

presents

RAVE99

**2nd Joint
Burgundy-California-Oregon
Winemaking Symposium**

UCDAVIS

Coordinators:

- Christian Butzke, Cooperative Extension Enologist, UC Davis
- Pascal Durand, Program Director, ENESAD, Bourgogne
- Michel Feuillat, Director, IUVV Jules Guyot, Université de Bourgogne
- Barney Watson, Extension Enologist, Oregon State University

COOPERATIVE EXTENSION

*At last, and maybe above all,
terroir is a state of mind,
a humbler attitude
in front of Nature ...*

*Jean-Yves BIZOT
VOSNE-ROMANÉE*

Dear Symposium Participants:

Welcome to our second Joint Burgundy-California-Oregon Winemaking Symposium! I wish you two enjoyable days of lectures and tastings among your fellow winemakers and vineyardists.

I would also like to take the opportunity to especially thank my fellow symposium coordinators, Pascal Durand, program director at the Établissement National d'Enseignement Supérieur Agronomique de Dijon, Professor Michel Feuillat, chair of the Institut Universitaire de la Vigne et du Vin 'Jules Guyot' at the University of Burgundy, and Barney Watson, extension enologist and winemaker from Oregon, for their essential role in bringing this exciting event together.

I am most grateful to Ms. Wendy Kercher at University Extension for assisting with the numerous arrangements for the speakers' tour and the symposium itself.

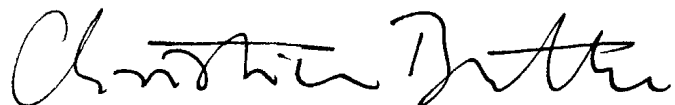
We shall raise our glasses to all presenting winemakers who have generously provided their finest wines for our joint tastings during the symposium, and to our Viticulture & Enology students (and future winemakers) for pouring them.

In addition, I gladly acknowledge all wineries that offered their hospitality but that I, with great regret, could not make a part of the tightly scheduled visit of our Burgundian delegation to California and Oregon.

We hope that this event will lead to a continuing and regular exchange between all regions, with alternating symposia as well as student internships. These internships, coordinated by Dr. Andrew Waterhouse, will be a combination of time spent both at a winery and at one of the cooperating university laboratories to provide exposure to both the art and the science of winemaking while helping to solve local problems in the cellars and vineyards.

Again, I invite you to become involved in the next symposium as a speaker or sponsor, and I look forward to further exploring with you les grands vins de Bourgogne in the year 2000.

A la vôtre!



Cooperative Extension Enologist

1999 Symposium Hosts & Sponsors

American Vineyard Foundation



Amity Vineyards

Linn Benton Community College Culinary Arts School

Domaine Bizot

Cameron Winery

Domaine de la Chanaise

Dehlinger Winery

Domaine Drouhin of Oregon

Flowers Vineyard & Winery

Domaine Michel Lafarge

Landmark Vineyards

Littorai Wines

Château de Maligny

Robert Mondavi Winery

Domaine de Montmain

Manoir Murisaltien

Oregon Winegrowers' Association

The R.H. Phillips Vineyard

Rex Hill Vineyards

Rosenblum Cellars

Saintsbury

Simi Winery

Sonoma-Cutrer Vineyards

Williams-Selyem Winery

Witness Tree Vineyards

Établissement National d'Enseignement Supérieur Agronomique de Dijon

Institut Universitaire de la Vigne et du Vin 'Jules Guyot'

Oregon State University

Department of Viticulture & Enology

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PROGRAM DAY 2

TUESDAY, FEBRUARY 09, 1999

9:00	Paul BOUCHARD	(Tasting 6)
9:25	Ann NOBLE	
9:50	Ted LEMON	(Tasting 7)
10:20	Break	
10:50	Jean-Paul DURUP	(Tasting 8)
11:20	Yves LE FUR	
11:45	Terry ADAMS	(Tasting 9)
12:15	Pascal DURAND (Luncheon Speaker)	
1:15	David MILLS	
1:40	Claudine CHARPENTIER	
2:05	Greg LA FOLLETTE	(Tasting 10)
2:35	Break	
3:05	Hervé ALEXANDRE	
3:30	Laurent ZANON	(Tasting 11)
4:00	Jean-Yves BIZOT	(Tasting 12)
4:45	Closing Remarks: BUTZKE, DURAND, FEUILLAT	
5:00	Adjourn	



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DELEGATION TOUR SCHEDULE

Saturday, February 06, Arrival

1:40^{pm} Departure Paris CDG
 4:20^{pm} Arrival San Francisco (SFO) on AF 84 from CDG
 5:30^{pm} Transfer to Alameda
 6:30^{pm} Arrival Rosenblum Cellars; Tour, Dinner • Kent Rosenblum
 9:00^{pm} Transfer to Davis
 10:30^{pm} Arrival Davis; University Lodge

Sunday, February 07, Napa

8:00 Breakfast
 9:00 Transfer to Carneros
 10:00 Arrival Saintsbury; Tasting • David Graves, Byron Kosuge
 11:30 Transfer to Oakville Experimental Vineyards • Jim Wolpert
 12:00 Lunch at La Familia
 1:30 Transfer to Robert Mondavi Winery
 2:00^{pm} Robert Mondavi Winery, Tour • Geneviève Janssens
 3:30^{pm} Transfer to St. Helena
 4:00^{pm} Arrival Littorai Wines; Tasting • Ted Lemon
 5:30^{pm} Transfer to Oakville
 6:00^{pm} Dinner at Robert Mondavi Winery • Rich Arnold, Susan Frey
 8:00^m Transfer to Davis
 9:30^{pm} Arrival Davis; University Lodge

Monday, February 08, UC Davis

9:00 Joint Burgundy-CA-OR Winemaking Symposium • Christian Butzke
 5:00^{pm} Adjourn
 7:00^{pm} Speaker Reception, International House, Davis • Christian Butzke

Tuesday, February 09, UC Davis

9:00 Joint Burgundy-CA-OR Winemaking Symposium • Christian Butzke
 5:00^{pm} Adjourn

Wednesday, February 10, Sonoma

7:30 Breakfast
 8:00 Transfer to Jenner
 10:30 Arrival Flowers Winery; Tour, Lunch • Greg LaFollette, Walt & Joan Flowers
 1:00 Departure for Dehlinger
 2:30^{pm} Arrival Dehlinger; Tasting • Tom Dehlinger
 4:00^{pm} Transfer to Healdsburg
 4:45^{pm} Arrival Simi; Tour • Nick Goldschmidt
 6:15^{pm} Transfer to Kenwood
 7:00^{pm} Landmark Vineyards Tour, Dinner • Eric Stern
 9:30^{pm} Transfer to Davis
 11:00^{pm} Arrival Davis; University Lodge

Thursday, February 11, Departure for Oregon

9:40 Departure Sacramento (SMF), Southwest Airlines
 11:10 Arrival Portland (PDX) • Barney Watson
 1:00^{pm} Lunch, Red Hills Provincial Cafe, Dundee
 2:30^{pm} Tour of Cameron Winery, Dundee
 4:00^{pm} Tour of Domaine Drouhin of Oregon, Dundee
 5:30^{pm} Transfer to Corvallis, Shanico Inn
 7:00^{pm} Dinner banquet at Linn Benton Community College Culinary Arts School
 9:30^{pm} Return to Shanico Inn

Friday, February 12, Oregon

9:00 Attend OSU Winegrape Research Day, Corvallis • Barney Watson
 12:00 Lunch (Luncheon Speaker: Michel Feuillat)
 1:30^{pm} Transfer to Amity
 2:30^{pm} Tour Amity Vineyards
 4:00^{pm} Tour Witness Tree Vineyards, Salem
 5:30^{pm} Transfer to Corvallis
 6:30^{pm} Oregon Winegrower's Reception & Banquet with (Dinner Speaker: Pascal Durand)

Saturday, February 13, Departure for San Francisco/Paris

12:00 Transfer Corvallis to Portland
 2:37^{pm} Departure Portland (PDX), Alaska Airlines AS 452
 4:15^{pm} Arrival San Francisco (SFO)
 6:10^{pm} Departure San Francisco on AF 83 to CDG

Sunday, February 14, Arrival Paris

1:55^{pm} Arrival CDG

UC DAVIS

COOPERATIVE EXTENSION

February 8 - 9, 1999

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2nd Joint Burgundy-California-Oregon Winemaking Symposium

UC DAVIS - INSTITUT JULES GUYOT WINEMAKER/SCIENTIST EXCHANGE BEGINS WITH A SPLASH

An Informal Report from the 1st Joint Burgundy-California-Oregon Winemaking Symposium

Andrew L. Waterhouse
Department of Viticulture & Enology

"*FANTASTIC.*" "*INCREDIBLE.*" "*AMAZING.*" These were the words used to describe the exchange visit to Burgundy and the Languedoc by 11 winemakers and scientists from California and Oregon in November of 1997. Our Burgundian colleagues organized the first symposium in Dijon at the University of Bourgogne and visits to the finest of Burgundy's producers from Chablis to Beaujolais. Our tour included such highlights as a private tours and tastings with Michel Laroche in Chablis, with André Porcheret at the new Hospices de Beaune winery, with Jacques Ladières at the newly-built winery of Maison Louis Jadot, and at the Domaine Drouhin with Robert Drouhin in Beaune. The group worked its way through the Beaujolais, the Rhône valley to the Mediterranean Sea and eventually ended up in Montpellier as VIP guests for the tradeshow SITEVI.

Christian Butzke, UC Davis Cooperative Extension Enologist, organized the symposium and trip with Pascal Durand, ENESAD Program Director in Dijon, and Dr. Hervé Alexandre, Assistant Professor at the viticulture and enology institute 'Jules Guyot' at the University of Burgundy, to improve our understanding of French winemaking and enological research, and to show our hosts current activities in California and Oregon, as well as to explore a regular student exchange program.

The travelers included Californians David Graves of Saintsbury, Willy Joslyn of Wente Brothers, Signe Zoller of Meridian, Kent Rosenblum of Rosenblum Cellars, John Ferrington of Williams & Selyem, from Oregon Steve Price of ETS Laboratories, Myron Redford of Amity Vineyards, Barney Watson of OSU, and the UC Davis group Christian Butzke, Doug Adams and Andrew Waterhouse.

The three-day symposium in Dijon was organized by the Institute Jules Guyot in collaboration with BIVB, the interprofessional wine society of Burgundy, and by the regional government of the Region de Bourgogne. The presentations included ones from the

scientists at the University, ENESAD and INRA at Dijon and from the US, as well as by our American winemakers. The papers presented included sensory, chemical and microbiological topics as well as business and geological discussions of running a high quality winery in California. We even introduced the Burgundians to the concept of grand cru Zinfandel. Our traveling winemakers also presented some of their wines after the symposium, to much appreciation.

Visits to other wineries included Domaine Dujac in Morey-St. Denis with Jeremy Seysses, and Domain Mugnier with Jaclyn Mugnier in Chambolle-Musigny, Domaine Bizot in Vosne-Romanee with Jean-Yves Bizot, and Domaine Naudin-Ferrand with Anne and Claire Naudin in Nuits-Saint-Georges, the Eventail Cooperative in Beaujolais with Bruno Tissier, and in the Languedoc (the "California Burgundy") Domaine Virginie with Pierre Degroote and Aussie Richard Osborne, as well as Laroche's new Domaine de la Chevalière with Chablis winemaker Alain Sorbas, and Director Guy Bascou and Olivier Merrien of the regional enology extension center ICV in Béziers. In every case we were hosted by the proprietor or winemaker. In most cases, we tasted the new '97 vintage, including numerous Premier and Grand Crus, but in some cases we tasted aged wines, including a superb 1976 Domain Dujac Grand Cru. Our gracious hosts were always willing to discuss their grapegrowing and winemaking techniques which often included crop limitations, no yeast inoculation, gentle must handling and manual or hydraulic punchdowns. The wineries in the Languedoc are capitalizing on the new Vin de Pays d'Oc appellation, which permits varietal labeling. The plantings of Chardonnay, Merlot, Cabernet and Viognier there are quickly expanding, and the wineries were outfitted with all stainless equipment, inert gas systems and efficient barrel management systems.

Pascal Durand's organizational skills and connections were amazing. We were in Beaune for the Exposition Générale des Vins de Bourgogne tasting of (nearly all) the new '97 Burgundy wines. Our host, who guided us through the 1,500 wines available, was Jean Mongeard of Vosne-Romanée, president of the Burgundy winegrape growers association, which organizes the tasting. Later, we were guests of Dominique Piron at his winery in Beaujolais for an all-night party celebrating the release of the '97 Nouveau wines. Then, traveling to Languedoc, we spent most of a day at SITEVI, the largest exposition of grapegrowing and winemaking equipment—over 30,000 square meters of displays. Our schedule was absolutely full, at least from 7 am to midnight+.

Other memorable events include a reception by the President of the Council of Burgundy, Jean-François Bazin, (equivalent to a US state governor) who welcomed us, and then during

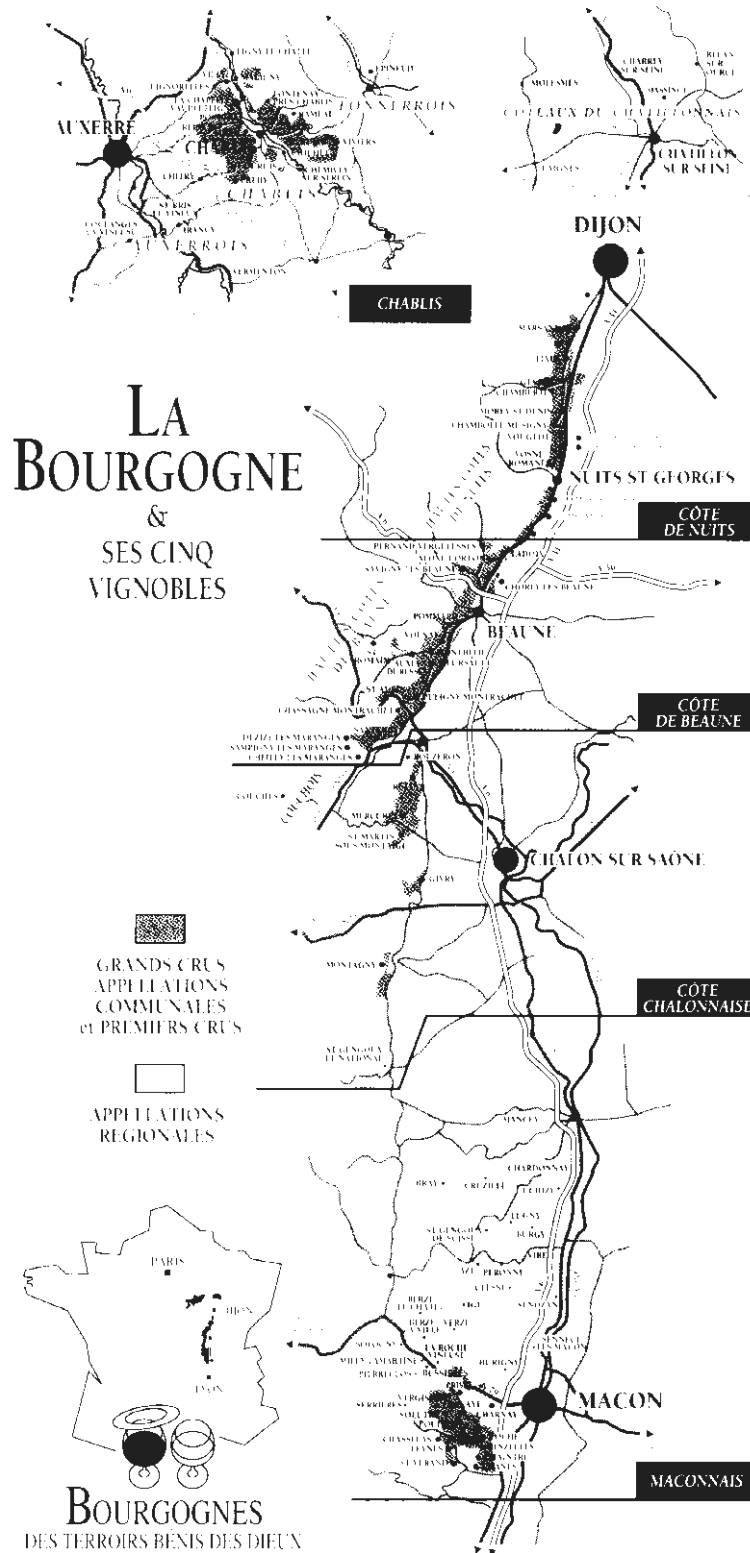
a press conference at the Burgundian parliament with Christian Butzke and Barney Watson admonished the use of Burgundian place names in semi-generic American wines.

