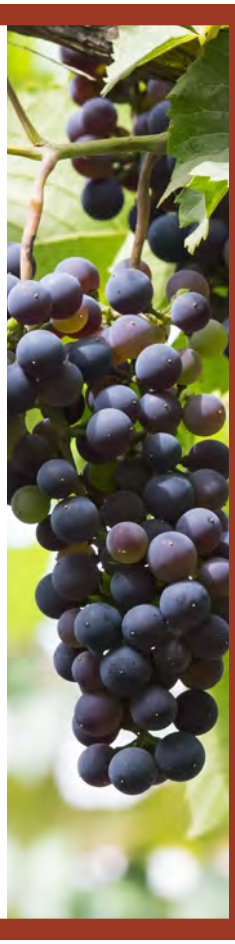

Grape prices remained unchanged from the past couple of years, primarily hybrids ranging in the $1,000-$1,600 per ton range, with most sales in the $1,200-$1,400 per ton range. There is somewhat lower demand from wineries this season because of carryover inventory.

Labor is very, very tight. EPA vineyard worker protection rules increased, and it's now much easier and cheaper to invest in mechanization. Iowa had eight mechanical grape harvesters in 2017; we now have 11, and four of them are doing custom work. Hedgers and leaf pullers are also starting to be used.

MICHIGAN

Leelanau Peninsula AVA, Old Mission Peninsula AVA and Tip of the Mitt AVA

Thomas Todaro
Viticulture extension specialist
Michigan State University

Generally, the quality and quantity of the overall 2018 harvest crop for the Leelanau Peninsula and Old Mission Peninsula AVAs in northwest Michigan were within the normal range. Growers reported slightly lower yield (tons per acre) and quality in Pinot Gris and Pinot Noir, normal-to-high yields and quality in Riesling, Merlot and Cabernet Franc, and high yields and quality in cold-climate hybrid cultivars such as La Crescent, Marquette and Frontenac. For southwest Michigan AVAs, yields were average this year, similar to the northwestern region.

The growing season started seven to 10 days later than normal, with bud break occurring around May 17. The summer months were characterized as warm and dry; however, the post-*veraison* period (late August through October) was characterized as wet and cool, which led to slowed ripening and increased fungal disease pressure (fruit rot). Southwest Michigan had a late, cool spring with a late bud

Oliver Winery in Bloomington, Ind., uses a Pellenc harvester to pick Catawba grapes in an estate vineyard.

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burst (about 10 days later than historical average) and no spring frost. Summer was really hot but humid, and after *veraison* there was a lot of rain.

The disease pressure was high. This was likely due to large and powerful storms (rain and wind) in late August through mid-September, which likely damaged the berries and provided excellent conditions for fungal disease (powdery mildew, downy mildew, botrytis and sour rot). Chardonnay, Riesling and Pinot suffered the most; Merlot and Cabernet did better.

MINNESOTA

Annie Klodd
Extension educator
University of Minnesota Extension

Growers and winemakers I surveyed were generally satisfied with Brix, pH and TA for most of their varieties this year. Quantity was below average and variable throughout the state. The saying I heard repeatedly was: "Quantity was low, but quality was high."

Bud break started two weeks late due to an April 15 blizzard and 9 to 22 inches of snow across southern Minnesota. Temperatures quickly rose and remained high through July, so we had high growing degree day accumulation going into *veraison*, which started July 29 in central Minnesota. We had two major rain events during harvest, with a period of hot temperatures sandwiched between. In the southwest, we had precipitation 50% to 75% above average overall, including several heavy rain and hail events in June, July and September (during peak of harvest). South-central and southeast regions had average precipitation until *veraison*. Then heavy rain in September, one to two weeks before ripening for critical varieties like Marquette and Frontenac, caused substantial splitting, berry shatter, bunch rot and berry shrivel. This led to substantial yield losses for some growers and resulted in overall precipitation to rise to 25% above average for the southeast.

Bunch rots (botrytis and sour rot) and downy and powdery mildew appeared to have the largest impact this season. I also observed a significant amount of phomopsis and anthracnose lesions, but they did not have a notable impact on yield. Flea beetles were heavy during bud break, and Japanese beetles were severe in some parts of the state. Spotted-wing drosophila is widespread throughout the state, but it is not believed that they have a large impact on intact clusters. We cautioned growers to spray for drosophila after rain events to reduce their impact on split berries, since they can contribute to sour rot and other off flavors. Starting in 2016, we have been dealing with reports of bunch stem necrosis in Marquette, but I have also observed it less frequently in other varieties including Prairie Star and Frontenac Gris. We are starting to study grapevine trunk diseases, and one of our major goals is to determine the extent to which trunk disease is contributing to cordon decline, which is a common cause of lost yield in Minnesota.

MISSOURI

Dean S. Volenberg
Viticulture and winery operations extension specialist
University of Missouri Grape and Wine Institute

In Missouri, grape quality was excellent for all cultivars, including Vignoles, Norton, Chambourcin and others. Depending on location in the state, yield was average or below. Lower yields in some areas are attributed to extended drought periods. This year, Missouri experienced one of the coldest Aprils on record. This resulted in delayed bud break, 10 to 14 days on average later than normal. Record-high temperatures occurred at the beginning of May. Bud break for most cultivars occurred near May 1, and bloom occurred three weeks later. Degree day accumulation was similar to 2017, which is greater than the 30-year average.

Fungal diseases were depressed when high heat (temperatures greater than 90° F) occurred and

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dry weather prevailed. Almost all areas of the state experienced periods of drought. Japanese beetles were an eight-week management problem but were controlled.

> Many areas in Missouri have been experiencing intermittent drought the past three years.
>
> *Dean S. Volenberg*
> *Viticulture and winery operations extention specialist*
> *University of Missouri Grape and Wine Institute*

A follow-up vineyard virus survey in 2018 showed that some Norton, Chambourcin and Crimson Cabernet vineyards have a high percentage of vines infected with grapevine red-blotch virus (GRBV). In some vineyards, more than 75% of the vines have GRBV. However, at this time it is difficult to say what impact GRBV is having on these cultivars. Norton and Chambourcin vineyards infected with GRBV show none of the classical GRBV symptoms. Only Crimson Cabernet, which is approximately 62.5% *Vitis vinifera,* shows classic GRBV symptoms.

Many areas in Missouri have been experiencing intermittent drought the past three years. This has resulted in surface water ponds used for irrigation becoming low or in some cases drying up completely. Missouri would benefit from fall rains or winter snowfall to replace much-needed subsoil moisture.