Nearly every noon and evening we were treated to exceptional five-course meals, and our hosts included the above mentioned vintners, the President of the University of Burgundy, Dr. Jocelyne Pérard, who hosted us at a three star restaurant, the Director of the Burgundian extension service BIVB, Philippe Trollat, ICV Director Claude Espeillac, and the world-reknown Director of the Institute Jules Guyot, Dr. Michel Feuillat and his faculty. Some of the memorable dishes were an incredibly rich beef bourgogne, a salmon in filo, a perfect creme brule, while we always finished with an amazing assortment of local cheeses.

With both Dr. Feuillat at IUUV in Burgundy, and Dr. Teissedre from the University of Montpellier, we agreed to investigate mutual student exchange programs both at Davis and OSU that would coordinate a university-organized experiment with a local winery crush position. We hope interested wineries will help support this important training for our students by offering a scholarship that will send one UCD student abroad and support a Burgundian student here.

P.S. For some memories of the First Symposium please visit

<http://wineserver.ucdavis.edu/ven20.html>



Courtesy of the Bureau Interprofessionnel des Vins de Bourgogne (B.I.V.B.), Beaune

PHENOLIC COMPOSITION OF PINOT NOIR IN BURGUNDY**– FROM THE GRAPES TO THE WINE****Dominique Peyron**

Institut Universitaire de la Vigne et du Vin Jules Guyot • Laboratoire d'Oenologie
Université de Bourgogne • 21004 Dijon • France

Christine Monamy

Centre Interprofessionnel Technique des Vins de Bourgogne - Beaune

Vincent Gerbaux

Centre Technique Interprofessionnel de la Vigne et du Vin– Beaune

The quality of the food products from raw material is generally dependent on phenolic compounds, mainly in the case of grapes and wines.

In Burgundy, the phenolic composition of Pinot noir grape berries can be really different from one year to another one. Since few years, we try to measure the phenolic compounds evolution in the berries in order to be able to choice the best time for harvest. In Pinot noir, seeds have ten times as much tannin as skin. These molecules are low Mr condensed tannins and may contribute, in so far as they are released into the medium, to organoleptic qualities.

Examples will be presented to compare in the same area, the phenolic composition of the grape berries, the extractibility of both anthocyanins and proanthocyanidins, and the wine composition.

COPIGMENTATION IN PINOT NOIR WINES**Roger B. Boulton**

Department of Viticulture & Enology

University of California, One Shields Avenue, Davis, CA 95616-8749

Copigmentation is the enhanced and modified color of pigments due to interactions with other non-colored components, or "cofactors", in solution. It is responsible for between a quarter and half of the color observed in young Pinot noir wines and may have important roles in pigment dissolution and retention during fermentation, in the rate and extent of red polymer formation during aging and in perceived bitterness and astringency of wines.

Typical levels of color found in Pinot noir wines from the Napa Valley, California during the 1995 and 1996 harvests averaged 4.18 AU [SD=1.93, n=16] and 3.73 AU [SD=0.78, n=34]. The level of copigmentation in the same wines was found to be 1.25 AU [SD=0.79] and 1.06 AU [SD=0.54] respectively, accounting for 30 and 28% of the color of these wines. Of as much interest as the levels is the variation in them, 63% and 52%, which are most likely due to vineyard site, rootstock and vine manipulations. A survey of the variation in copigmentation in Pinot noir wines from 21 vineyard blocks within the Carneros region, all made at the same winery, showed that color intensities ranged from 2.6 to 7.1

AU [mean=3.8, SD=0.97]. The corresponding copigmentation levels ranged from 0.4 to 2.2 AU [mean=1.2, SD=0.34], accounting for as little as 15.6% and as much as 46.5% of the color of these wines. (The total phenol content, measured in absorbance units at 280 nm, in these wines ranged from 20.7 to 117 AU [mean=58.1, SD=26.8]).

As Professor Hilgard noted in 1886, "such marked discrepancies in one and the same grape variety are well worth investigation, as they may well lead to a better understanding of the causes of loss in color in general".

The enhancement of copigmentation (and color) by the pre-fermentation addition of catechin, a natural grape constituent, to Pinot noir grapes was of the order of 40%. This study, conducted in the 1996 harvest in Chile, resulted in increases of 1.40 to 2.00 AU in copigmented color. That these significant increases in color were obtained by the addition of non-colored grape components, demonstrates our long-held view that grape berry composition is far more important than winemaking techniques in determining the color of young red wines. Similar studies with other cultivars have shown that such color enhancements can be retained beyond a year of aging.

We have been able to develop the relationships between wine composition and the level of copigmentation formed and this has been tested with a

limited number of Pinot noir wines from the 1996 harvest. We are presently involved in studies of the relationships between grape berry composition and the corresponding wine composition, in terms of both the pigment and cofactor groups in several cultivars.

The knowledge that has now been gathered regarding the individual cofactors and their importance to copigmentation has yet to be applied to more specific investigations of the influence of site, season and viticultural practices on the copigmentation of Pinot noir wines.

Frederic & Chantal Lafarge**Domaine Michel Lafarge****Volnay**

Michel Lafarge and his son Frederic own and manage a 25-acre Pinot noir family estate located at Volnay from the end of the 18th century. Frederic is a graduate of the School of viticulture of Beaune and his wife Chantal is a graduate from the Institut Jules Guyot, University of Burgundy, Dijon.

Domaine Michel Lafarge bottles and markets all the wines produced on the estate. The Lafarge family is accurate on the care dedicated to the vine culture, preferring old vines and natural balance. Soils are plowed by hand. A severe sorting of grapes and a 85 to 100% destemming is done before 13 to 18 days fermentation, with daily punching and pumping over. The wines matures for 15 to 18 months in oak barrels, using 20% to 30% new oak barrels for 1st Cru. The Domaine has a complete range of wines:

- White wines: Bourgogne Aligote and Meursault
- Red wines: Bourgogne Passetoutgrain, Bourgogne Pinot noir, Volnay, Volnay 1st Cru, Volnay Clos des Chenes, Volnay Clos du Chateau des Ducs, Beaune Greves, and Pommard Pezerolles.

This presentation will focus on the importance of terroirs for Pinot noir expression.

**A NEW LOOK AT SONOMA TERROIR –
A PERSPECTIVE FROM WILLIAMS & SELYEM WINERY**

Bob Cabral

Williams & Selyem Winery

Sonoma Coast/Russian River Valley

My name is Bob Cabral and I am the new winemaker at Williams & Selyem working with Burt Williams. I have only been with Williams & Selyem for about 7 months, but I am a long time customer and fan of Burt's wines.

When I was asked by Christian to give a presentation at this symposium I was somewhat reluctant. I had just completed my first harvest at Williams & Selyem and it was the first time I had worked with most of the Williams & Selyem growers. Not that I was completely unfamiliar with Pinot Noir grown in the Russian River Valley, Sonoma Coast, Anderson Valley/Mendocino County and the Central Coast. I had made wines with fruit from each of those regions at previous wineries I had worked at.

As I approached the '98 harvest, I decided to begin trying to equate juice chemistries with vineyard clones/viticultural practices and terroir. I thought general patterns and observations would help me to continue producing distinctively crafted wines with the Williams & Selyem signature on them. This was one wheel I did not want to reinvent, but possibly polish it up a bit.

The diversity of soils even within the sub-regions of Sonoma Country is numerous. To go one step further, over the years I have found that several growers have varying soils even within their vineyard blocks. This became most evident while I observed viticultural practices at a neighboring winery in the Russian River Valley through the mid-1980's. Tom Dehlinger, Marty Hedland and Fred Scherrer spent a painstakingly amount of time and energy to individually identify vines within a block and then group them accordingly with their common traits. These vines were harvested as group or lots and vinified separately. I was astonished by the differences within these lots.

I'm not sure I have the time, energy or even the resources to do something similar with each of our growers. But, I would like to take another approach and see over the years if I can become as intimately knowledgeable with the fruit destined to become wines at Williams & Selyem.

The AVA areas of interest for harvest of 1998 were Russian River Valley, Sonoma Coast, Central Coast, Anderson Valley and Yorkville Highlands in Mendocino County. I will now go over briefly what my observations are with the data compiled this past harvest.

I will start with the Russian River Valley appellation. Our flagship wines and most familiar to me personally.

RUSSIAN RIVER VALLEY

In the warmer areas around or near the winery, I found a pattern of generally lighter pH's of around 3.44 (average) and malic acids of around 206mg (average) at our harvest ° Brix perimeters. These wines have always been very concentrated wines of berries/cherries that are very fat and creamy in the mouth. They always seem to have long, fruit/berry finishes. All of this at a relatively short age. I have not found these wines to age much more than 7-8 years – maybe 10 on an exceptional vintage.

SONOMA COAST

In contrast I saw some very different analytical numbers from the Sonoma Coast fruit – only a few miles away. The pH's averaged 3.30 in 1998 and the malic acids averaged 324 mg – almost 120mg more than the Russian River Valley. I have found these wines to be more acidic in the mouth at a young age. The fruit is more subtle and closed in and the mid-palate is much more angular and less creamy than its Russian River Valley cousins. The soils – in general – seem to have more limestone and chert than the deep gravely/clay/loams found near the winery in the Russian River Valley. Having been a customer of Williams & Selyem for so long I have also discovered that the Sonoma Coast wines do not really begin to come around for drinking until they are 6-7 years old. Some of the better vintages will be interesting to taste after 15 or even 20 years. I suspect they may turn out to be exciting/fun to drink.

ANDERSON VALLEY

The Anderson Valley is extremely intriguing to me personally. In the last couple of years I have seen some outstanding Pinot Noir's produced from that area. Soils seem to vary as much as they do on the Sonoma Coast. Pinole gravelly loam, igneous rock and chert all vary from site to site and block to block. The analysis on the juice sample from 1998 were not a complete surprise. It was unusually warm up there this past summer and it reached up as high as 110° F at one of our vineyard sites. The malic acids were somewhat lower than I had hoped – 203 mg average – and an average pH of 3.56. I hope with a more typical growing season I will see lower pH's and higher malic's. The wine flavors are still very concentrated, nice mid-palates, good fruit/berry flavors but a bit short in the finish – at least in our 1998 Anderson Valley wines.

CENTRAL COAST – Santa Clara & San Benito Counties

The final AVA I would like to discuss is the upper Central Coast. Williams & Selyem fermented a couple of test lots from ranches that John Dyson owns. This is an extremely exciting area for me because of the nice gravelly/clay/loam soils with high amounts of limestone throughout. The climate is typical of the Monterey Valley/upper Salinas Valley with lots of early morning fog and cool afternoon breezes. Our test lot fruit came in a little riper than I had hoped – both over 26° Brix. The pH's averaged 3.57 and malic's averaged 215 mg. The wines obviously showed very ripe flavors and characters. Good mouth feel and tannins are nice spicy finishes.



Williams & Selyem Pinot noir Clones, Juice Composition, and Vineyard Soil Types:

Vyd #	Appellation	Harvest Date	Clone	Acids by HPLC in grams/100mls								ppm		Assimilable
				Brix	pH	Tartaric	Malic	Citric	Succinic	Acetic	K+	NH3	Amino N2	
# 1	Russian River Vly	9/25/98	Pommard 4	24.4	3.28	0.525	0.193	0.017	0.002	0.005	1200	87	126	
# 2	Russian River Vly	9/26/98	mixed Dijon	23.9	3.59	0.439	0.224	0.022	*N.D.	0.011	1550	83	167	
# 3	Russian River Vly	9/16/98	15	24.9	3.46	0.372	0.230	0.025	*N.D.	*N.D.	955	109	154	
# 4	Russian River Vly	9/19/98	Pommard 4	24.9	3.43	0.646	0.176	0.027	*N.D.	*N.D.	1585	89	125	
# 5	Central Coast	10/9/98	Calera	26.6	3.57	0.571	0.255	0.026	*N.D.	*N.D.	1530	180	266	
# 6	Central Coast	10/8/98	777	26.8	3.57	0.591	0.175	0.030	*N.D.	*N.D.	1565	113	228	
# 7	Sonoma Coast	10/25/98	13/15	24.2	3.13	0.729	0.360	0.055	*N.D.	*N.D.	1260	105	199	
# 8	Sonoma Coast	10/11/98	mixed	23.8	3.32	0.542	0.286	0.024	*N.D.	*N.D.	1360	72	107	
# 9	Sonoma Coast	10/9/98	Mt.Eden	24.8	3.42	0.467	0.297	0.023	*N.D.	*N.D.	1390	60	128	
# 10	Sonoma Coast	10/9/98	Pommard 4	25.0	3.34	0.556	0.354	0.029	*N.D.	*N.D.	1310	123	185	
# 11	Anderson Vly	10/28/98	mixed	25.1	3.51	0.446	0.234	0.055	*N.D.	*N.D.	1780	72	123	
# 12	Anderson Vly	9/28/98	mixed	24.2	3.43	0.684	0.149	0.024	0.002	0.006	1560	111	142	
# 13	Yorkville Hiinds	10/12/98	Romanee Conti	24.4	3.74	0.387	0.226	0.061	*N.D.	*N.D.	1685	93	166	

Vyd #	Appellation	Harvest Date	Clone	General Soil Types	Brix	pH	ppm		Assimilable
							K+	NH3	Amino N2
# 1	Russian River Vly	9/25/98	Pommard 4	6-7ft. Sandy loam on 50 ft. gravel	24.4	3.28	1200	87	126
# 2	Russian River Vly	9/26/98	mixed Dijon	Goldridge sandy loam	23.9	3.59	1550	83	167
# 3	Russian River Vly	9/16/98	15	2-3ft Arbuckle gravelly loam w/ shale & clay beneath	24.9	3.46	955	109	154
# 4	Russian River Vly	9/19/98	Pommard 4	2-3ft Arbuckle gravelly loam w/ shale & clay beneath	24.9	3.43	1585	89	125
# 5	Central Coast	10/9/98	Calera	San Benito gravelly / clay / loam & silt clay	26.6	3.57	1530	180	266
# 6	Central Coast	10/8/98	777	Zamora gravelly / clay / loam	26.8	3.57	1565	113	228
# 7	Sonoma Coast	10/25/98	13/15	Goldridge & Yorkville sandy loam	24.2	3.13	1260	105	199
# 8	Sonoma Coast	10/11/98	mixed	Josephine, chert, limestone, 20% clay / loam base	23.8	3.32	1360	72	107
# 9	Sonoma Coast	10/9/98	Mt.Eden	Multiple- Hugo, Josephine, Goldridge & limestone chert	24.8	3.42	1390	60	128
# 10	Sonoma Coast	10/9/98	Pommard 4	Multiple- Hugo, Josephine, Goldridge & limestone chert	25.0	3.34	1310	123	185
# 11	Anderson Vly	10/28/98	mixed	Pinole gravelly loam	25.1	3.51	1780	72	123
# 12	Anderson Vly	9/28/98	mixed	Pinole gravelly loam	24.2	3.43	1560	111	142
# 13	Yorkville Hiinds	10/12/98	Romanee Conti	Yorkville & Melange mix (chert, igneous rock, clay/loam)	24.4	3.74	1685	93	166

For this presentation I chose to specifically talk about patterns in the pH's and malic acids. This was just to illustrate the point that all of the analysis performed on these juice samples will need to be looked at as a whole. Only then I will be able to begin my attempt to interpret this information.

**BIOLOGICAL CONTROL OF BOTRYTIS CINEREA AND PHYTOALEXIN (RESVERATROL) IN
GRAPEVINE BY SOME SOIL MICRO-ORGANISMS**

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Botrytis cinerea Pers. is highly pathogenic to the grapevine plant, producing the characteristic grey mould symptoms within 7 days of inoculation on vitroplants. Biological control of this disease has been attempted by using,

- a)** a mycoparasite, and
- b)** a soil bacteria.

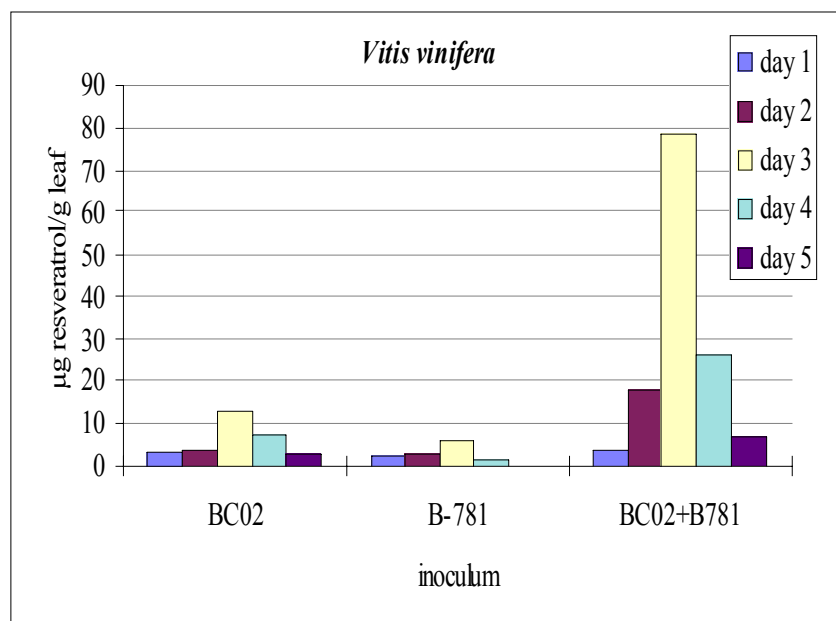
The results are very encouraging.

a) A soil fungus belonging to the genus *Pythium* was found to be a mycoparasite of *Botrytis cinerea*. This fungus is non pathogenic to the grapevine plant and when inoculated on its leaves together with *Botrytis cinerea*, it arrests the growth of the pathogen by invading its mycelium. The mycoparasite ramifies within and empties the entire protoplasmic contents of *Botrytis cinerea*. The infected mycelium of *Botrytis cinerea* fails to produce the grey mould symptoms.

b) A bacterial strain, isolated from soil, belonging to the genus *Bacillus* was found to be antagonist against *Botrytis cinerea*. It is known that the fungal attack on the grape-vine acts as an elicitor to the production of phytoalexines like resveratrol. This compound was also formed when the leaves of the grapevine vitroplants were inoculated with the bacteria alone, and this activity was enhanced when a mixture of the pathogen and the antagonist bacteria was applied. This bacteria can be used as a potential biological control agent as well as a biological elicitor of resveratrol.

Table 1: Elicitation of resveratrol ($\mu\text{g/g}$ fresh weight of leaves) by *Botrytis cinerea* (BC 02), bacteria (B-781), and the two together (BC 02+B-781).

<i>Vitis vinifera</i>					
Days	1	2	3	4	5
Water	0	0	0	0	0
BC 02	3.3	4.04	12.89	7.31	2.87
B-781	2.41	2.91	6.07	1.33	0
BC 02+B781	3.69	17.71	78.3	26.44	6.95



EVOLUTION OF SKIN AND SEED TANNINS IN PINOT NOIR BERRIES DURING RIPENING:**APPLICATION OF A SIMPLE ASSAY TO A DIFFICULT PROBLEM****Douglas O. Adams and James F. Harbertson**

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The astringency of red wines is due primarily to the presence of condensed tannins extracted from skins and seeds of the grape berries during fermentation and extended maceration. Tannins are also important in the color of wines from some varieties because they combine with anthocyanins to form colored tannins, also known as polymeric pigments. Tannins are the most abundant class of phenolic compounds in grape berries and they are composed of polymeric flavan-3-ols derived primarily from catechin, epicatechin, epicatechin gallate and epigallocatechin, linked by C4-C8 interflavan bonds. One study reported that the average number of monomer units in grape seed tannin polymers ranged from 2.3 to 15.1 (Prieur et al., 1994). When we consider that grape tannins may range in size from dimers up to 15-mers or even greater, we recognize that the possible number of chemically unique species is in the tens or perhaps even hundreds of thousands. Because of the large number of chemically unique species possible and the difficulty of resolving them by reversed phase or even normal

phase HPLC, analysis of individual tannins is currently a very difficult problem and will probably continue to be so for quite some time. In the absence of procedures to analyze all of the chemically distinct tannin species, our approach has been to try to devise methods for estimating the total amount of tannin present in grapes and wines.

We have developed a tannin assay based on the coprecipitation of two proteins, alkaline phosphatase (AP) and bovine serum albumin (BSA). BSA is supplied in the assay at 1mg/mL and AP is present in just trace amounts. The reaction is performed in an acetate buffer adjusted to the isoelectric point of BSA (pH 4.9) to maximize precipitation of the protein-tannin complexes. When tannins from wines or grape extracts are added to this mixture, they cross-link and precipitate BSA along with the alkaline phosphatase, and we have shown that the amount of alkaline phosphatase activity precipitated under these conditions is proportional to the amount of tannin present in the solution. Using iodinated BSA, others have shown that the amount of BSA that precipitates is proportional to the amount of tannin precipitated (Hagerman and Butler, 1980). Thus, alkaline phosphatase activity can be used to measure either the amount of tannin in an extract or wine, or it can be used to determine the amount of protein precipitated by a known amount of tannin. In addition to the BSA/AP assay, we have evaluated a method described by Hagerman and Butler (1978) and have optimized it for use with wine, or grape extracts. This method uses a ferric chloride reagent to determine the amount

of tannin in the protein/tannin complex that results from the BSA/tannin precipitation. Thus, by performing both the BSA/AP assay and the ferric chloride analysis on a single sample we are able to determine the total amount of tannin present as well as estimate how much protein the tannin is capable of precipitating.

During the 1998 season we studied tannin development in berries of Pinot noir and Cabernet Sauvignon grapes. The vineyards were selected for their uniformity and their locations in regions recognized for their ability to produce high quality fruit of the respective varieties. Pinot noir was collected from a vineyard in Carneros and Cabernet Sauvignon was collected from a vineyard near Oakville. Triplicate samples of twenty berries each were collected weekly from about two weeks prior to veraison until harvest. After weighing each twenty-berry sample, skins and seeds were separated from the pulp and skin and seed samples were extracted and analyzed separately. Seeds from each of the twenty-berry samples were counted, weighed and then extracted with 20 mL of 66% (v/v) aqueous acetone overnight with gentle agitation. The mesocarp tissue was removed from the skins, the skin sample was weighed and then extracted with 20 mL of 66% (v/v) aqueous acetone in the same manner as the seeds. The acetone was removed at 38 C using a rotary evaporator, and the aqueous phase was adjusted to 10 mL with deionized water. The aqueous sample was frozen at -20 C until the analysis for tannin was performed using the methods briefly described above.

Seeds of Cabernet berries showed highest values prior to veraison after which the seed tannin per berry declined and remained fairly constant during the four weeks prior to harvest. The skin tannin content per berry changed little in Cabernet and by harvest the amount of tannin in skins and seeds was nearly the same.

Results obtained with seeds of Pinot noir were more problematic because of a very large variation observed between triplicate samples. It was determined that the sample variation was not due to poor or uneven extraction, but instead appears to be a natural characteristic of tannin levels in Pinot noir seeds. The cause of this large variation will be the subject of further investigation. Values for tannins present in skins of Pinot noir were less variable and showed a pattern similar to Cabernet skins, having a relatively constant amount of tannin on a per berry basis from just before veraison until harvest. As with Cabernet Sauvignon, the amount of tannin in seeds and skins of Pinot noir were very nearly the same at harvest.

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TANNINS, COLOR AND FLAVOR MATURITY IN CALIFORNIA PINOT NOIR**- THE WINEMAKER'S PERSPECTIVE****Byron Kosuge****Saintsbury****Los Carneros**

Over the last ten years, it has become increasingly obvious that the traditional measures of grape ripeness-sugar, acid and pH-are imperfect indices of true ripeness. With red wine, there is also the question of tannin ripeness, color development and flavor ripeness. Maximizing each is the obvious goal, but actually doing it is another thing entirely. With Pinot Noir, achieving ripe (but not overripe) flavor, good color and sufficient tannin is perhaps more difficult than with any other red.

I think it begins and ends in the vineyard. In our forgiving climate, we seldom have to worry about achieving sufficient sugar ripeness. Instead, our struggle is to achieve flavor and tannin ripeness before sugar and acid go out of balance. Depending upon the climate, site and variety (and clone and rootstock and vintage) the ripening curves of sugar, acid, flavor, color and tannin disconnect to a greater or lesser degree. Those sites which are best for a given wine--the best terroirs, if you will--are the ones where those ripening

curves are naturally close together, through a combination of favorable soil, climate, rootstock, scion and farming interactions. Figuring out how the best sites got to be so good is not straightforward. Figuring out how to make your own site great -or near-great - is even harder. Copying a good vineyard from one site to the next has proven to be crap shoot at best. What we have to do is understand how vines "decide" whether to produce sugar, color, tannin or flavor, what if any influence we can exert on them to do one thing over another, and how to recognize optimal ripeness in grapes before you actually make the wine.

If you spend much time among vines, you notice a number of physiological indicators of vine and fruit maturity, such as leaf senescence, shoot and stem maturity, seed and skin appearance and flavor, grape turgor, and so on. For making picking decisions I rely on all of the above, plus taste, chemistry, and, of course, a measure of gut feeling. I would like to know more. At this point, we're able to measure a fair number of the chemical constituents that constitute ripening. We're starting to get a handle on how to promote color and tannin development in grapes. We know a thing or two about color stability and anthocyanin and tannin interactions. But we don't have a way, other than our sometimes fallible taste buds, to keep track of flavor and aroma potential in the grapes as they ripen. If we could identify the physiological factors that favor or inhibit flavor and aroma development (as opposed to

tannin and sugar development,) then we could modify our viticultural and enological practices accordingly, in much the same way we modify our practices to improve color and tannin development.

Byron Kosuge —

Started out studying literature at UC Davis. Became interested in winemaking during my time as an English student, and decided to get an Enology degree too. Graduated from Davis in 1985. Worked two harvests in California, at Sonoma Cutrer and Schramsberg, as well as a brief stint at Saintsbury, before taking a year off from wine to travel and pursue studies in American literature. Realized that I was probably a better enologist than literary scholar, and returned to Saintsbury in 1987 as assistant winemaker. Became winemaker in 1996. My definition of winemaking is simple: grow good fruit and treat it such that as much as possible of the good, and as little as possible of the bad characters of the grapes make it into the wine. To that end, I try not be beholden to any one school of thought, but rather to draw on whatever knowledge or tradition is appropriate for the situation. Tradition, research, engineering, even a bit of voodoo--each is useful, and I freely borrow when needed. Saintsbury--in fact, all of Carneros--has come a long way in the twelve years I've been here, both in terms of winemaking savvy and viticultural insight. New plantings, including some of our own, and new clonal material will give us a lot of interesting grapes to make into wine. The past two years I've been trying to get smarter about what goes on in the vineyard, which means I don't have time to read many novels these days.

Bernard Hudelot**Domaine de Montmain****Hautes Côtes de Nuits Saint Georges**

Bernard Hudelot is a 55-year old enologist and viticulturist from the Hautes Cotes de Nuits Saint Georges. He is owner and creator of the Domaine de Montmain. Montmain is situated at Villars Fontaine, at the altitude of 250 to 400 meters. Vines are planted using a wider spacing (3 meters x 1 meter) and a portion are planted on terraced sites. 20 acres of Chardonnay are planted and 30 acres of Pinot noir.

Skin maceration after harvest is conducted over a longer period at low temperatures. Wine was placed in oak barrels for up 30 months, with fining and without filtration.

This presentation will focus in production of grapes using wide spacings in high altitude sites on steep slope, on cool soil with low fertility.

**THE CASE OF BURGUNDY WINES: CONSEQUENCES OF QUALITY AND APPELLATION OF
ORIGIN RELATED TO WINE MARKETING POTENTIAL**

Catherine Laporte

Wine Economist, Department of Agricultural Economics

Établissement National d'Enseignement Supérieur Agronomique de Dijon

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The objective of this presentation is to examine the characteristics of the system of classification for wine quality in Burgundy wines and discuss the consequences of this system upon production and quality of these wine products

Firstly, our work has shown that the diversity of wines in Burgundy is based upon a coherent organization of differentiation among wine products. This specific organization permits the development of hierarchies in appellation, year and brand name.

Secondly, the French regulations regarding appellation of origin (AOC) sustain a preexisting system of differentiation: it guarantees the quality signified by the given appellation in association with production conditions.

Thirdly, our work as shown that the appellation system of the wines of Burgundy assumes a previous agreement between the producers of the factors determining quality and even of the type of quality signified by a given appellation.

In conclusion, two key points emerge:

1. The system of quality utilized within Burgundy enhances the development of small independent producers and negociants.
2. The regulations of the AOC permits the characteristics of wine quality to evolve slowly, over time, as reflective of the tradition which has created the conditions associated with their particular reputation.

**EFFECTS OF MACERATING PECTINASE ENZYMES ON COLOR, PHENOLIC PROFILE, AND
SENSORY CHARACTER OF PINOT NOIR WINES**

Barney Watson, N. Goldberg, H.-P. Chen and M. McDaniel

Dept. of Food Science & Technology, Oregon State University, Corvallis

Steve PRICE

ETS Laboratories, St. Helena, California

Introduction and Methods

Several macerating pectinase enzyme preparations are currently being used by Oregon wineries to enhance color, color stability and phenolic extraction of red wines. Previous research on the use of commercial pectinase enzymes in Oregon Pinot noir and Cabernet Sauvignon wines showed that some enzyme preparations were capable of reducing red wine color through pigment modification and subsequent degradation (Wightman, J.D. et al. 1997). During the 1996 and 1997 vintages, commercial 'color' extracting enzymes were evaluated for their effects on Pinot noir wine composition and sensory character.

In 1996, the trials included the addition of two enzymes, Scottzyme Color Pro and Color X (Scott Laboratories) at a rate of 100ml/ton (the highest dosage

recommended by the supplier). In 1997, the trials included the addition of several enzymes at both a low and a high dosage rate. Scottzyme Color Pro and Scottzyme Color X were added at the rate of 60 and 100 mL/ton, Lallzyme EX (Lallemand) at 15 and 30 g/ton, Rapidase EX Color (Gist Brocades) at 15 and 30 g/ton, and Vinozyme G (Cellulo) at 25 and 50 g/ton. Pinot noir was harvested from Woodhall Vineyards, in Alpine, Oregon and all treatments were made in triplicate lots from 16 kg of fruit. Enzymes were added after crushing and destemming, addition of 50 mg/L sulfur dioxide, and inoculation with 250 mg/L of rehydrated Lalvin RC 212 yeast. The wines were pressed off the skins after 12 days of skin contact at dryness. The new wines were inoculated with OSU malolactic bacteria (Lalvin) and cold stabilized at 4°C after completion of malolactic fermentation (MLF). The wines were bottled unfiltered with addition of 25 mg/L of sulfur dioxide at 6 months of age.

The new wines were analyzed at bottling for total anthocyanin content, color intensity, total phenolic content and for specific phenolic fractions by high performance liquid chromatography (HPLC). HPLC analysis was provided by ETS Laboratories, St. Helena, CA. The wines underwent sensory evaluation at 9 months of age by a winemaker industry panel in the Sensory Sciences Laboratory of the Department of Food Science and Technology using the technique of free-choice profiling. Data was analyzed through Generalized Procrustes Analysis and Analysis of Variance.

Results and Discussion

Differences in color intensity, total phenols, and specific phenolic fractions as measured by HPLC were observed in wines with enzyme treatments compared to untreated control wines. Wines produced by enzyme treatments were higher in polymeric anthocyanins, polymeric phenols, and catechin, but not in monomeric anthocyanin content compared to control wines, as shown in Table 1. As an example of the effect of enzyme treatment on overall phenolic profile, a spider graph of HPLC analysis of 1996 Pinot noir produced with addition of Scottzyme Color X (100mL/ton) is shown in Figure 1 compared to the untreated control (concentrations of the phenolic fractions in control wines were normalized to 100%).