NEBRASKA

Paul E. Read
Professor of viticulture
University of Nebraska
Viticulture Program

Although there were some extremes, the overall harvest was good to slightly better than average. Grape quality was excellent overall, except where hail or disease impacted individual vineyards. Yields were down in a few instances, but mostly average or above average in most parts of the state. Overall vintage rating would be characterized as very good to excellent — some outstanding wines were made.

Harvest in Nebraska begins in early August and continues into late September or early October. That said, part of the early harvest season was beset by unusually cool, wet weather that was replaced by seasonably warm and clear skies and only moderate rainfall later in the harvest season. One vineyard was hit by hail part way through the harvest period, with around 30 acres of production lost.

Overall there was less disease and herbicide-drift pressure than in the past two years. There was some downy mildew, along with sporadic black rot, in May. Most common diseases were managed well with appropriate spray programs. Isolated Japanese beetle infestations caused modest to severe damage and crop reduction.

The biggest challenges include labor shortages. There have been additional machine harvesters added in 2017 and 2018. There's also a high demand for red grapes, exceeding supply, but some overproduction of white wine grapes.

NEW MEXICO

Gill Giese
Extension viticulture specialist
New Mexico State University

New Mexico's 2018 wine-grape harvest was slightly above average, and quality was above average to excellent. However, wide variation in quantity is typical, due to the state's range of mesoclimates and eight to 10 climatic zones. Some yield reductions were due to frost, difficulty with replants, and intermittent hail and untimely rains at harvest of red varieties.

The season was about two weeks early across all regions, following an unusually dry winter and hot, dry spring and early summer. However, there were reports of late April frosts, with varying degrees of damage. Excessive heat in May through July accelerated harvest timing with

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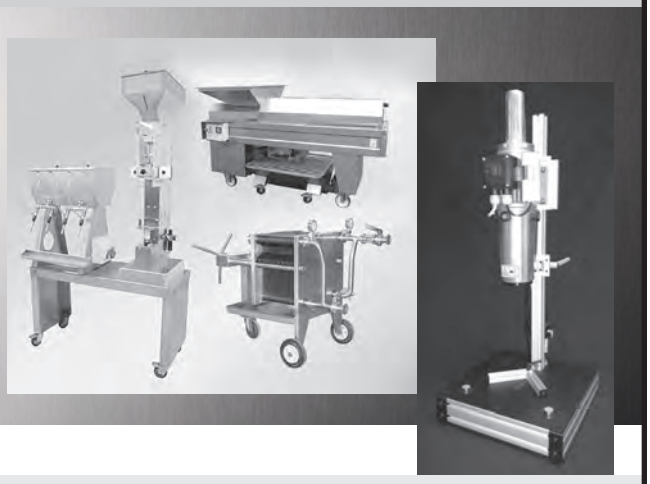
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sporadic, spotty and heavy rains during the monsoon season at harvest with consequential rot issues. Atypical rainfall continued immediately post-harvest in many locations. The rain timing impacted bunch-rot incidence and severity at some sites, but overall most growers reported very low seasonal disease pressure and good to excellent conditions at harvest. Vertebrate pests such as deer, gophers and raccoons substantially hindered operations and reduced yields, especially in the case of smaller plantings. Leafhopper infestations were ubiquitous statewide, although growers have a workable action threshold in most cases.

Continued drought and lack of irrigation capacity and water quality may induce growers to reduce acreage. Labor shortages in the wineries, especially at harvest, continue to be a major challenge. Mechanical harvesting appears inevitable, with adoption by some growers with as few as 10-15 acres. Most technology and innovation adoption occurred in the winery, with some new processing equipment and must additives/adjustments to enhance quality and increase juice yield.

Many New Mexico growers prefer own-rooted *vinifera* due to market demand and threat of winter cold, although growers south of Albuquerque utilize grafted vines. Malbec, the Cabernets, Tempranillo, Pinot Noir and Montepulciano remain popular reds. Various Muscats, Riesling, Vignoles, Chardonnay and Chenin Blanc are popular whites. Hybrid varieties dominate plantings in the Four Corners region and selected sites statewide, including Chambourcin, Baco Noir, Vignoles, Leon Millot, Cayuga and St. Vincent. A few growers have had success with *Vitis aestivalis,* Cynthiana/Norton.

> Labor shortages in the wineries, especially at harvest, continue to be a major challenge. Mechanical harvesting appears inevitable with adoption by some growers with as few as 10-15 acres.
>
> *Gill Giese*
> *Extension viticulture specialist*
> *New Mexico State University*

OHIO

Todd Steiner
Enology program manager
Ohio State University

Maria Smith
Outreach specialist
Ohio Agricultural Research and Development Center Library

The 2018 vintage proved to be both interesting and challenging. Due to hot and very humid summer conditions, disease pressure was high from June through harvest. This provided the need for up-to-date and timely spray programs in between rains. Overall, it was a decent vintage in terms of both white and red wine quality, with good winemaking practices potentially producing some really nice wines from this vintage.

The 2018 harvest observed an overall warmer season with a higher amount of growing degree days. High late-season rains made it challenging to hang fruit longer to achieve proper maturity and to evaluate the potential for berry breakdown and sour rot with approaching rains. In all, we did not receive the higher amounts of torrid rain that some other states indicated, with adequate maturity being obtained. There were comments of sour rot being problematic throughout the state, which made cluster sorting, chilling of the grapes and sulfur dioxide use important. Higher levels of downy and black rot were observed during the growing season. Weed pressure and growth was also a concern during this time. The development of sour rot and berry shriveling was problematic during harvest. Many growers received slightly lower yields due to some winter damage in both 2017 and 2018, along with some berry shriveling and rot. However, demand was still high, especially for high-quality fruit from good producing vineyards. Adoption of intelligent sprayers was critical in targeting spray applications for disease control in those vineyards using this technology. Labor shortages in the vineyard have been an issue for keeping up with the high disease pressure and quick harvest decisions based on upcoming rains being predicted.

TEXAS

Mesilla Valley AVA, Escondido Valley AVA, Texas Davis Mountains AVA and Texas High Plains AVA

Frances Pontasch
Program specialist
Texas A&M AgriLife Extension

Regarding quality, we estimate 12,000 tons of overall yield, varied by area of the state growing *vinifera* and those growing hybrids. The *vinifera* yields were low due to drought combined with hot temperatures. The hybrids produced a bumper crop due to plentiful rainfall when rainfall was needed, but also absent when needed — during cluster formation and fruit set. The Blanc du Bois was expected to be large — but not a bumper crop — which resulted in a shortage of tank space for the variety. The overall quality is excellent: berries reached optimum ripeness with good balance between sugar, acids, phenols and aromas.

The entire growing season in the vinifera-growing AVAs of West Texas and the High Plains was dry with short rainfall events. The regions of the state growing hybrids experienced a cold dormant season, perfect spring and very dry, hot summer. Disease and pest pressure was overall very low.

Labor continues to be short, especially skilled labor. Mechanical harvesters have increased significantly. Water stress in drought areas was also a challenge. And injury due to phenoxy herbicide drift continues to be an issue. Despite these obstacles, overall grape quality has greatly improved.

Hill Country AVA

Brianna Hoge
Viticulture program specialist — Hill Country
Texas A&M Viticulture and Fruit Lab

Despite the drought, yields in the area were fairly normal. Berries were smaller in many vineyards, but overall yield was good. Quality was also good despite the weather. Brix took longer to develop than usual in some varieties.

This year, the Hill Country started with a wet spring that quickly switched to high temperature, drought conditions. There were moderate issues with disease and pest pressure. While many foliar fungal diseases were less of an issue due to the lack of rainfall, black rot was severe in the Hill Country. Early spring rains caught many growers off guard, so treatment was delayed. Later in the season, symptoms of Pierce's disease and cotton root rot were more pronounced due to water stress.

Major issues continue to be drought and the labor shortage. There was more mechanical harvesting performed this year than previously.

Texoma AVA

Michael Cook
Viticulture program specialist — North Texas
Texas A&M AgriLife Extension Service

Overall, the 2018 harvest occurred earlier than average and had slightly reduced yields. However, wet chemistry targets were in excellent range and overall quality parameters were very high. The

2018 growing season was perhaps one of the most erratic ever recorded. Winter was deemed normal and was not mild. Spring advanced quickly with warm temperatures, and bud break occurred as expected. For northern growers, a spring frost near Easter reduced crop in some vineyards. For all growers, hot temperatures were found in early June, with temperatures rising to over 110° F. Wind and extremely high temperatures remained through August with no precipitation. This hastened ripening by up to two weeks for many cultivars. Following harvest, temperatures cooled, but up to 30 inches of rain fell in the months of September and October.

Due to the early heat that remained through harvest and lack of rainfall during the summer months, disease pressure was at an all-time low. Some incidences of black rot and late-season powdery mildew were reported. A few vineyards noted downy mildew. That being said, due to extreme environmental stressors during summer, older vineyards known to have trunk disease were showing visible symptoms as early as June.

Though yields were slightly reduced overall due to spring frost in the northern areas near the Texoma AVA down to Stephenville, demand for high-quality, locally grown grapes in the region is extremely high. Prices remain stable. Growers in the region continue to adopt best current practices. Many are expanding their use of pre-emergent herbicides. One large vineyard has utilized aerial imaging.

Adapting to the quick changes in weather was the greatest challenge for growers. The heat, excessive wind and drought that plagued North Texas growers required fast thinking and adjusting common practices, such as closer monitoring of water status. Despite the erratic and extreme weather events, growers reported few vine losses, and yield was adequate with very high quality.

First harvest at Silver Crest Cellars in Madison, Ohio. Left to right John Boninc, Eric Cotton, Patrick Linenan (founders/owners)

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EAST

NEW YORK — LONG ISLAND

Alice Wise
Senior issue educator
Cornell Cooperative
Extension of Suffolk County

Yields were average to above average except where sorting of cluster rot was required, especially for susceptible white varieties. Summer was hot but often cloudy. Consequently, fruit was physiologically ripe with low to moderate Brix (18-20) and acids (5-7 g/l). Like many eastern regions, Long Island experienced an extended period of very warm, humid weather. Rainfall was not excessive during the summer, but the typical four- to six-week dry period did not take place. Temperatures remained above average through September. A nor'easter storm on Oct. 27 hastened the harvest of Bordeaux red varieties.

Due to vigorous shoot growth, periodic rainfall, dewy mornings and warm temperatures, downy mildew was the primary challenge through much of the season. Post-*veraison*, botrytis bunch rot and sour rot were problematic in susceptible varieties, though there was great variability in the degree of cluster rot from farm to farm. Despite the challenges of minimizing downy mildew and, in some cases, sorting out cluster rot, well-managed vineyards were still able to produce decent yields of ripe, flavorful fruit.

NEW YORK — FINGER LAKES

Yates, Ontario, Wayne, Seneca, Schuyler and Steuben counties

Hans Walter-Peterson
Viticulture extension specialist
Cornell Cooperative Extension

After 2017's very large crop, the general expectation was that this year's yields would be lower than normal in many cases. This proved to be true in some vineyards, but not in others. Overall crop this year ended up being close to average for most growers. Quality appears to be good overall. Varieties that were harvested earlier generally did better than later varieties due to ongoing pest pressure, especially sour rot in Riesling. Brix levels were generally lower than usual, but warm nights pushed acidity levels lower. Winemakers have generally been pleased with the quality of red varieties like Cabernet Franc, Pinot Noir and Lemberger.

2018 was a season with two distinct phases – one dry and one "not so dry." The period from April through July was drier than normal, with some vineyards beginning to show some early signs of drought stress by the Fourth of July holiday. Conditions changed significantly at the end of July and lasted through most of October, with more consistent rains. Communities on the eastern side of Seneca Lake and western side of Cayuga Lake were hit with 7 to 12 inches of rain during the morning of Aug. 14, causing damage to roads, homes and businesses, but relatively little damage to vineyards. The Finger Lakes also had a historic number of days with high humidity (dewpoints reaching over 70° F), which prevented fruit from drying out after rains and seemed to contribute to higher incidence of fruit splitting before harvest.

Pest pressure was relatively light in the first half of the season, thanks to the relatively dry conditions. That changed when rain and humidity entered the picture beginning in August. Downy mildew was a constant challenge. Sour rot was a significant problem in susceptible varieties, especially Riesling and Vignoles. Many growers spent significant effort to drop infected fruit before mechanical harvesters arrived, and others brought in crews to pick by hand. Later-season reds, including Cabernet Franc, were not impacted nearly as much.

The harvest crew at Boordy Vineyards in Maryland needed rain gear while picking Sauvignon Blanc in September during a rainy vintage for most of the Eastern U.S.

The first spotted lanternfly was found in the Finger Lakes this summer. Further surveys and scouting found no evidence of other individuals or egg masses, but we know now that it's probably just a matter of time before this pest shows up here.

Grape prices were generally flat or slightly lower than last year. Because of the very large crop that was harvested last year, a number of wineries cut back on their purchases from growers this year.