In the 1997 trials, all five of the enzymes produced new wines with greater total phenolic content than untreated controls (expressed as gallic acid equivalents, GAE). Scottzyme Color Pro at the high dose rate produced wine with the highest total phenolic content at pressing, however, by the end of MLF a decrease in total phenols was observed, presumably due to polymerization reactions and precipitation. Similar decreases were observed in the control wines and in wines produced with the addition of Scottzyme Color X (Fig. 2).

The total anthocyanin content (as measured by absorbance 520 nm, pH<1) of the 1997 wines at the time of pressing (dryness) and at the end of malolactic fermentation (MLF) is shown in Fig. 3. At pressing, the anthocyanin content of wines produced by enzyme treatment was similar to or in a few cases higher than the untreated controls. By the end of MLF, however, a loss in anthocyanin content was observed in all the treatments. Only the Scottzyme Color Pro wine at the low dosage rate was higher in total anthocyanin content

than control wines. Several of the enzyme treatments did, however, produce new wines with greater color intensity than untreated controls. Color intensity of wines at the end of MLF (absorbance at 420 + 520 nm at wine pH) is shown in Fig. 4. Addition of Scottzyme Color Pro, Scottzyme Color X, and Vinozyme G produced new wines with greater color intensity than controls at both the low and the high recommended dosage rates. The low dosage rate of Lallzyme EX Color appeared to be more effective in increasing color intensity than the high dose rate. The low dose of Rapidase EX Color did not increase color intensity while the high dose showed a slight increase. The increase in wine color intensity by the enzyme treatments may be due to increases in polymeric anthocyanin content and/or due to co-pigmentation effects due to the enhanced extraction of other phenolic fractions.

Table 1.

Phenolic profile* through HPLC (high performance liquid chromatography) on 1997 Oregon Pinot noir wines

Sample	Monomeric Anthocyanins mg/l	Polymeric Anthocyanins mg/l	Polymeric Phenols mg/l	Catechin mg/l
Control	81.0	8.0	195.0	120.0
Scottzyme Color Pro				
(low)	72.0	11.0	258.0	152.0
(high)	73.0	11.0	268.0	163.0
Scottzyme Color X				
(low)	71.0	12.0	277.0	144.0
(high)	73.0	11.0	274.0	164.0
Lallzyme EX				
(low)	78.0	11.0	276.0	156.0
(high)	79.0	10.0	271.0	158.0
GB Rapidase EX Color				
(low)	78.0	10.0	250.0	158.0
(high)	78.0	10.0	264.0	154.0
Vinozyme G				
(low)	74.0	11.0	273.0	155.0
(high)	83.0	11.0	283.0	163.0

*Measurements taken at the end of malolactic fermentation (90 days after crush)

*n=1, pooled sample of 3 wine batches

Fig. 1

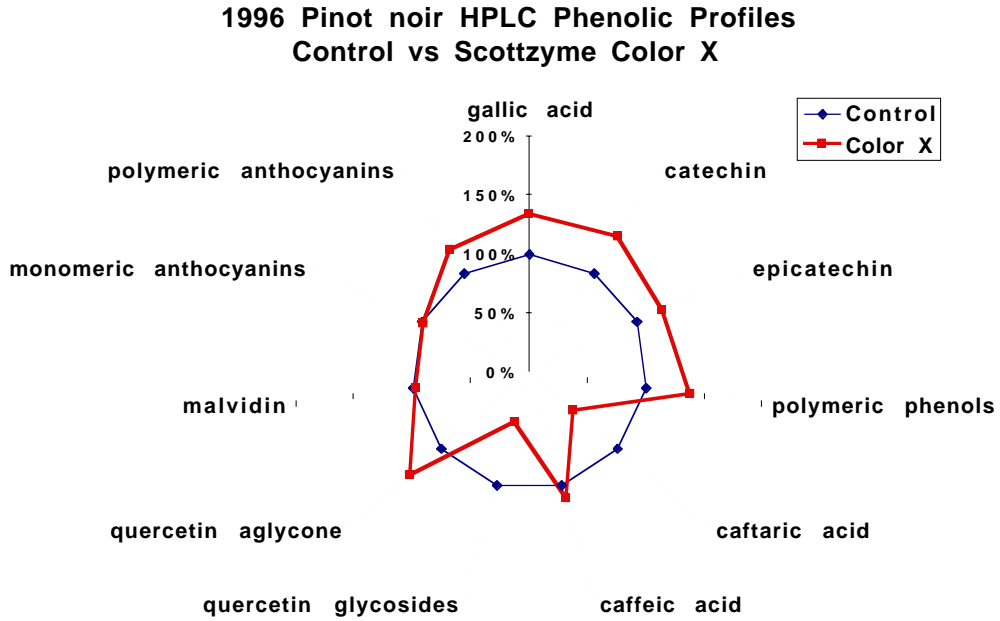


Fig. 2.

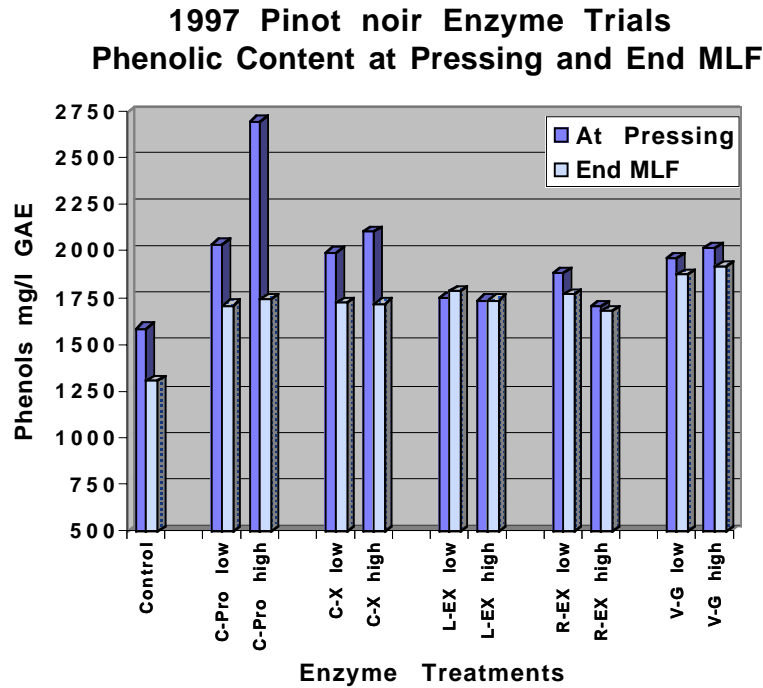


Fig. 3.

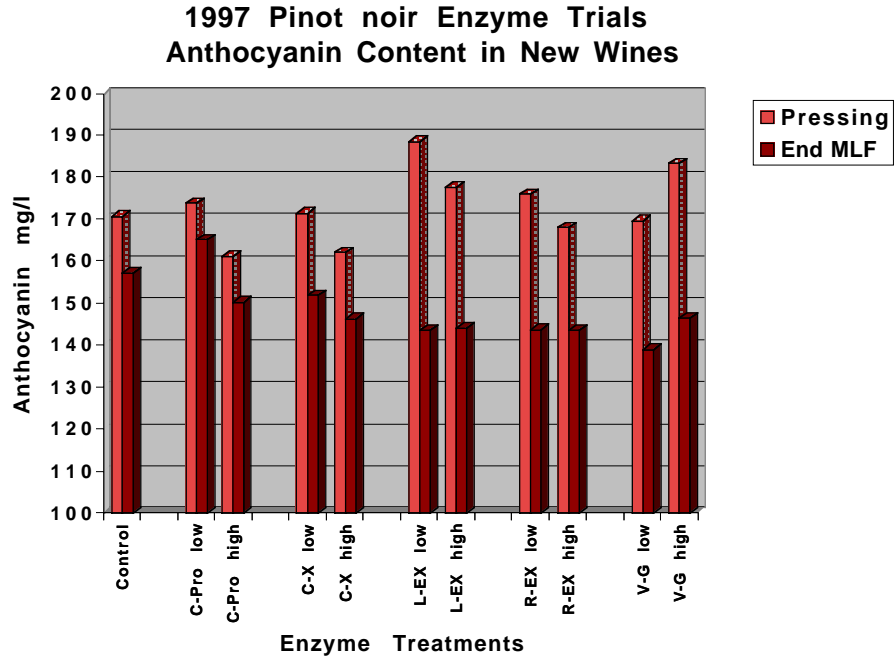
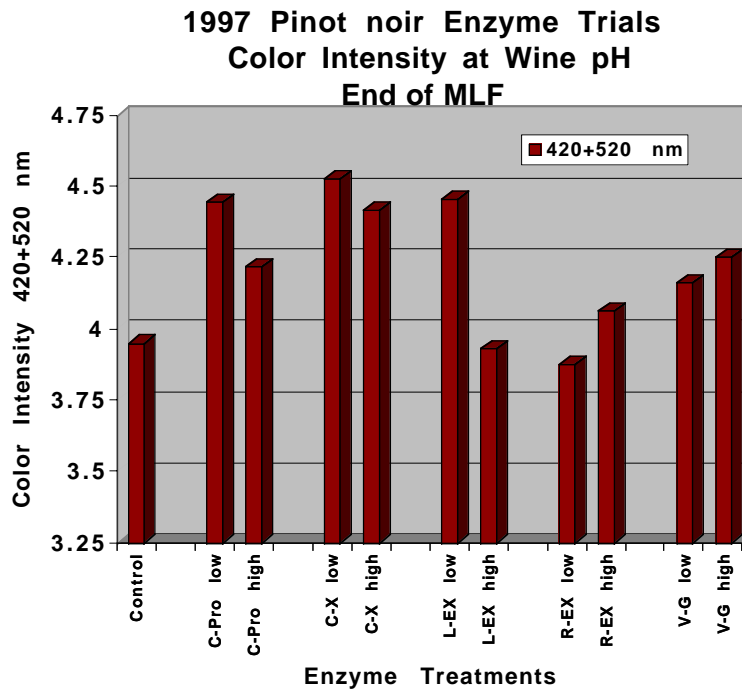


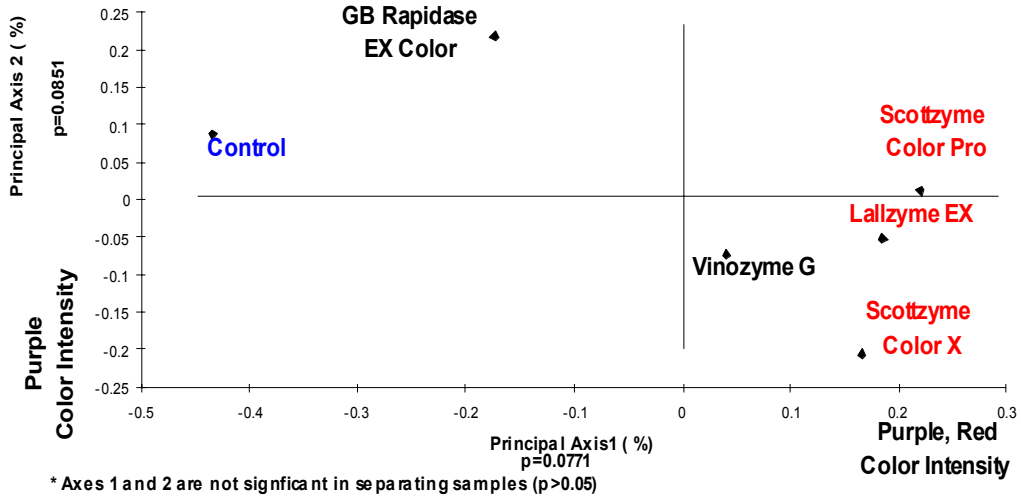
Fig. 4.



Significant differences were observed in color intensity, aroma, flavor, body, and mouthfeel characteristics in wines produced using some of the enzyme treatments compared to untreated control wines. Using the technique of free-choice profiling the winemaker panel was able to differentiate the wines produced by the lower enzyme treatments more clearly from the control wines than the those produced by the higher enzyme treatments in color, aroma, and flavor characteristics. Overall, Pinot noir wines produced with the addition of the lower dosages of the enzymes tended to produce wines with greater purple, red descriptors, increased color intensity, and enhanced fruity, floral, spicy, vegetative, earthy, and body characteristics (Figs. 5, 6 & 7). At the higher treatment levels (data not shown) the trends in color, appearance, and aroma characteristics were similar to the lower enzyme treatments, however, in flavor the wines were described as generally having enhanced acidity, bitterness, and astringency characteristics.

Fig. 5.

Color & appearance profile map* of low dosage enzyme treated 1997 Pinot noir wines from a winemaker panel



Fi. 6.

Aroma profile map* of low dosage enzyme treated 1997 Pinot noir wine from a winemaker panel

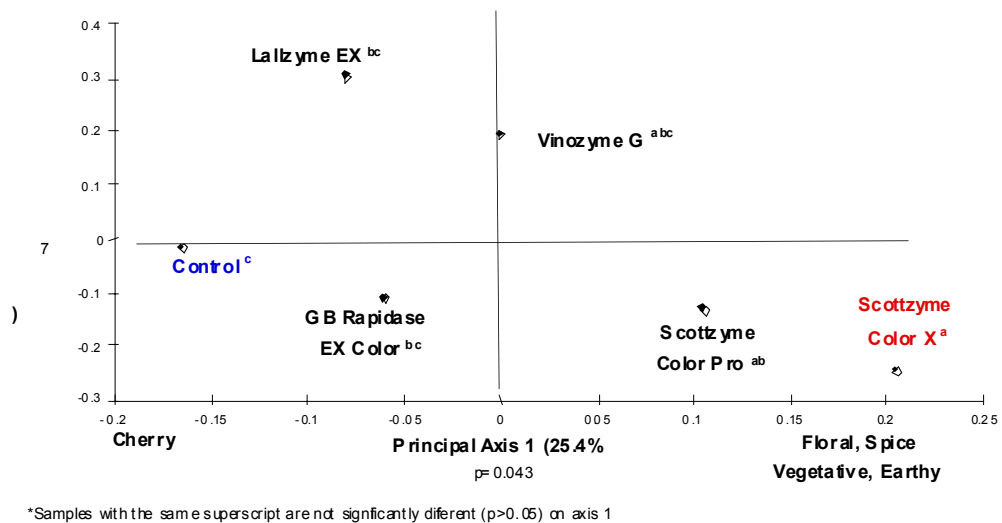
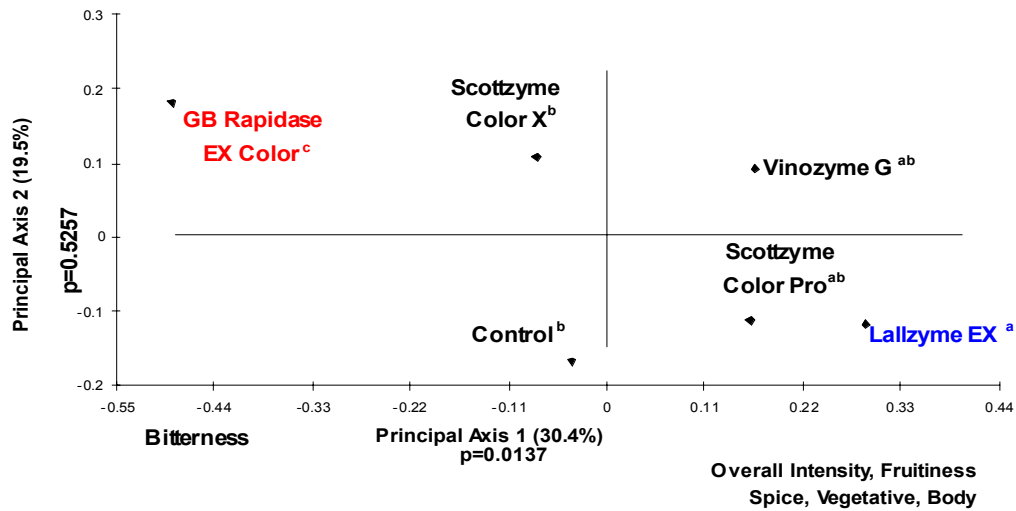


Fig. 7.