NEW JERSEY

Gary C. Pavlis
Associate professor
Rutgers Cooperative Extension

2018 was a difficult year. The season lacked sun and heat and had an overabundance of rain. I haven't heard wineries complaining about diseased fruit, as most growers are quite adept at controlling the diseases encountered, but the expense of these controls truly hurts their bottom line. Additionally, it appears that in 2018 red wines will be light in color and structure, as many varieties did not reach optimum ripeness. By the end of September, New Jersey had already received a year's worth of rain. Storms in September dashed any dreams of salvaging an already-difficult season. Fungal pressure was very intense: Botrytis and mildews required extreme diligence.

ONTARIO

Niagara Peninsula

Ryan Brewster, field service manager,
KCMS Applied Research and Consulting Inc.

Jim Willwerth, senior scientist in viticulture,
Brock University

Following a record-breaking year for Ontario, with more than 85,000 tons of grapes purchased by processors in 2017, the 2018 harvest was impacted by some early-winter injury during bud acclimation and increased disease pressure during ripening, resulting in a smaller harvest. Approximately 60,000 tons of grapes have been purchased by processors so far in 2018, not including ice wine and late harvest. Fruit quality was acceptable across all regions; however, certain thinner-skinned, early-ripening vinifera cultivars suffered greater levels of fruit breakdown late in the season, which slightly influenced overall yields and fruit quality.

The growing season in Ontario got off to a wet start, with greater-than-average precipitation re-

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Vidal Blanc grapes at the Cornell University teaching vineyard in Dresden, N.Y.

corded in April. This resulted in high soil moisture levels being maintained throughout bud break and early shoot development. Warm temperatures and relatively dry conditions were experienced throughout bloom and the early fruit-development phase, with growing degree day accumulations being above average for this period. Temperatures remained above historical averages through *veraison*, and many areas received significant levels of rainfall during the early stages of fruit ripening. Weather conditions during maturation and harvest were challenging.

While there were dry periods during the 2018 growing season, there were enough rain events to maintain high disease pressures. Highly sensitive cultivars, such as Chardonnay and Riesling, required routine fungicide treatments to maintain disease levels below economic thresholds. Powdery and downy mildew are the main types of fungal diseases in Ontario. Heavier pressure from grape berry moth and late-season leafhoppers was also observed. Low to moderate levels of botrytis were noted in susceptible cultivars. This was aggravated by heavy rains following *veraison*, along with elevated daytime and evening temperatures during ripening. Due to the level of fruit rots and berry shatter experienced in select vineyard blocks late in the season, some growers elected to mechanically harvest using onboard optical-sorting systems or to deliver and sort fruit using other optical-sorting systems at local wineries. While this reduced yields, it assisted in optimizing fruit quality by keeping clean grapes and eliminating the diseased berries.

Weather conditions during fruit ripening proved to be challenging for thin-skinned, tight-clustered cultivars. Growers had to be diligent in making decisions to mitigate losses associated with fruit rots. The impact of red-blotch and leafroll virus continues to be apparent in select vineyard blocks. Cabernet Franc, Cabernet Sauvignon and Chardonnay are displaying the greatest levels of virus symptoms. Many growers have now integrated an insect vector management program at their vineyards, and a national initiative through the Canadian Grapevine Certification Network is underway to provide local nurseries "clean" propagation material.

On average, there was a 1.4% increase in price per ton over 2017 pricing. It should be noted that this average was not consistent across all cultivars. Slightly reduced crop levels and minimum-wage increases drove this growth. Somewhat reduced yields were anticipated in most growing regions following regional bud survival analysis conducted in December 2017. An early cold event in late October 2017 resulted in some primary bud loss. However, at most locations, secondary buds compensated for this loss and produced a reasonable crop in 2018.

PENNSYLVANIA

Linda Jones McKee
Wine East editor
Wines & Vines

Pennsylvania has three grapegrowing regions — Lake Erie, the mountains stretching from southwest to northeast, and the southeast — but this year all three regions had two common characteristics: later-than-usual bud break and too much rain for the entire growing season. Jamie Williams, president of the Winery at Wilcox in the northwest, reported that due to the rain "it's not an amazing vintage." Williams, who also has vineyards in the southeast, said they picked early, even though the grapes were not fully ripe. The yields were fairly good, but only three varieties were picked above 20° Brix.

Michela Centinari, assistant professor of viticulture at Pennsylvania State University, said growers across the state faced persistent rainfall. "Growers had to be on top of their fungicide spray schedule and canopy management plans to minimize the risk of disease," she said. Growers had difficulty getting tractors into the vineyards to spray, and people picking grapes sometimes had to pick in the rain. Hurricane Florence did not bring winds to the region but slowly moved across the state and added more rain to already waterlogged vineyards. The Lake Erie region had somewhat less rain but incurred some winter damage that affected yields.

Persistent rains raised the disease pressure across the state, but growers who applied sprays appropriately did not see an increase in downy or powdery mildew. Many growers, however, did have to cope with sour rot and the accompanying fruit flies. Growers spent more money on sprays and more time applying them, but even minor errors in application resulted in lower-than-usual-quality fruit. Some wineries saw spotted-wing drosophila for the first time, and vineyards in the quarantine area for spotted lanternfly in southeastern Pennsylvania had increased numbers of that invasive pest.

VIRGINIA

Tremain Hatch
Extension associate
Virginia Tech

Summer and fall were a challenging growing and harvest season for Virginia grapegrowers. Frequent and heavy rain fell during the growing season and continued through harvest. There was higher-than-average rainfall across the season. Hurricanes Florence and Michael affected portions of the state during harvest in the fall, which led to high downy mildew pressure throughout the growing season. Growers also reported high incidence of grape berry moth injury to fruit.

While the forecasts for rain were gloomy all season, they were accurate, for the most part. Growers utilized weather forecasts to help make decisions. Hurricane Florence was forecast to affect a majority of the state in mid-September; fortunately, the hurricane's course changed and the storm delivered less rainfall than initially called for across the state. With the high rainfall, many late-season varieties did have lower-than-normal soluble solids concentrations (Brix). Some winemakers chose to utilize more red fruit for rosé-type wines than in an average year. In some cases, grape yields were depressed due to hail and poor fruit set. High rainfall led to fruit rot in some cases, requiring some growers to field-sort a portion of their crop.

Diligent growers worked hard and brought in clean grapes, which are predicted to make nice wines.

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Covering Eastern North America

Michigan Winery Wins Best Riesling in the World

Sutton's Bay, Mich.—The wine industry is learning that the cool climate regions of the northwestern part of Michigan, and specifically the Leelanau Peninsula and Old Mission Peninsula AVAs, are superior wine producing areas.

On Oct. 19, the team at Winery at Black Star Farms in Sutton's Bay, Mich., found out their 2017 Arcturos Dry Riesling had won the best Riesling in the World Award at the Canberra International Riesling Challenge in Australia. The wine was also recognized as the Best Dry Riesling and the Best American Riesling. In addition, the other five Rieslings entered in the competition by the winery won medals, including an elite gold for the 2016 Arcturos Winter Harvest Riesling.

Ken Helm, owner of Helm Wines in New South Wales, Australia, started the Canberra International Riesling Challenge (CIRC) 19 years ago. CIRC is now the largest Riesling competition in the Southern Hemisphere: 567 Rieslings were entered in this year's competition. Entries came from 240 wineries in Australia, and from Germany, France, New Zealand, the Czech Republic and the United States.

The Winery at Black Star Farms tasting room and white wine production facility on the Mission Bay Peninsula northeast of Traverse City, Mich.

Making Riesling at Black Star Farms

Kerm and Sallie Campbell founded the Winery at Black Star Farms 20 years ago as a grower-owned winery on the site of the Sport Valley Farm equestrian facility on the Leelanau Peninsula north of Traverse City. The estate now is home to Black Star's red wine production facility, tasting room, distillery, café, inn, meeting and event spaces and extensive hillside vineyards.

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Black Star Farms added a white wine production winery and a tasting room on Old Mission Peninsula northeast of Traverse City in 2007. The combined vineyards in the two locations total 185 acres and the winery produces approximately 35,000 cases annually, according to Wines Vines Analytics.

Lee Lutes, general manager and head winemaker, reported that the grapes for the award-winning wine came from the winery's vineyards on both the Leelanau and Old Mission Peninsulas. Lutes noted that "the 2017 season was on the cooler side, and then, on Sept. 1, summer started. From September into October, we had a beautiful dry ripening season. We could pick grapes, clean fruit, when the grapes were optimally ripe, not because we had to. The winemaking was easy."

The grapes were picked by hand on Oct. 17 and 18 at 21.7° Brix, 7.5 g/l total acidity and a pH of 3.26. After being gently pressed the day they were picked, the grapes were cold settled and then racked into tanks. "We add maybe one-third to one-half of what's recommended for yeast additions and keep the fermentation cool, at 55° F or less," Lutes said. "The dry Riesling fermentation can take five weeks or more."

"We could pick grapes, clean fruit, when the grapes were optimally ripe, not because we had to. The winemaking was easy."

–Lee Lutes, winemaker
BlackStar Farms

One unique aspect of the fermentation is that neutral oak chips are added to the fermenting wine. Lutes said he adds a couple of pounds of Pronektar Fresh by Tonnellerie Radoux to 1,000 gallons of wine to increase the phenolic presence. "You do taste wood tannins in the fermentation," Lutes said. "That fades but [the chips] add to the mouthfeel. Then, as soon as the fermentation starts to struggle, we do macro-oxygenation."

When the Riesling is dry, sulfur is added. The wine is racked off the gross lees, chilled down, and then rests on the light lees until February or March. About 120 days before bottling the wine, the winemaking team begins bench trials to try blends of Rieslings from different vineyards and evaluate aromatics, fruit profile and the body and texture in the mouthfeel. Vladimir Banov, Black Star's production winemaker at the Old Mission Peninsula winery, manages the operations of that white wine facility and brandy distillery. He reported that the 2017 dry Riesling at bottling had a residual sugar of 0.55%, an alcohol of 12.04%, a pH of 3.13, total acidity at 7.09 g/l, free SO_2 of 29.9 ppm, total SO_2 of 82 ppm, and malic acid at 0.260 g/l. A total of 1,500 cases of the dry Riesling were produced.

Trezise wins Riesling award

Wolf Blass, owner of Wolf Blass Wine in Nuriootpa, Australia, presented the Wolf Blass International Award at CIRC to Jim Trezise, founder of the International Riesling Foundation (IRF). The award is given bi-annually to a person or organization that has made a major contribution to Riesling development and promotion. Trezise received the award in large part because of his role in founding the IRF in 2008 and in serving as the Foundation's president until recently. Trezise has supported CIRC as a judge for four years and as a proponent of American wineries entering that competition.

—Linda Jones McKee

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WINES VINES ANALYTICS

Growing Corot Noir Grapevines in Missouri

A study on the effects of training systems and pruning severity on performance

By R. Keith Striegler, Eli Bergmeier and Mark Pederson

Corot Noir is one of three varieties, along with Noiret and Valvin Muscat, that were introduced in 2006 by Bruce Reisch, professor of horticulture, plant breeding and genetics in the School of Integrative Plant Science at Cornell University.[5] All three have developed a following with growers east of the Rockies, and Corot Noir, a red wine grape, is now planted in vineyards from New York and Pennsylvania to Illinois, South Dakota, Missouri and Colorado.

A mid- to late-season red wine grape, Corot Noir is the result of a cross made in 1970 between Seyve Villard 18-307 and Steuben. The vines are moderately winter-hardy and moderately resistant to fungal diseases. The wine has a deep red color, cherry and berry fruit aromas, and a soft, full tannin structure.

Choosing an appropriate cultivar for a specific site and market conditions is a critical component of successful viticulture and can be the difference between a vineyard or winery making a profit or loss with those grapes. Data collected in other Midwestern grape production regions indicate that Corot Noir has the potential to produce a varietal wine or be used as a component in red blends in the region and specifically in Missouri. Consequently, we set out to evaluate the performance of Corot Noir under conditions in Missouri.

Selection of an appropriate training system and pruning severity are fundamental components of a successful management strategy for any grape cultivar. The training system defines the architecture of the vine's perennial structure and impacts canopy distribution and density, sunlight capture, and photosynthetic capacity and efficiency.[7] Training systems can also significantly impact fruit zone microclimate, thereby influencing fruitfulness, source-sink relationships within the plant and fruit composition.[1,2,3,4,6,7,8]

Simultaneously, pruning severity can influence vegetative and reproductive balance within the vine, canopy distribution and uniformity, and the rate at which the vine establishes a photosynthetically productive leaf canopy during the growing season.[2,3,4]

The response of any given cultivar to these influences is dependent upon numerous genetically determined factors such as propensity for growth, adaptation to various climatic factors, productivity and growth habit in addition to site-specific management practices. Accordingly, training and pruning methods should be selected based upon a given cultivar's traits and conditions under which it is being grown.