Flavor profile map* of low dosage enzyme treated 1997 Pinot noir wine from a winemaker panel



*Samples with the same superscript are not significantly different ($p > 0.05$) on axis 1

References:

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Dominique Piron
Domaine de la Chanaisé
Morgon

Dominique Piron is a descendant of Etienne Bailly who started growing grapes in Villie in Beaujolais nearly four centuries ago. He is the 14th generation of family winegrowers.

Domonique owns and manages Domaine de la Chanaisé, a 43 acres vineyard located at Morgon, at the foothill of the famous Py. He is also the president of Dominique Piron Winery , with a capital of 88 additional acres, covering a large part of the Beaujolais Appellation with Beaujolais, Beaujolais village, Regnie, Bruoilly, Morgon, Moulin a Vent. He also produces a Macon Chardonnay.

Dominique Piron will give a presentation of the expression of the Gamay grape and the influence of "terroir origin" of grapes in the vinification process.

THE EFFECT OF AGING ON THE FLAVOR OF NAPA VALLEY CABERNET SAUVIGNON WINES**Yiannis FLERIANOS, Leilah BACKHUS, Jordan FERRIER, Ted HENRY,****Marbue MARKE, Lei MIKAWA and Ann C. NOBLE**

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Ten commercial 1986 Cabernet Sauvignon wines from Stags Leap District, Howell Mountain, Conn Creek, Spring Mountain, and Rutherford-Oakville were evaluated by Descriptive Analysis in 1988 and again in 1998. Using the common terms between the two studies, the configurations for the wines then and now were compared first by inspection of the polar coordinate plots and then by principal component analysis of '88 and '98 ratings. In addition, the viticultural, enological and soil data were used to model the changes in flavor by Partial Least Squares Regression (PLS). The largest differences among the wines in both 1988 and 1998 were contrasts between wines high in fruity (berry) notes vs those high in bell pepper and asparagus/green bean (vegy) aroma and flavor. However the changes in wine flavors were not consistent across the ten wines. Five increased in berry aroma and flavor, while five showed increases in vegy aroma or in mint and butterscotch. In both 1988 and 1998, all wines were not systematically clustered by origin. At both times, the wines from Howell Mt. were similar as, to a lesser degree, were those

from the Rutherford-Oakville area. The Howell Mt. wines increased in berry notes, and decreased in vegy notes, while very few changes (in the terms rated at both times) were observed for the two Spring Mountain wines. On the other hand, the wines from Stag's Leap changed inversely in fruity and vegy notes. The pattern of associations between wine flavor and the viticultural, enological and soil variables observed in 1988 was seen for these older wines. Wines higher in fruitiness were made from riper grapes, from well drained soils especially on hillsides; soils high in clay, vines with high yield, grapes with lower Brix, were more vegetative.

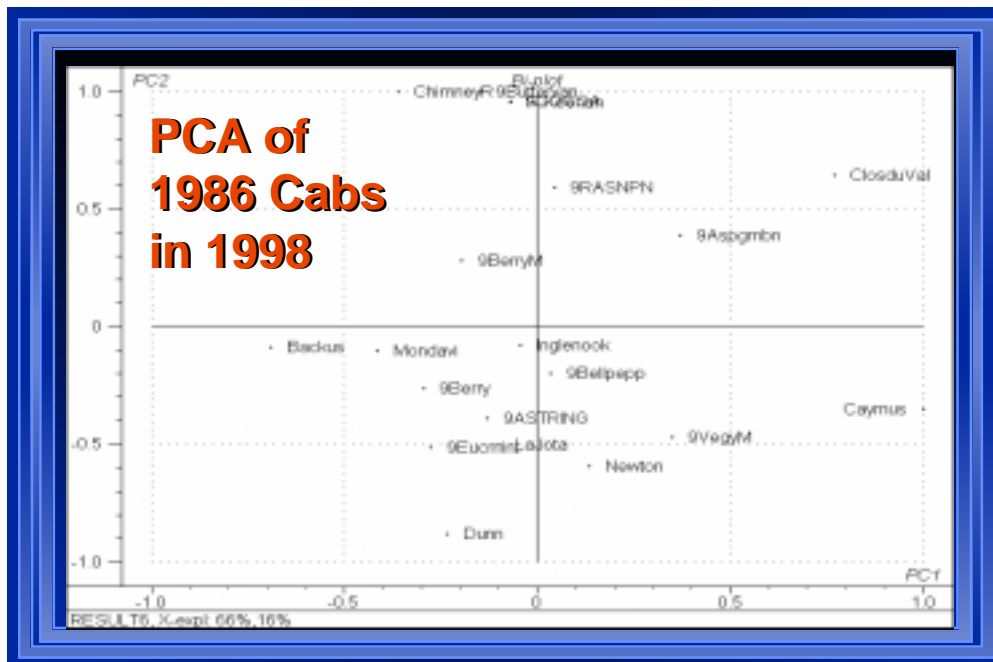
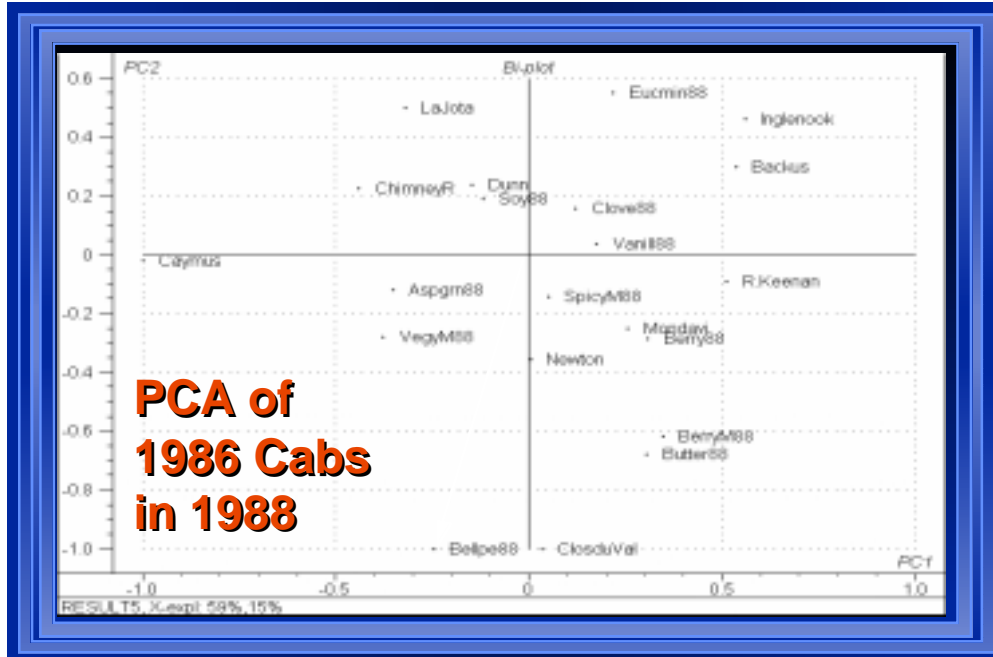
Descriptive Analysis

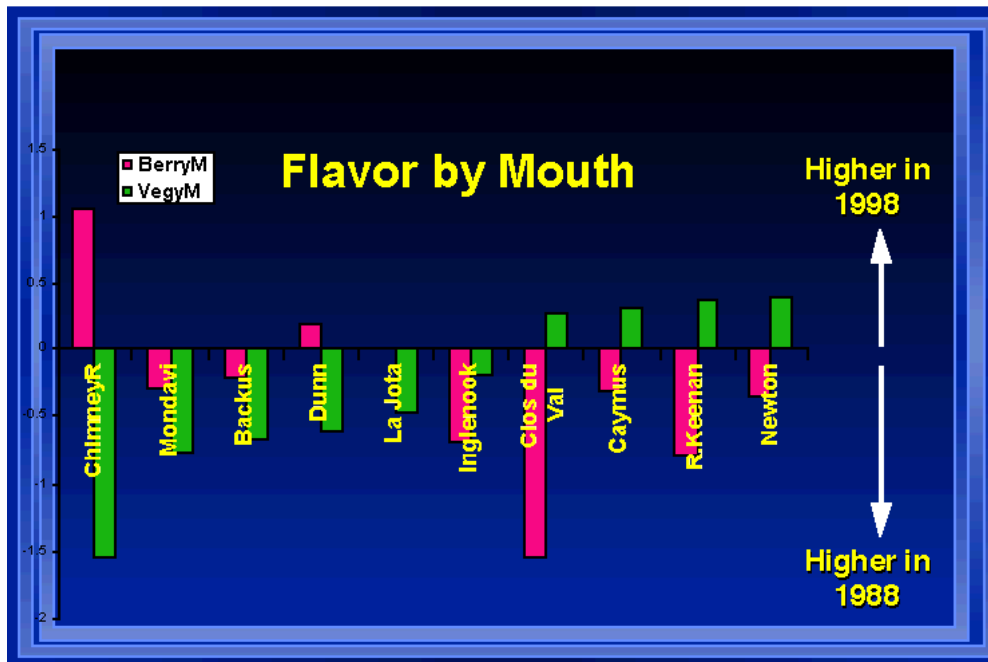
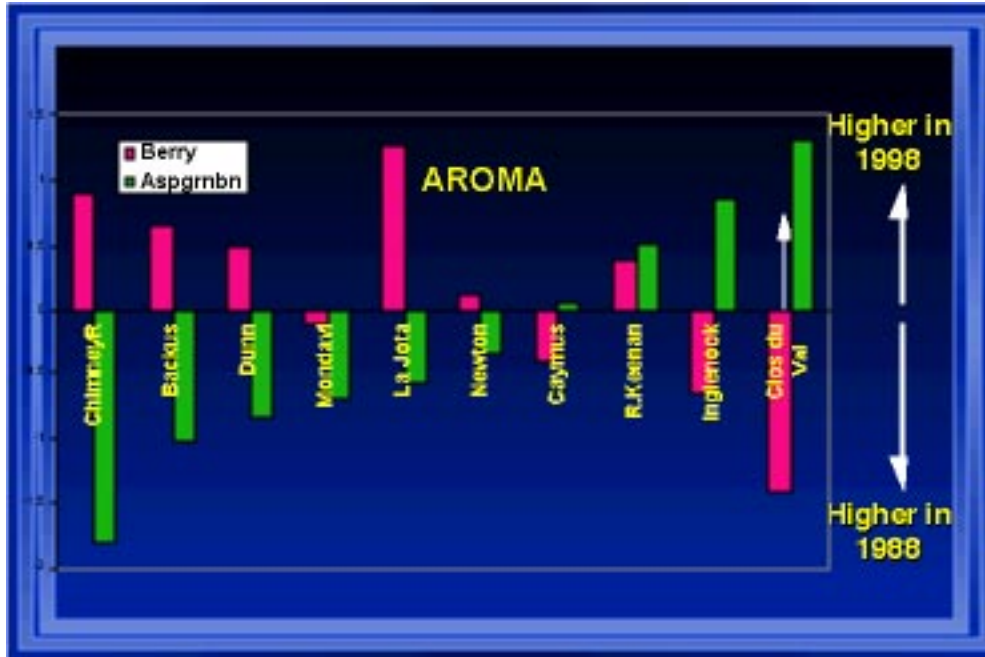
1988 16 judges x 2 reps

- **AROMA**
- Butter
- Vanilla
- Berry
- Asparagus, Green bean
- Black pepper Eucalyptus/mint
- Soy
- Clove
- **FLAVOR:** Berry, Vegy, and Spicy by Mouth

1998 17 judges x 2 reps

- **AROMA**
- Butter/Vanilla
- Berry
- Asparagus, Green bean
- Raisin/Prune
- Black Pepper
- Eucalyptus/mint
- Cocoa
- **FLAVOR:** Astringency, Berry, Vegy, and Spicy by Mouth





**THROUGH THE LOOKING GLASS – PERSONAL REFLECTIONS ON GROWING, VINIFYING AND
MARKETING PINOT NOIR IN BURGUNDY, CALIFORNIA AND OREGON**

**Ted Lemon
Littorai Wines
Napa Valley**

1. Introduction to Littorai Wines
2. Is Pinot noir The "Alice In Wonderland" of Grape Varieties?
- 3a. The Golden Age of American Pinot noir
 - How and why did it happen?
 - What does it mean for Burgundy?
 - Will American Pinot become a major player on the international stage?
 - Where will great American Pinot noir be in the year 2050?
- 3b. The Golden Age of Burgundy?
 - The role of tradition in Burgundian winemaking
 - The appellation system, help or hindrance?
 - The role of inherited skills, professional training and international experience
4. Starting a Pinot Vineyard and Winery in Oregon, California and Burgundy in 1999: A Comparison of Techniques Appropriate to Each Region
 - Vine density, rootstock and clonal selection, husbandry practices, including disease control, harvesting parameters, and vinification techniques
5. Oregon, California and Burgundy: Competitors or Confrères?
 - The common need for applied research
 - The common enemy: Cabernet
 - Issues specific to each region

Jean-Paul Durup
Château de Maligny
Chablis

Jean-Paul Durup is currently president of the family business called Jean Durup, father and son. He is also a member of the committee for Appellation of Origin for Burgundy and a member of the board of the Confederation of Viticultural Associates of Burgundy. Jean-Paul Durup is a graduate from Institut Jules Guyot.

The family domaine consists of 463 acres located in the Chablis area, and the largest domaine in Burgundy.

The subject of this presentation includes a description of the history and culture of the Chardonnay grape vine and specifically the vinification of Chablis.

**CONTRIBUTION OF VOLATILE COMPOUNDS TO THE SENSORY QUALITY OF BURGUNDY
WINES : EXAMPLE OF CHARDONNAY WINES**

Yves LE FUR

Établissement National d'Enseignement Supérieur Agronomique de Dijon
ENESAD • BP 1607 • 21036 Dijon Cedex • France

Establishment of a validation process from gas chromatography-olfactometry (GCO) results: the aim of this study was to establish a process of validation from the preliminary results of gas chromatography-olfactometry (CHARM analysis) obtained in Burgundy Chardonnay wines. This new methodology was applied to four potent odorant compounds ethyl cinnamate, guaiacol, cyclotene and maltol. The process of validation was established on three analytical tools : the sensory analysis, the instrumental analysis and the survey into cultural and enological practices. This study was affected 28 Burgundy Chardonnay wines (vintage 91).

The sensory analysis was based on the results of a descriptive quantitative analysis elaborated from a partial sensory profile. The selected and trained judges were conducted to describe the odor and aroma of the 28 wines using a consensual vocabulary established from different solutions (water, synthetic wine and base wine) of the four volatile compounds. The results was to evidence several couples between wines and attribute(s).

Secondly, the isotopic dilution and selected ion monitoring (SIM) allowed to determine the concentration of the four compounds in Chardonnay wines. A new volatile compound was identified and the amount was determined : the 5,6-dihydro-4-methyl-2H-pyran-2-one. Sensory and instrumental analyses were shown the group of 28 wines could be divided in two significant categories.

In order to explain it, the survey into cultural and enological practices applied to the 28 Chardonnay wines was carried out. It is obvious that the winemaking conditions, especially alcoholic fermentation and aging in oak barrels, were determinant by comparison with the environmental and biological conditions on the guaiacol, cyclotene and maltol levels in wines.

The relationship between sensory and instrumental analyses allowed to confirm the olfactive impact of guaiacol and cyclotene. The potent odorant effect of ethyl cinnamate was not demonstrated. Maltol can be considered as a marker of the use of new oak barrels in winemaking conditions.

SENSORY IMAGES OF CHARDONNAY**Terry Adams****Sonoma-Cutrer Vineyards****Russian River Valley**

What I want to share with you today are some images of Chardonnay derived from some analytical work we have been doing at Sonoma–Cutrer Vineyards. But, as important and interesting as this work is, perhaps the real value of my presentation is showing you the method used in the evaluation.

You be the judge!