In the current study, own-rooted Corot Noir vines grown in a central Missouri commercial vineyard were trained to two systems: high bilateral cordon (HBC) and vertically shoot-positioned (VSP) or low cordon. In addition, vines were pruned to three levels of severity (10, 15 and 20 nodes retained per pound of dormant pruning weight).

Analysis of multiple-year mean data collected during the 2007, 2008 and 2009 seasons indicate that while fruit composition wasn't strongly impacted by choice of either training system or pruning severity, both factors had some influence on yield, yield components and pruning weight (see Table 1).

Yield of vines trained to high cordons was greater than vines trained to low cordons (see Table 2). This appears to be caused by higher cane numbers observed on high-cordon vines (data not shown). Total yield was statistically higher for vines pruned to retain 15 or 20 nodes as compared to vines pruned more severely (10 nodes retained).

As has been reported for other cultivars by previous authors, vine size was impacted by training system, with low-cordon vines producing greater pruning weight. Ravaz Index values (yield in pounds to dormant pruning weight in pounds) were somewhat low for vines trained to low cordons, near optimal for vines trained to high cordons, and generally improved with lower pruning severities (data not shown).

Few interactions between training system and pruning severity were observed, suggesting these influences acted independently upon Corot Noir under the conditions of this study. Retaining adequate node numbers on conservatively pruned, low-cordon-trained vines proved problematic due to cane maturation problems.

Vines in this study had lower vine size than vines in a previ-

TABLE 1: INFLUENCE OF TRAINING SYSTEM AND PRUNING SEVERITY ON FRUIT COMPOSITION OF COROT NOIR GRAPEVINES.

Treatment	Soluble solids (%)	pH	Titratable acidity (g/L)	Anthocyanins[x] (mg/g) berry wt	Phenols[x] (AU/g) berry wt	Tannins[x] (mg/g) berry wt
TRAINING SYSTEM						
HBC	17.2	3.58	7.8	1.4 b[y]	1.38	2.08
VSP	17.7	3.61	7.7	1.6 a	1.5	1.98
	n.s.[z]	n.s.	n.s.		n.s.	n.s.
PRUNING SEVERITY						
10 nodes	17.6	3.59	7.8	1.6	1.48	2.11
15 nodes	17.5	3.61	7.5	1.5	1.46	1.91
20 nodes	17.3	3.60	7.8	1.5	1.39	2.06
	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

[x] Means of 2008 and 2009 seasons.

[Y] Means followed by the same letter do not differ significantly at the 0.05 level. Mean separation by Tukey's Studentized Range (HSD) Test.

[z] n.s. = not significant at the 0.05 level.

ous study conducted in New York.[9] Implementation of shoot- and cluster-thinning may have improved canopy microclimate and vine balance in this study.

Viticulturally, all treatment combinations tested produced commercially acceptable results under the conditions of this study, although some treatments appear to provide significant advantages for Corot Noir producers in the Midwest. The higher yield of high-cordon vines observed in this short-term study, combined with the lower trellis cost and labor demands of this training system, suggests it may be economically preferable, rather than using low-cordon training.

Furthermore, the higher yields produced by retaining 15 or 20 nodes per pound dormant pruning weight rather than 10 nodes, without a meaningful penalty in fruit composition or vine balance, suggest either of the two former pruning severities may be appropriate and preferred by producers.

The results from this study indicate that performance of Corot Noir grapevines in Missouri would be optimal when vines are trained to a high-cordon system and pruned to retain 15 or 20 nodes per pound of dormant pruning weight. Future trials should incorporate production and analysis of research wines to fully evaluate treatment effects.

This research was conducted by the Grape and Wine Institute, University of Missouri. Funding from the Missouri Wine and Grape Board and St. James Winery is gratefully acknowledged. We thank Jacki Harris for providing technical assistance on this project.

R. Keith Striegler is grower outreach specialist for E. & J. Gallo Winery in Acampo, Calif.; Eli Bergmeier is vineyard manager at Crown Valley Winery in Ste. Genevieve, Mo.; and Mark Pederson, a sales representative for Dow AgroSciences in Spokane, Wash., earned his bachelor's degree at the University of Missouri-Columbia.

To see references and acknowledgements for this article, go to winesandvines.com and search under Magazine › Features › December 2018.

TABLE 2: INFLUENCE OF TRAINING SYSTEM AND PRUNING SEVERITY ON YIELD, YIELD COMPONENTS AND PRUNING WEIGHT OF COROT NOIR GRAPEVINES.

Treatment	Yield (tons/A)	Clusters per vine	Cluster weight (lbs)	Berry weight (g)	Berries per cluster	Pruning weight (lbs/vine)
TRAINING SYSTEM						
HBC	5.8 a[y]	39 a	0.4	2.6 a	70	1.1 b
VSP	4.6 b	32 b	0.4	2.4 b	69	1.6 a
			n.s.[z]		n.s.	
PRUNING SEVERITY						
10 nodes	4.8 b	33 b	0.4	2.6	68	1.4
15 nodes	5.4 a	36 a	0.4	2.5	72	1.3
20 nodes	5.4 a	37 a	0.4	2.5	69	1.3
			n.s.	n.s.	n.s.	n.s.

[Y] Means followed by the same letter do not differ significantly at the 0.05 level. Mean separation by Tukey's Studentized Range (HSD) Test.

[z] n.s. = not significant at the 0.05 level.

PHELPS COUNTY, MISSOURI, 2007-2009.

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WINES VINES ANALYTICS

The Phenotyping Bottleneck

How grape breeders link desired traits to DNA markers

By Tim Martinson and Lance Cadle-Davidson

Before inexpensive DNA sequencing was available, grape breeders had to rely solely on traits observed in the field (phenotypes) to decide which new seedlings produced through crosses to keep and which to discard.

For disease resistance, this meant tossing out any plants that showed powdery mildew or downy mildew infections at the seedling stage during the first year of growth. Although they kept those that didn't show any symptoms, this method of field phenotyping didn't help them much in determining which and how many genes were involved and whether or not the trait would survive a subsequent round of breeding intact. DNA markers and more extensive use of mapping populations have changed all that.

Since about 2000, genetics researchers have been busy linking DNA sequences (called markers) to specific locations on grape chromosomes (loci) that are associated with observed traits of grapevines in the field (phenotypes). To date, they have identified markers for at least 13 loci for powdery mildew resistance and 27 for downy mildew resistance (Figure 1).

Now that they have these markers, grape breeders can test seedlings for the presence of specific genes or loci and know what and how many loci for disease resistance they have in their new seedlings (see "Grape breeders no longer flying blind," *Wines & Vines*, March 2018,).

This is a powerful new approach that gives breeders the means to reliably incorporate desirable traits into breeding lines. For example, having DNA markers for a strong locus for Pierce's disease resistance (named Pdr1 for Pierce's disease resistance 1) allowed University of California, Davis professor Andy Walker to pass through five successive "backcross cycles" confidently and quickly, to incorporate Pdr1 (from wild *Vitis arizonica*) in a 98% *Vitis vinifera* background, resulting in new varieties that are resistant to Pierce's disease.

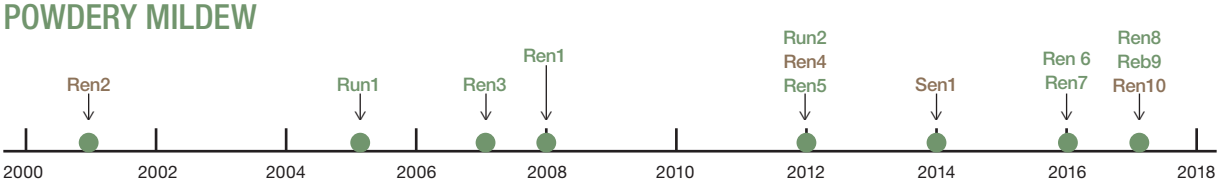
Mapping populations and markers

How do breeders and geneticists find these DNA markers among the approximately 500 million DNA base pairs and 19 chromosomes in the grapevine genome?

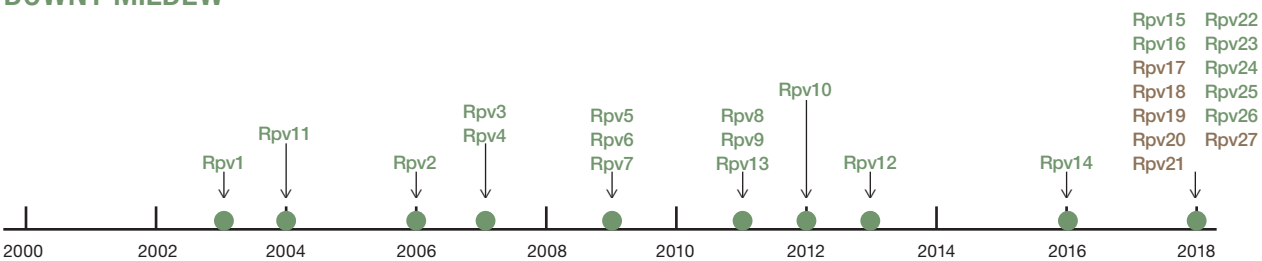
The answer is that they have to make special crosses between two existing varieties or wild accessions and place the resulting seedlings into a special planting called a "mapping population." Mapping populations (there are 12 in the VitisGen2 project) typically consist of 200-300 full-sibling progeny of these crosses, grown in the field. These siblings share half of each parent's DNA, and each vine carries a unique set of traits.

The next step is to use DNA sequencing techniques to identify snippets of DNA sequences (markers) that vary among the two parents. Using a technique called genotyping by sequencing (GBS), VitisGen researchers were able to identify roughly 2,000 DNA markers (~100 for each of the 19 chromosomes) at a cost of $15 for each individual vine tested. Obtaining a detailed genetic map of 200 unique individuals, each with 2,000 markers, used to be very ex-

FIGURE 1:
POWDERY MILDEW



DOWNY MILDEW



Disease resistance loci identified since 2000 for powdery mildew and downy mildew. Black loci denote those that have been identified by scientists in the VitisGen projects.

pensive but is now very affordable at a total cost of $3,000, or less than a penny per marker.

The map of each chromosome is very much like a roadmap with mile markers that show the distance between locations. Once the mapping population and genetic mileposts are in place, researchers then measure the desired trait or phenotype (in this case, powdery mildew or downy mildew resistance) somehow and associate the trait with specific markers on the genetic map.

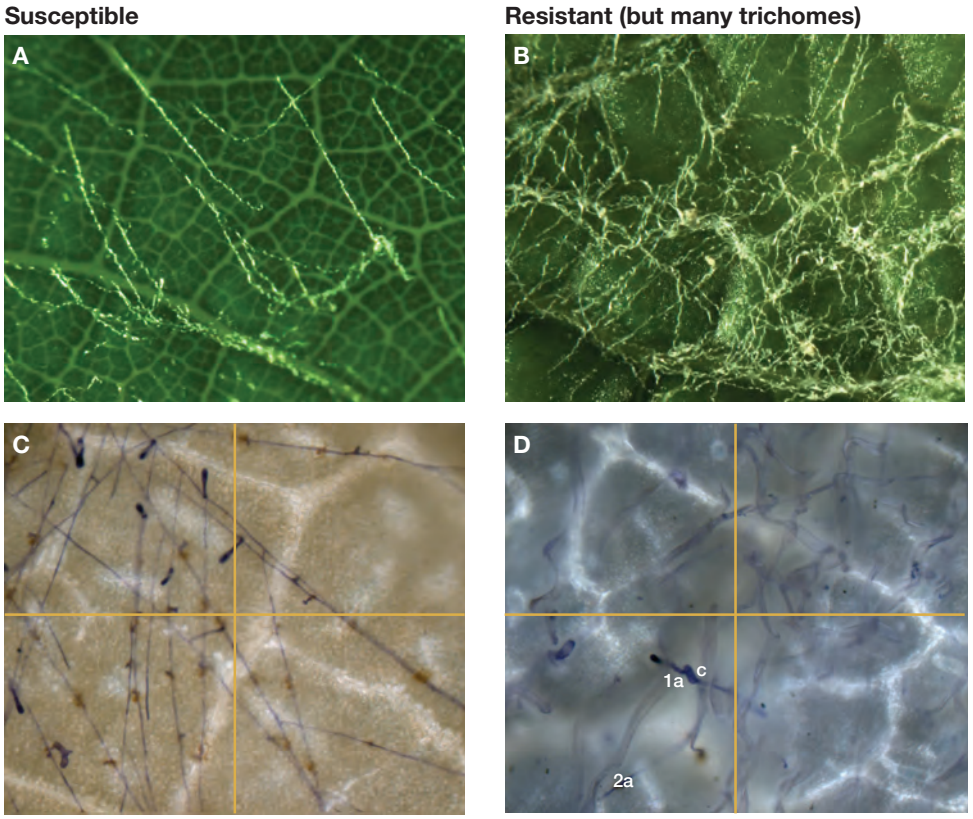
From then on, it's a matter of statistics. Researchers use statistical methods, most commonly a technique called quantitative trait loci (QTL) analysis, to associate phenotypes with DNA markers. These markers — once validated — can be used by grape breeders for marker-assisted selection of the best vines.