While preparing for this talk, I came across some notes written by Bill Bonetti, founding winemaker, and now Winemaker Emeritus at Sonoma–Cutrer Vineyards. This story refers to an experience Bill had as a young man while working in the Gallo lab in Modesto. I quote from Bill's notes, "I remember an episode I witnessed many years ago, in the early 50s. On a Saturday morning, Professor Amerine was visiting the winery, and he was invited to join in on the sensory evaluation of a series of wines—the glasses were all lined up on the tasting table. He tasted them, and then Mr. Julio Gallo asked him which one he liked best. Well, replied the wise professor, which one I like best is my own business, ask me what you want to know. I thought that was a

great answer, because sensory evaluation is only effective if we first know what we are looking for."

The preceding paragraphs and especially the last statement —"sensory evaluation is only effective if we know what we are looking for," is my way of introducing aroma evaluation, using prepared aroma standards, as a judging criteria for experimental work and competitive tastings.

Now, before I go any further, I want to ask you all to sit back, take a deep breath, and have an open mind. I know there are some of you who find it difficult and restrictive to evaluate wines within the confines of aroma standards. I still have an ongoing struggle with it myself. There is so much more to the appreciation of wine than the stiff, structured aroma standards. But, as you will see, and as I have learned, there is much that can be learned using this method of evaluation. It has added new images to our collection. And the images produced are very interesting, and fun.

- Slide A: Wine Aroma Wheel

I think it is appropriate here to give some credit to the people who are really responsible for the foundation of this work. Ann C. Noble, professor here at U.C. Davis, developed the Aroma Wheel in the mid 1980s. Her goal was to develop a graphic representation of wine aromas. Necessary and essential

was to develop a standard set of descriptors to aid in the evaluation of wine qualities. As in Dr. Amerine's statement to Julio Gallo, if we all agree as to what we are looking for, perhaps we can more effectively describe and discuss it.

- Slide B: Mary Lou Mendum

Mary Lou Mendum, The previous Research Enologist at Sonoma-Cutrer, is the one responsible for us exploring aroma standards at SCV. She has a very unique and persistent style of persuasion that is quite effective. As I am becoming more and more frustrated with the ambiguity and the lack of consensus in the sensory panel evaluation of our experimental work, the possibility of more meaningful statistical data perked my interest—so I decided to give it a try. So we developed two sets of standards, each with 10 aromas, using modified Ann Noble recipes, one set for vineyard trials and one set for competitive wine trials.

- Slide C: Vineyard Descriptors

The vineyard set was designed to avoid fermentation characters and oak induced aromas, leaving out aromas like cheese, toast, smoke, vanilla, and butter. One might call these primary varietal and terrior characters.

- Slide D: Competitive Tasting Descriptors

This list includes some oak and fermentation characters like butter, toast, and oak. Granted, these are somewhat simple lists, but I think simplicity and clarity are important here.

I should add that any aroma evaluation always includes the wines being tasted and ranked. I am not one who believes that wine aroma and bouquet are the most important attributes of quality wines. I believe mouth feel, entry, middle and finish, structure and balance, and the absence of bitterness and harshness to be as important, as is the subjective expression or statement or meaning—terrior or style. The subjective elements of wine are essential and cannot be forgotten. But for the moment, let's put them aside and look through a different window.

The standards are made from a base wine, usually our Russian River Ranches, and adding the specific material that provides the aroma. Ann Noble has developed recipes for 83 descriptors, and there are probably more today, way too many for our work. We will use only 10 descriptors. We make floral by adding a bit of violet extract, this seems to me to be the broadest range of generic floral character. We have tried and occasionally revisit it using rose, acacia, peony, linalool, linden, and orange blossom. What works best for me is violet, so that is what we use. We make apple by putting little pieces of

apple in the wine. Earthy we get from adding dried wood ear mushrooms to the base wine. Citrus is from adding the peel of oranges and grapefruit, pepper is crushed black pepper, spicy is clove. Apricot/pineapple is from canned fruit nectar. We are constantly reevaluating the quality of the standards, and of course, everyone is never completely happy.

- Slide E: Tasting

Here is a slide of a sniffing/tasting session in progress. Notice the standards here. We use them during the tasting to refresh our memories and to be precise. Mary Lou seems to know, when reviewing the data, when I have been actually using the standards and when I, or others, are using only memory. Another interesting observation has been that experienced tasters find it difficult to work within the limitations of the standards. To paraphrase Mary Lou, we like to make up succinct little poetic stories about each wine, not really valid or acceptable here.

- Slide F: Tasting Sheet

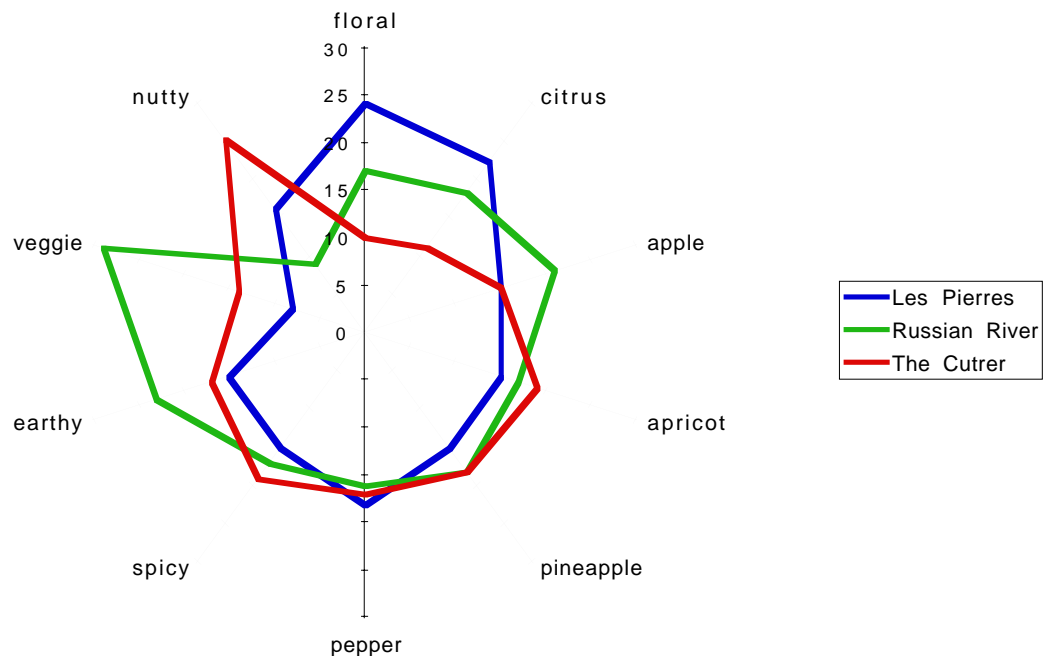
Here is a copy of our sniffing/tasting sheet. Notice the wines being evaluated are listed across the top. The aroma standards are listed down the left. We ask the taster to evaluate the wines in terms of the descriptors.

For example, we ask that they take the apple standard, smell it then smell each of the wines marked A, B, and C.

Then rank the wines giving the wine with the greatest amount of the standard a "1." We give the weakest wine for the character a "3," and the wine in the middle a "2." The scoring is a forced rank, meaning every wine is included in the consecutive ranking. Notice that we evaluate each wine also by overall preference at the bottom of the form, this is still very important information. Now, I think that you have a good understanding of the background and direction of our work, let's take a look at some graphs, images if you will, that represent the aroma analysis of some of our experimental work at Sonoma-Cutrer.

- Slide 1: Comparison of SCV Current Releases

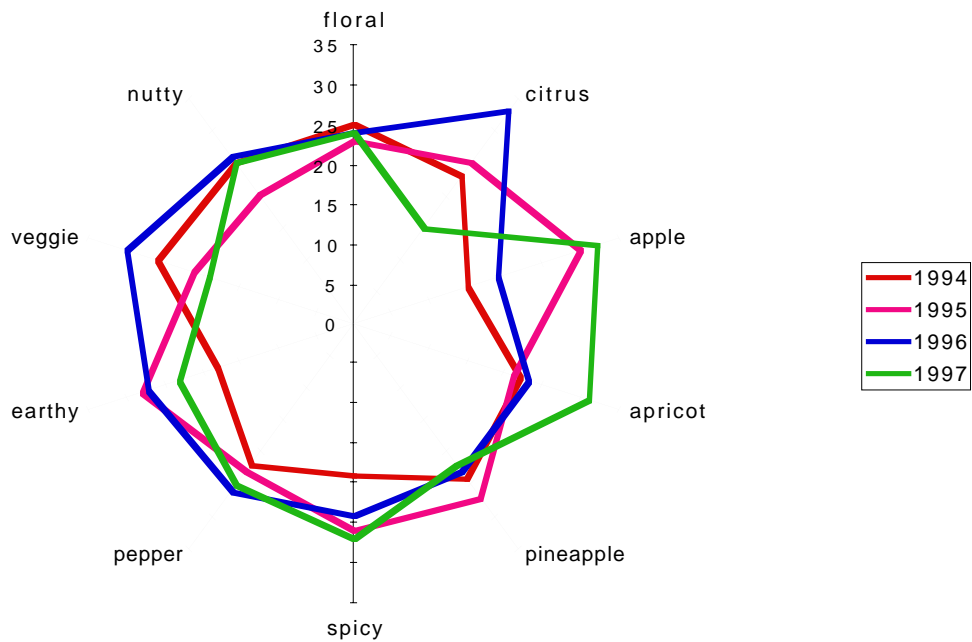
Comparison of SCV Current Releases



We are looking at the three Chardonnays produced by Sonoma–Cutrer Vineyards. At first glance, I see the three wines as very similar in the characters of spicy, pepper, pineapple, apricot, and apple. These are all fairly common aromas to cool climate California Chardonnay. The differences tell more about the wines. The Russian River Ranches, which I often describe as a fruit bowl, shows strong apple, citrus, and floral characters and significantly less nutty aromas than Les Pierres and The Cutrer. The vegetal and earthy elements are always present in the Russian River Ranches, but I feel they are quantitatively less significant than expressed in this image. Remember that each attribute is relative unto itself. At the winery we often serve the Russian River Ranches with a mushroom and truffle oil dish which is complemented by this subtle earthiness. The Les Pierres show high citrus and floral components and low veg. This is typical, the wine tends to be brighter and more austere, with a strong mineral character. We have not been able to come up with a good mineral aroma standard. We have tried some things but cannot quite capture it. The Cutrer show similar base elements with the other wines but with a pronounced nutty, slightly earthy spike. I think this ties in with the more fatty, phenolic nature of the wine.

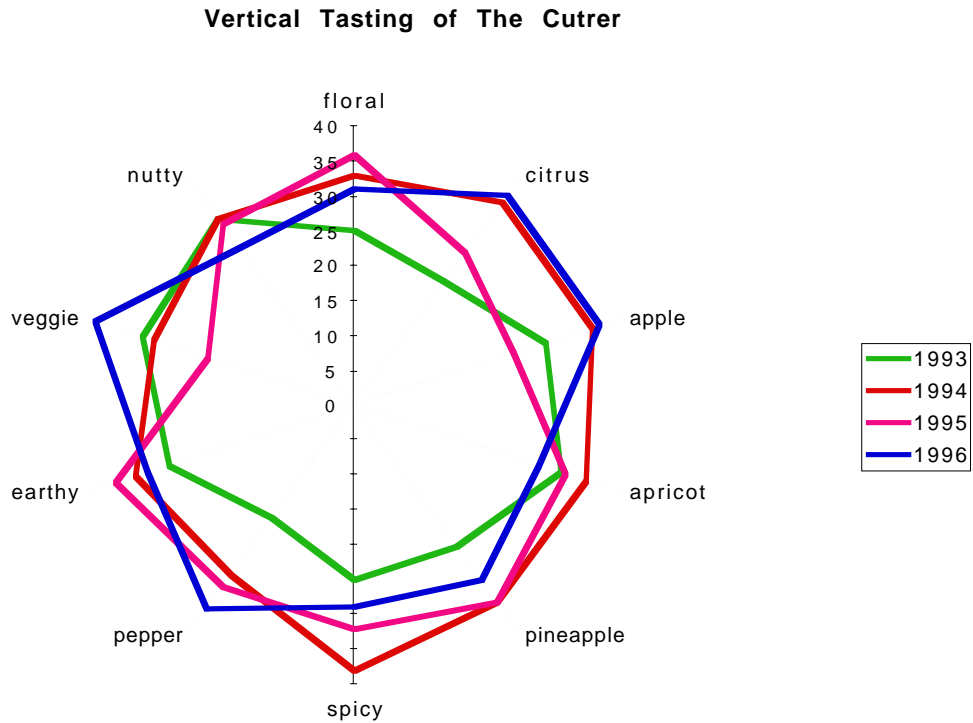
- Slide 2: Vertical Tasting of Russian River Ranches

Vertical Tasting of Russian River Ranches



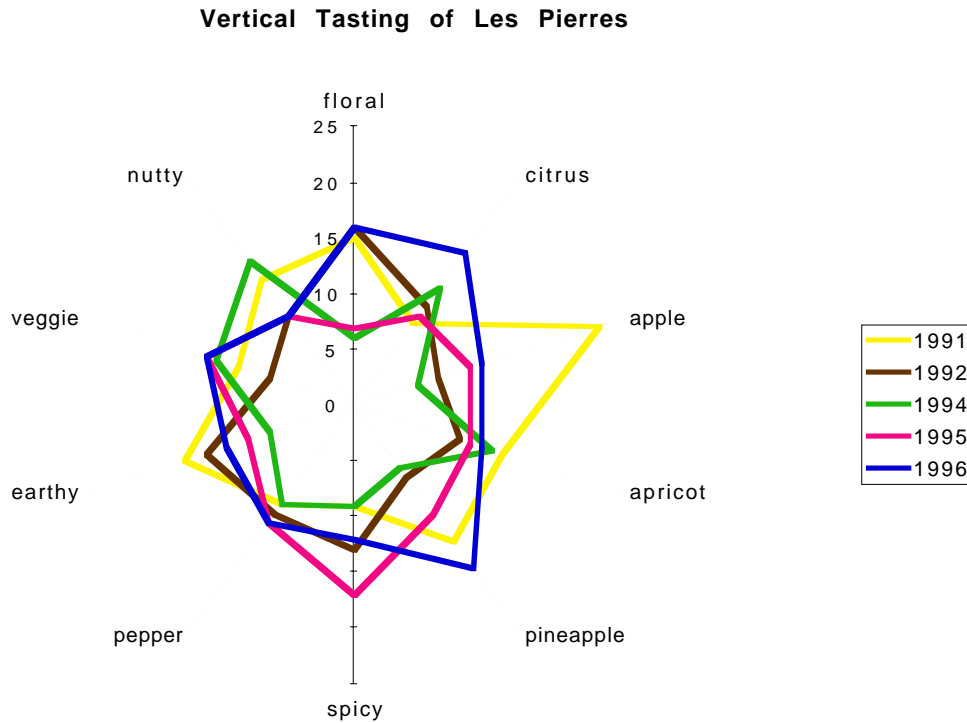
The first thing that strikes you when looking at this slide is the uniformity of this wine from year to year. It is also interesting that maturity and bottle development do not show up as significant issues when comparing the aromatic intensity of the wines. I wonder about the disparity in citrus character. This does correlate with size of crop and could be related. And does the apricot intensity allude to the botrytis in 1997?