Phenotyping

Obtaining the DNA markers from the 200 progeny — once inconceivably difficult — is now easy and routine. The real bottleneck in the process is measuring the desired traits and how they vary (i.e., phenotyping).

Consider powdery mildew, for example. The challenge in phenotyping powdery mildew resistance is that field populations present notoriously variable environmental conditions, even within a small planting. To address this

FIGURE 2:



A leaf disk sample susceptible to powdery mildew (A,C) compared to a resistant sample (B,D)

AMERICAN PHYTOPATHOLOGICAL SOCIETY, 2016 DOI: 10.1094/PHYTO-02-16-0080-FI

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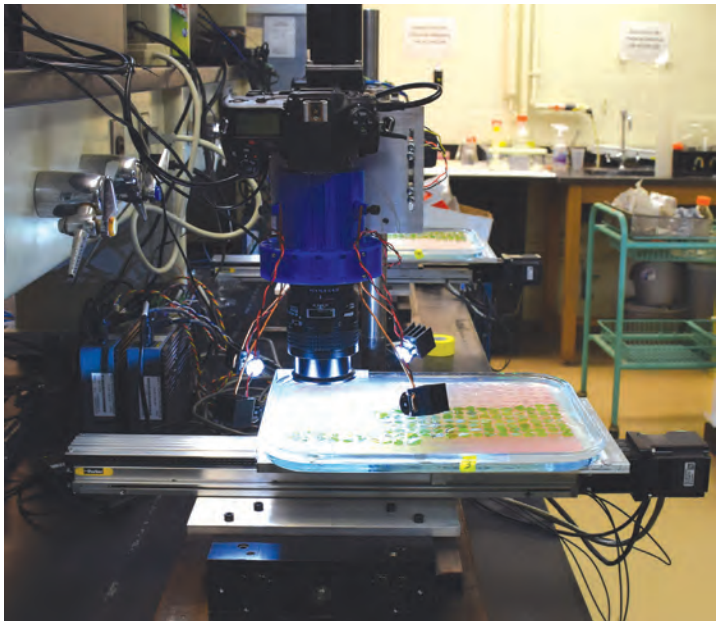

Firgure 3: Automated powdery mildew phenotyping setup uses image analysis and inoculated leaf disks to rate powdery mildew resistance.

problem within the VitisGen2 project at Cornell AgriTech, the powdery mildew team has developed highly controlled laboratory assays to assess powdery mildew resistance. This is how we do it:

Rating resistance in the field. The traditional approach is to allow natural infection of vines (grown with no fungicides) and then to subjectively estimate the severity of disease infections on each vine, typically by using a 4- or 5-point rating scale. However, field ratings are subject to many uncontrolled variables that affect how accurate and precise results are.

Powdery mildew inoculum, though ubiquitous, is not evenly distributed throughout the vineyard, or even within vines, and field populations of the pathogen have their own genetic variability. It almost goes without saying that temperature, solar radiation and rainfall vary from season to season and moment to moment, affecting disease severity and the lighting conditions needed to record ratings accurately.

Rating resistance in the laboratory. Laboratory-based phenotyping offers scientists many advantages over field-based disease ratings, including the ability to control the environment, the genetics of the pathogen and the quantity of pathogen spores that land on the leaf. In our laboratory, we use leaf disks and inoculate them with a suspension of spores. After incubation, we then remove the green chlorophyll and stain the fungus dark to count the number of fungal hyphae that intersect with a microscope grid (Figure 2).

This standard procedure eliminates much of the environmental "noise" in field evaluations, removes human bias and subjectivity, and allows us to replicate tests of each vine on several disks. By doing so, we can identify more moderate forms of resistance that would be difficult or impossible to detect in the field.

Automating the process. Examining and scoring leaf disks is still a time-consuming, tedious task. With 200 siblings to evaluate, tissue from four shoots and duplicate leaf disks for each shoot, each evaluation involves examining 1,600 leaf disks, which requires three to 12 weeks of staff time spent on physically exhausting and repetitive microscopy. This is one reason why we've developed a robotic evaluation tool that uses live sample imaging to quantify the hyphae in each sample. Our automated process can capture ratings for the same 1,600 leaf disks in one day, delivering results 20- to 80-fold faster than manual microscopy, and with much less pain (Figure 3).

This imaging of living samples and increase in efficiency means we can rate the individual leaf

disks several times or use different strains of powdery mildew spores to test each one of the individual samples. These multiple "snapshots" allow us to characterize how robust the observed resistance is with better accuracy.

A eureka moment! Phomopsis resistance identified

The ability to use inexpensive sequencing techniques to identify thousands of markers and associate them with desired traits has already resulted in four newly released varieties in France with two powdery mildew and two downy mildew genes (see "ls Europe Starting to Embrace Hybrid Wine Grapes?" *Wines & Vines,* August 2018).

It is interesting to note that information from one of these mapping populations also resulted in other surprising results beyond the VitisGen2 project's focus on powdery mildew.

Technician Steve Luce was pruning a mapping population at Cornell AgriTech for Bruce Reisch, professor of plant breeding and genetics in Cornell's department of horticulture, and noticed that another disease — phomopsis cane and leaf spot — varied in intensity. He recorded which siblings in the mapping population had severe disease symptoms and which had no symptoms. Because the project already had a marker-based map of the vineyard, graduate student Paola Barba was able to use his observations to identify two strong DNA loci for phomopsis resistance on the same day, literally within a few hours of receiving the data. This unanticipated, rapid and useful result further demonstrates the power of having the detailed genetic information available.

To date, the VitisGen project has identified more than 70 new marker-trait associations not only for disease resistance, but also for fruit-quality attributes such as anthocyanin modifications, skin color, sugar and acid content. Inexpensive DNA sequencing techniques, establishment of 12 mapping populations, and field/laboratory phenotyping are the resources that made it possible.

The payoff of these new markers will be better tools for breeders and more high-quality, disease-resistant varieties in the pipeline for current and future generations of grapegrowers.

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Dr. Tim Martinson is senior extension associate at Cornell University. Dr. Lance Cadle-Davidson is a research plant pathologist with the USDA Agricultural Research Service's Grape Genetics Research Unit, based at Cornell AgriTech.

To see references and acknowledgements for this article, go to winesandvines.com and search under Magazine › Features › December 2018.

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