- Slide 3: Vertical Tasting of The Cutrer



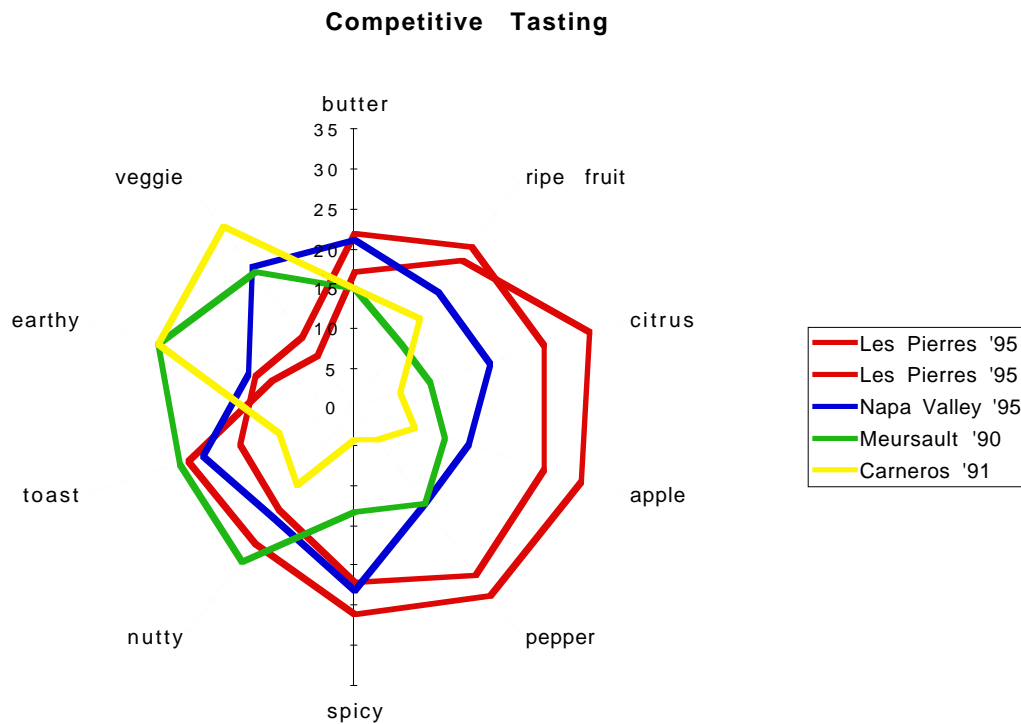
Look at this one. Here is a vertical tasting of The Cutrer, vintages 1993 through 1996. The first thing that strikes me is the uniformity of the graphs, they look almost like concentric circles. Notice the uniform balance of expression of each of the aromas from year to year. Remember, this is the nature of the fruit the vineyard gives us from year to year. This is also a good graphic image of the way I approach blending. I try to put together a wine that is round and complete in its expression of what the vineyard has to offer.

- Slide 4: Vertical Tasting of Les Pierres



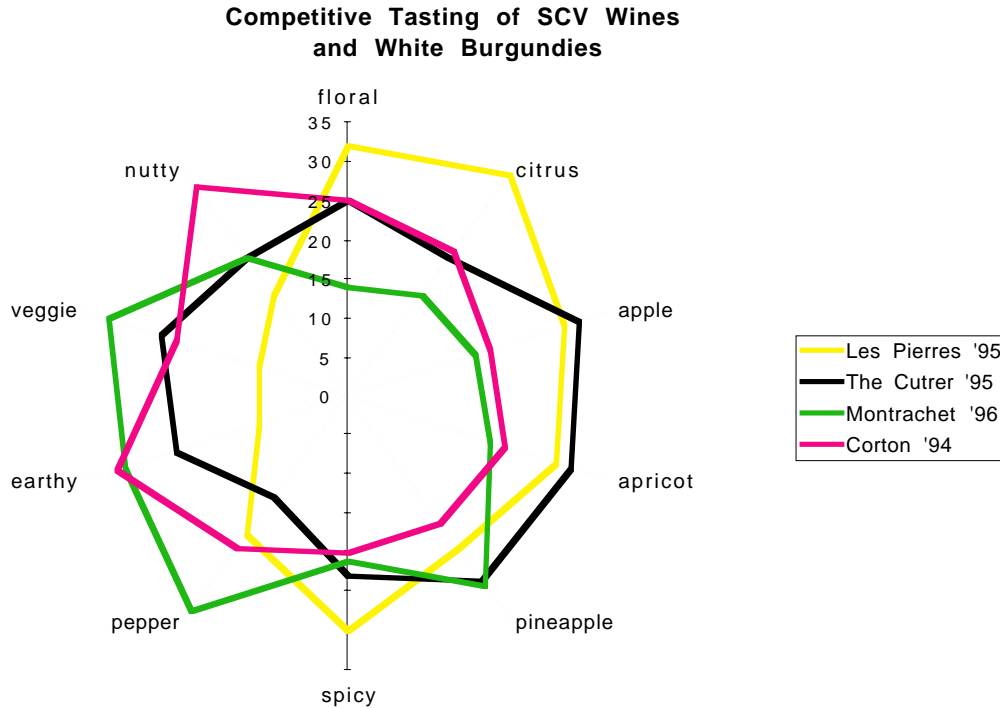
Here is a vertical tasting of Les Pierres vintages 1991 through 1996, excluding 1993. The reason for no 1993 is that we do not have any remaining in the winery. At first glance, the image is a bit more angular which is typical of Les Pierres. I find it interesting that 1991 has such a strong spike for apple. A strong green apple character was very characteristic of prephylloxera Les Pierres. In 1992 some important blocks were replanted due to phylloxera infestation.

- Slide 5: Competitive Wine Tasting



This gives images of five different wines. One is from Napa Valley, one from Carneros, one from Meursault, and two identical bottles of Les Pierres. Of course, the wines were tasted blind. We did not know that there were two of the same wines in the tasting. Brice Jones had secretly placed the second Les Pierres in the tasting to see if we were truly being discerning. It adds credence to this method of evaluation and to the consistency of the tasters that the Les Pierres graphs are so uniform. Also demonstrated here, and we have seen this in other tastings, that French Burgundies tend to shift to the earthier, nutty side of the scale. California Chardonnays tend to the fruity side of the scale. The Carneros wine was found to be oxidized by many in the panel, hence the limited range of aromas and strong veg placement.

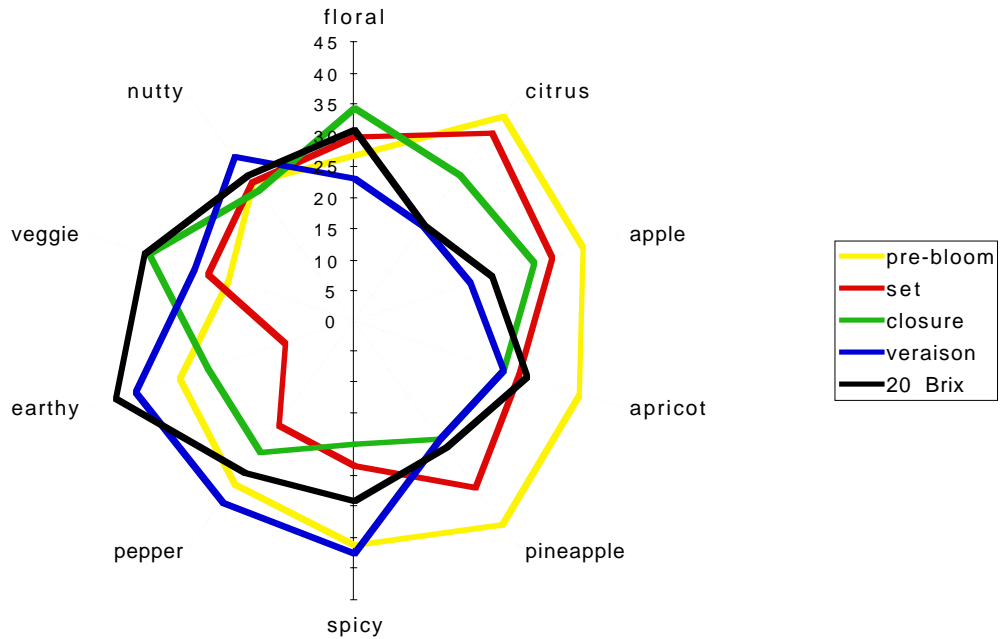
- Slide 6: Competitive Tasting of SCV Wines and White Burgundies



This is another image showing the comparative results of an aroma evaluation looking at Les Pierres and The Cutrer and a Montrachet and a Corton. Again, we see the stronger fruit expressions of the California Chardonnays as opposed to the more earthy, nutty white Burgundies. You also can see Les Pierres and The Cutrer repeating their typical shapes.

- Slide 7: The Cutrer V-Block Time of Thinning Trials

Cutrer V Block Time of Thinning Trial



I wanted to show you this slide because it is so interesting. This is an evaluation of one of our vineyard experiments. I wanted to look at the results of thinning a various times during grape development. We set aside ten rows in V-block at Cutrer vineyard. Two rows are thinned to one cluster per shoot just before bloom. Two rows are thinned at berry set, two rows at what we call cluster closure, two rows at veraison, and the last two rows at 20° Brix. We have only one year's data, so it is a bit premature to draw any conclusions from as yet, but it has generated a pretty interesting aroma graph. What we see here is that the earlier thinning is always on the right, the latest thinning is shifted to the left. In other words, there is a progression, starting with pre-bloom thinning on the fruitier side and ending with the 20° Brix thinning on the more earthy side. I find this pretty interesting. And it is reproducible. It is surprisingly similar to the differentiation we see between California Chardonnays and white Burgundies. What does this mean? We intend to find out ...

CONJUGAL TRANSFER SYSTEMS FOR WINE-RELATED LACTIC ACID BACTERIA**David A. Mills**

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Over the past 15 years research on the genetics and physiology of lactic acid bacteria (LAB) has increased dramatically. One outcome of this research has been the commercial development of LAB starter cultures with novel metabolic capabilities thereby ensuring more consistent fermentations and improving product flavor. While molecular tools for genetic manipulation have been developed for some LAB, primarily lactococci, others are resistant to molecular approaches. Indeed, the lack of appropriate molecular tools has slowed research on a range of LAB (such as *Oenococcus oeni*) and impeded commercial strain development.

In the past decade electroporation has become the method of choice for transforming LAB. Electroporation utilizes extremely high voltage, short duration electronic pulses to permeabilize bacterial cell membranes and thereby facilitate passage of DNA (7). While the advent of electroporation has clearly advanced molecular analysis of some LAB, other strains (such as *Oenococcus oeni*) are still difficult or impossible to transform by electroporation. One alternative to electroporation as a means of

transformation is to exploit conjugative systems to promote genetic transfer of plasmids between bacteria. In nature, conjugation is considered to be a dominant means for genetic exchange between bacteria. The specific mechanism of DNA transfer comprises two distinct functions, one involving the enzymatic preparation of the plasmid DNA prior to replicative transfer and a second encompassing the formation of the mating channel through which DNA is transferred into a recipient cell (6). Initiation of plasmid transfer requires a single-stranded cleavage at a specific origin of transfer (oriT) produced by the action of a specialized nucleoprotein complex called a relaxosome. A key feature of transfer origins is the ability of the region to confer mobilization in cis provided the remaining transfer functions are present in trans. This trait has led to the exploitation of oriT regions to generate mobilizable plasmid derivatives which are transferred into recipients providing the remaining conjugal functions are expressed in the same cell. This strategy has often been employed to permit manipulation of bacteria that are difficult to modify by current genetic technology (13).

Several heterologous conjugative systems have been shown to transfer to and among the LAB. The broad host range conjugal elements pAMb1 and pIP501 have been transferred among a variety of LAB. These systems have also been utilized to mobilize traits among lactococci, lactobacilli and enterococci (5).

Mobilizable derivatives of pAMb1 have also been exploited for allelic exchange in LAB (2). Among the LAB, most indigenous conjugative elements

have been identified in lactococci (15). These conjugal elements have also been exploited as a means of strain development of commercially significant starter cultures. However, in all cases, the specific genetic trait involved was fortuitously positioned in association with a conjugative element allowing mobilization into other lactococci. Currently the means to conjugatively deliver specifically engineered genes among LAB, in a food grade manner, remains to be developed.

Recently we have characterized the conjugal element pRS01 from *Lactococcus lactis* subsp. *lactis* ML3. pRS01 and a homologous sex factor from *L. lactis* subsp. *lactis* 712 are prototypical mobile elements in lactococci. Both elements have been shown to mediate high frequency transfer of genes encoding lactose utilization (Lac+) by insertion sequence-directed cointegration with non-conjugative Lac+ plasmids. In addition, both elements confer a cell aggregation (Clu) phenotype associated with high frequency conjugative transfer. Previous genetic analysis of these elements has identified the gene responsible for the aggregation phenotype (clu) associated within an inversion region (1). In an effort to exploit conjugation as a means of lactic acid bacterial strain development, we characterized the transfer regions of pRS01 by insertional mutagenesis using the plasmid pTRK28 (14). Analysis of the insertion site junctions of pRS01::pTRK28 cointegrate plasmids identified four distinct regions of pRS01 involved in conjugative transfer (9). Two of these

regions, Tra1 and Tra2, were found to be unlinked to the previously known transfer regions (1).

Complementation analysis of Tra1 region insertions with cloned Tra1 DNA resulted in mobilization of the complementing vector, an outcome that indicated the pRS01 conjugative origin of transfer (oriT) was contained within the Tra1 region (8). Sequence analysis of the region encompassing Tra1 and Tra2 revealed six open reading frames (ORFs), ltrC, ltrD, ltrE, ltrBE1, ltrA, and ltrBE2. Further analysis indicated the presence of a bacterial group II intron (termed Ll.ltrB) within the gene encoding a conjugative relaxase (ltrB). This intron was subsequently shown to possess both splicing and mobility functions common to many fungal group II introns (3, 10, 11). Deletion analysis of the Tra1 region localized the pRS01 transfer origin to a 446 nucleotide segment in the intergenic region between ltrD and ltrE(12).

In order to exploit the pRS01 conjugal system for genetic manipulation of LAB, we examined the host range for transfer of pM2036 (a cointegrate plasmid containing pRS01) and the mobilizable derivative, pLE12-4, into several LAB recipients. Conjugative transfer was observed into *Leuconostoc mesenteriodes subsp. cremoris*, *Enterococcus faecalis*, *Lactobacillus johnsonii*, *Streptococcus thermophilus* and *Oenococcus oeni* recipients. Moreover, transfer of other pRS01 derivatives was established with *Lactobacillus acidophilus* and *Lactobacillus gasserii* recipients. Surprisingly, intergeneric conjugal transfer into *Leuconostoc* and *Lactobacillus* often occurred at

extremely high frequencies (10^{-2} to 10^{-3} transconjugants/donor cell) similar to those obtained with lactococcal recipients.

Our current work is focused on the development of additional oriT-containing derivatives that are mobilizable by pRS01. These vectors will then be utilized to study gene expression in *O. oeni* and other LAB. An additional goal of this work will be use of the pRS01 conjugal system to promote allelic exchange of target genes. This will permit chromosomal genetic manipulation in the LAB currently resistant to other genetic approaches (like *O. oeni*).

The creation of a pRS01-based gene transfer and allelic exchange system will expand the range of LAB for which molecular approaches are possible. An additional advantage to the creation of a pRS01-derived gene transfer and allelic exchange system is the potential for generating genetic modifications in a food grade manner. Lactococci, the genus in which pRS01 resides, are commonly used as a starter cultures in the production of fermented dairy products and possess the status "Generally Regarded As Safe" (GRAS).

Therefore, modifications generated by use of pRS01 may be considered a "self-cloning" technique (4).

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ENOLOGICAL ROLES OF YEAST MANNOPROTEINS**Claudine CHARPENTIER & Michel FEILLAT**

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Université de Bourgogne • 21004 Dijon • France

During alcoholic fermentation and aging of white wines on lees there is a release of mannoproteins from yeast cell walls. These mannoproteins play an important role in winemaking:

1. they increase the growth of malo-lactic bacteria
2. they interact with aroma compounds, modifying their volatility and therefore the sensory properties of wines
3. they protect wines from protein haze and inhibit potassium hydrogen tartrate crystallization

All these properties will be discussed with regard to the vinification of Burgundy Chardonnay.

CHEMICAL AND SENSORY EFFECTS OF *ELEVAGE SUR LIES* ON CHARDONNAY WINE**Greg La Follette****Flowers Vineyard & Winery****Sonoma Coast**

Samples of sur lies and of racked California Chardonnay wines from two vintages (1989, 1990) and from two barrel-construction materials (French oak, stainless-steel) taken monthly and at bottling revealed no differences in concentrations of viable cells, viscosity, "protein stability/fining" requirements, content of dissolved oxygen, protein or acetaldehyde. Racked wines were lower in titratable acidity (TA), pH and cinnamate, catechin, and total nitrogen concentrations. Differences in redox potential measurements for sur lies versus racked wines were seen only at the end of barrel-aging for the 1990 wines aged in oak.

Sensory pair-tests generally showed few significant differences in oak aroma, while bread-toast aroma was higher in sur lies wines. In stainless-steel, racked wines were more fruity and less toasty than sur lies wines, with no difference between racked and sur lies wines in buttery or oak aromas.

This research was conducted at the University of California, Davis, and at Edna Valley Vineyard, San Luis Obispo, CA.

ENOLOGICAL PROPERTIES OF SACCHAROMYCES CRYOTOLERANT YEAST**Hervé Alexandre, C. Massoutier, M. Feuillat and C. Charpentier**

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Cryotolerant *Saccharomyces* strains were isolated from grape must (Pinot Noir) using the enrichment method. Eleven cryotolerant strains were collected which all belonged to the *Saccharomyces uvarum* species. Fermentations were carried out at 10°C and 25°C, the level of fermentation products was compared with those produced by mesophilic yeasts. Regardless of temperature, cryotolerant yeasts (SY055 and 12233) produced twice as many isobutyl and isoamyl alcohols as mesophilic yeast and 2-phenethyl alcohol was produced by cryotolerant yeasts at levels 4 times as high as mesophilic yeasts. Together with their cryoresistance, cryotolerant yeast are characterized by a greater succinic, malic and glycerol production and a lower acetic acid production. Furthermore comparison of aromatic profile of wine fermented with the cryotolerant yeast showed a greater level of higher alcohol compared with the mesophilic yeast.

Laurent Zanon

Manoir Murisaltien

Meursault

Let me quickly introduce myself: My name is Laurent Zanon, I am 40 years old, and I am an enologist. I have made Chardonnays for 17 years. I have gotten this experience from the various French regions where I worked: in the Champagne at PANNIER's, in Arbois at HENRI MAIRE's, in the South of France at SKALLI's, and at Puligny-Montrachet at CHARTRON and TREBUCHET'S. Thanks to this experience, in 1991 I founded a winemaking consulting company, ATV, then in 1992 we started up a negociant business in Burgundy near Macon, DEMESSEY, and in 1995 we bought another negociant in Meursault named the MANOIR MURISALTIE.

I will tell you about my various experiences in the winemaking of Chardonnay, for I am not here as a scientist who speaks about his research but as a simple winemaker who always has to keep in mind the target to reach, that is to please the customer, and I will speak about my means to reach this target.

I will discuss three ways of winemaking with Chardonnay, plus my own technique I use in my cellar, which I call the "reduction process".

1. Winemaking of a Chardonnay Vin de Pays d'Oc.
2. Winemaking of a Chardonnay AOC Mâcon Vinzelles
3. Winemaking of a great white wine AOC Meursault
4. Reduction process.

1. Winemaking of a Chardonnay Vin de Pay

In this case we work with vats from 6,600 gal to 13,200 gal therefore larger volumes . The vinification are of industrial type and they are led by processes established in advance that are subject to technological rules and simple work orders and results that can be reproducible. Since we didn't have enough background knowledge on the potentials of the different chalky and clayey terroirs, we have chosen to emphasize the Chardonnay grape, to comply with the analytic and or organoleptic specifications of our customers' brands.

Another important point of this type of work is that we must not directly aim at the final product with only one vat , but we have to make different base blends. with respect to structure, richness and fruit, which will take part in the desired cuvée.

As examples , I will talk about two big categories of Chardonnay in the Pays d'Oc:

- fresh fruity and
- heavier oaked

1.1. For the first one, we need at least two wines for the blend: one all fruity and the other one richer:

1.1.a. Fresh fruity Chardonnay is made from clean grapes , mechanically harvested before complete maturation, at 11.3 to 11.5% potential ethanol, T.A. 5.0 to 5.5 (as H₂SO₄) (Ed.: conversion factor to tartaric = 1.531), cold settling, then use of cryophilic yeast selected in regards to the desired fruity flavor , vinification in temperature-controlled vat at 14°C. Malolactic fermentation is inhibited to keep an acidity from 4.0 to 4.2 after cold stabilization, and a pH of about 3.3. The wine is kept until the blending on the very thin lees at 14°C.

1.1.b. In order for the fruit to last in the bottle it will have to be blended with a fat and more structured wine which can be reach by manual harvesting (or mechanically but very early and cold in the morning. Initial maturity from 11.5 to 11.7 % potential ethanol to be raised to about 12.3 to 12.5% potential ethanol. A Laccase test is performed on the must (2 point maximum); skin contact of the destemmed grapes in vats where they macerate from 6 to 12 hours at 12°C according to their condition. The use of pectolytic enzymes of 2-4 g/hL can sometimes enable us to emphasize the varietal aromas of Chardonnay. The alcoholic fermentation will take place at 17°C to 18°C. MLF will be inhibited and the wine will be kept on the thin lees in air conditioned cellars until blending.

1.2. Chardonnay matured in oak barrels

It will be better here to keep wines in barrels containing more alcohol in order to avoid the problems of storage. Again, to get a good blend we need at least two base wines:

1.2.a One base wine corresponding to 60 to 80% of the final blend which will be harvested between potential alcohol of 11.8 and 12.0% potential ethanol. The total acidity is 5.0 to 5.2 and we use skin contact time as in the example above. Then we can put concentrated must to reach 12.7 to 12.8% potential ethanol. The fermentation temperature will be at 20°C with the malolactic fermentation inhibited. The wines will be put in new oak barrels on their thin and medium lees and protected by inert gas for racking. During the maturation in barrels we will periodically use stirring (bâtonnage) until blending. The choice of wood and toasting level is also very important.

To end with the Vin de Pays d'Oc Chardonnay, I have to point out something that is applicable to all wines. Despite of all the care taken at harvest time as well as in the vinification process, the quality of the bottled wine will be quickly altered if the choice of the fining has not been thoroughly thought over for each element of the final blend: if the filtration too harsh, if the level of CO₂ is too low, and especially if you have worked the wine without specific and necessary reasons, which always leads to excessive levels of SO₂.

By experience, I have noticed that after more than 60 to 70 mg/L of total SO₂, the wines loses its specific organoleptic qualities, and at over 110 mg/L it becomes dry and also can become a health concern.

2. Chardonnay; Area of Mâcon; AOC wine

The two examples are:

- the winemaking at the Vinzelle Cooperative (CAVE DES GRANDS CRUS BLANCS) with a total production capacity of 264,000 gal, and vinification in tanks of 2,600 gal to 6,600 gal.
- the winemaking at the CHATEAU DE MESSEY with a total production capacity of 13,200 gal in 396 gal barrels and stainless steel tanks of 1,300 gal.

2.1. Vinzelle Cooperative

In the case of the Mâconnais, we work on a type of process I call half-industrial. I can't give you each detail either concerning the vinification techniques because in our AOC area we have to respect the local, constant and loyal uses, or concerning the analytic and organoleptic quality of the final product since it must correspond to taste criteria defined by The National AOC Institute.

The soil (Terroir) of Vinzelle is composed of clayey and chalky grounds and gives us rich and very typical wines that look like their neighbor, the well-known Pouilly Fuissé; we are used to saying: "it's *pouillotent*".

An example of standard Mâcon Vinzelle: It is mechanically harvested then pressed pneumatically. We use pectolytic enzymes (CPZ 500 for clarification), and selected yeast. The alcoholic fermentation is controlled under a temperature of 18 to 20°C, pH 3.2 before malolactic fermentation, then 50 to 100% go through MLF according to the type of blend (cuvée) in order to get the wine to 3.8 g/L of total acidity (H₂SO₄) after cold stabilization. After MLF we use centrifugation to take the bigger lees off, and the wine matures for several months on thin lees in temperature controlled cellars. We fine lightly with bentonite, then the wine is cold stored in vats at -30C by contact, followed by a Kieselgur filtration, finally it is bottled through a 1.2 µm filter, the level of CO₂ is 800 mg/L, and total SO₂ mostly lower than 60 mg/L.

Beside this standard type, we make selections of the different lots every year in order to elaborate smaller volumes of very strong and very fruity wines in relation to the age of the wines or the characteristics of the soils, which enables us to adjust our blends. Moreover, this year facing the lack of fruit owing to the damages from spring frost, we have invested in a filter for the deposit of the must (canvas filter plate), which enables us to get back 85 L of

clear juice at potential 11% potential ethanol from 100 L of deposit of must at a potential alcohol of 11% potential ethanol, increased with white sugar to get 13% potential ethanol. The fermentation has been made by natural yeast, the fermentation temperature has been controlled at 15.5 to 16°C in order to get a good concentration in primary aromas of Chardonnay grapes.

These aromas are strong, in majority with white flowers, exotic fruit and they are very interesting for the blend.

2.2. In the Château de Massey, the wines of Chardonnay AOC Mâcon Cruzille are for the most part kept in new 396 gal oak barrels on thin and rough lees where we work a “reduction process”, about which I will talk later on.

The harvest is done manually, the grapes pressed pneumatically with a light settling lasting for 3 hours. Located in ancient vineyards belonging to the Monks of Cluny Abbey at the very top of Cruzille village in the North of the Mâcon area, the vines face due east that's why the crop comes in late every year, however in clean condition, and with a potential degree of 11 to 11.5% potential ethanol which we increase to 12 or 13% potential ethanol according to the type of wine required. The pH before MLF ranges from 2.8 to 3.0. The alcoholic fermentation develops between 20 and 25°C. The MLF are often stuck between 80 and 90% to maintain the wine with a typical malic character and

to hold a total acidity of 4.2 g/L (H₂SO₄) after cold stabilization. During the maturation we leave the wines on their lees without touching them or we just stir (bâtonner) them but rarely and quite lightly, and this from the end of September to the end of March when the wine is bottled. We touch the wines very little since we want them to get to a state of reduction close to mercaptan formation but without reaching it - that's what we call it the "reduction process". The musts placed in the wooden barrels generally come from selections of juices corresponding to the median zone of the berry (out of 530 gal = 160 + 210 + 160 only the 210 gal of the heart of pressing will be placed in barrel.

In addition, in tanks of 800 to 1,300 gal, we make a range of Mâcon wines which are fruity, structured, or rich and fat, according to the selected judges and the strains of yeasts used (empirically chosen from fermentation starter cultures and others bought from yeast suppliers) which will be the elements of blending of the three blends of Chardonnay made at the estate.

3. Vinification of a Meursault Village at the MANOIR MURISALT[EN

Our total production is 26,000 gal of Villages, 1st Cru and Grand Cru whites.

During the vinifications of great white Burgundy wines, the variety grape becomes secondary and must fade or rather bring the qualities of the soil out.

This time, the vinifications are totally made by craftsman in the noble sense of the word and are made for sets of 5 to 30 casks in oak barrels which contain 228 Liters. Our soils composed of clayey and chalky grounds draw their differences from the location of the vines in relation to the hill (bottom, middle or top) and to the sun setting (south-cast, slightly north or to the east). Towards the east is undoubtedly the orientation which gives the best results in Burgundy since it enjoys a good balance between hours of sunshine and summer heat which both enable the good process of photosynthesis and the good evolution of acids. But the TERROIR is not only that, it's also the IDEA each winemaker has of it.

To use a parable, the soil (terroir) little by little corresponds to a landscape several painters would have to paint, each one seeing it through his own eyes thus would paint it in his a way, but in any case, anybody could recognize it. It's a bit the same thing for the winemakers of Meursault or of any other great white wine.

It is therefore more difficult to speak about the wines of Chardonnay from our soils in purely technical words since a part of the artistic sense of the winemaker has to be taken into account.

The vinification of the 1998 Meursault at the Manoir Murisaltien is one of the most classical. It is hand-harvested with a yield of about 480 gal/acre and a potential maturity of 12% potential ethanol increased to 13.5 with sucrose, a total acidity of about 5.5, pH of 3,0 to 3,1 maximum, pneumatically pressing, SO₂ to 20 mg/L, then cold settled for 6 hours at 16°C.

The different sets of the same blend are located in new barrels (Allier, Tronçais, Vosges, Nevers, Chatillonnais) or in barrels used in one or two vintages. The fermentations are inoculated with commercial starter cultures or by fermenting starters prepared from grapes selected in the vineyard some days before. The temper of fermentation is not controlled and can reach 26°C.

The chaptalization is done in fractions to make the fermentations last as long as possible in order to gain in fineness and aromatic complexity.

The malolactic fermentation is prevented to keep a total acidity of 4.0 to 4.2 g/L depending on the richness and the alcohol level of the must. Having a good pH (from 2.9 to 3.0) is very important for us at the Manoir, and with equally considering the rate of sugar accumulation it influences our choice of the date of the harvest.

For 90% of the grapes, the purchases came from vines oriented towards the east . Each set of barrels of a same blend will be worked differently in order to

get either structure, or some richness, or some fruit which will complement another in the making of the blend. The choice of the type or barrel will be made according to the presumed characteristics of the vintage for each cru. After 8 to 10 months of maturing on lees in barrels, we will generally fine this wine with a slight dose of bentonite and we will bottle it with a light filtration, or more and more with no filtration at all when the customers agree with it. The transfer to cold storage will be made only if the wine really shows an obvious tartaric instability.

Most of the winemakers in Meursault stir (bâtonnent) which means they periodically put their thin lees in suspension in order get richer, more aromatic wines.

4. Finally, I will tell you a few words of what I call "working with the reduction process":

On my own free will, I have chosen to settle more lightly than it is done in our area so that I can keep average deposits of the lees in addition to thin lees and increase my chances to have temporary aromas of pronounced reduction. In fact, experience has shown me that these wines are often those which have the largest complexity and the longest potentiality for aging.

Moreover, the fact that I have sulfur compounds in my wines in form of H₂S,

which is highly reductive, protects the most subtle aromas which, in my opinion, are the most revealing of the terroir.

We vinify our musts directly in 228 L barrels and its porosity gives a tiny contribution which is slow and continuous in time add gradual from the top to the bottom, which is often enough to avoid the occurrence of mercaptans.

Having a good pH enables me to keep weak doses of sulfur dioxide. As soon as bâtonnage is done too often, a lot of oxygen is dissolved every time, which leads to oxidation these most subtle aromas and compels us to adjust the doses of SO₂ more often. The less the wine is handled, the more we try to work in good harmony with the material Nature has given us, and the greater the opportunity is to have a "hygienic" wine.

Finally, I would like to say that in Burgundy our TERROIRS enable us to make beautiful things easily but very often, most often, it is the experience and the skill of the winemaker that will make the difference!

Jean-Yves Bizot

Domaine Bizot

Vosne-Romanée

Domaine Bizot is a very little family estate, certainly one of the smallest of Burgundy. It is located at Vosne-Romanee, a famous area of Pinot noir production. We work on 2.5 ha (6.25 acres) and yields are low. We produce between 6 000 to 10 000 bottles year, depending of the vintage. 95% of production is red wine, on 5 different wines, all made with Pinot: one of the goals of the estate is to disclose the particularities of each area of production.

In Burgundy, an old fashion gives wine the name of the area where it comes from. Among all the other components of quality, it is an intuitive acknowledgement of the role of natural factors on characters of wines. Everything being equal, two areas of vineyard, sometimes neighboring, don't produce the same wine.

Very early in the history of vineyards, winemakers have noticed this fact, and at the same time they developed techniques of growing and winemaking process, they have selected areas of production. The use of only one type of vine, the Pinot, have made easy, and also necessary, this approach. In spite of its simple appearance, the area of vineyards of the Côte-d'Or, what we call

“La Côte”, is a complex environment, which maybe finds its expression in the diversity of wines. All the production of wine in Burgundy is founded on this idea, the terroir.

But what is a terroir? To start with, we will consider it as an agronomic notion. Then the terroir is only natural factors : geology (kind of rocks, tectonics, climatology at all scale, and pedology (type of soil, depth, etc.). Even nowadays, it is impossible to make a simple and full synthesis of their role. A description of the environment of the two most famous areas of production of Pinot, Côte de Nuits and Côte de Beaune, brings only part of an answer and contributes to understand how this influence expresses itself.

But, in fact, in the terroir there are also human factors, manifesting themselves in the history of the vineyard: successive growing processes, fertilization, density of planting have had a role on environment, as history and economy, as the vineyards of Vosne-Romanée show us.

At last, and maybe above all, terroir is a state of mind, a humbler attitude in front of Nature. In an estate, it determines an other way of production, a more searching approach of the intrinsic quality of vineyard and grapes, and of the winemaking process.