



PENNSSTATE



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Introduction

Warning: This article is really intended for viticulture geeks and wine nerds. It is also very long. Our mission was to learn about vineyard practices in Bordeaux and I believe we succeeded. As a demonstration of our commitment to this goal, when Monsieur Bascaules at Chateau Margaux asked us what we wanted to do I replied that our priority was the vineyard and if, in the interest of his time, we could not visit the cellar, that would be fine. Jeff immediately gave me a very startled and nervous look, like I had just said, “we really don’t care for your wines, but we sure would like to see you vineyard.” Thankfully, we got to see both and they are spectacular. We were given a tremendous volume of information during our brief visit hence the length of this documentary. I also wanted to integrate some of the non-viticulture Bordelais charm and personality we encountered.

Great wine regions around the world have a varietal identity. While Pennsylvania and the Mid-Atlantic region are in the process of establishing its identity the trend appears to be towards the Bordeaux varieties, at least among red wines. Soils in the region are quite different from those in Bordeaux yet there are enough climate similarities to continue to pursue this course. If considered in the context of terroir, we may have three of the key components – climate, plant materials and viticulture. Soil, which is the key to

Bordeaux, is still an enigma here. It is up to us to figure out just how to best utilize each of these to create wines as magnificent as the best from Bordeaux.

After 25 years in this business I have found the best way to learn and improve is to investigate the methods and ideas of those whom, after careful study, you would seek to emulate. This begins by tasting their wines and setting benchmarks then identifying the key components that contribute to the attainment of those benchmarks. In Oregon it made perfect sense to learn about Pinot noir producers from the vigneron in Burgundy. Once a connection is made then there is a thoughtful process of information collection and synthesis to determine what among those ideas and practices are transferable keeping in mind that we are not trying to make a Bordeaux wine here but a very fine wine that is unique to our region perhaps in the style of a wine from Bordeaux.

I was invited to travel to Bordeaux with a small group of viticulturists to learn ideas and practices in the vineyards. It was an offer I could not refuse. The group consisted of Jim Law at Linden Vineyards and Rutger de Vink at RdV Vineyards in Virginia and Jeff Newton of Coastal Vineyard Care in Santa Barbara, California (Fig 1). These are three of the smartest and most savvy viticulturists I know. While this was a “vacation” for me it was an incredibly thought-provoking experience and I feel compelled to share my observations. Our visits in Bordeaux included:

- Kees van Leeuwen, viticulture professor at the University of Bordeaux and technical director of viticulture at Cheval Blanc
- Dany Rolland, owner of Le Bon Pasteur with her husband, Michel Rolland
- Edouard Moueix at Chateau Petrus
- Jean-Luc Thunevin at Chateau de Valandraud
- Argen Pen and Kees van Leeuwen at Chateau Richelieu in Fronsac
- Frans Roskam at Chateau Cantenac in St. Emilion
- Nathalie Ollat at INRA, the French national agricultural research service
- Jean-Philippe Roby, professor of viticulture at the University of Bordeaux
- Philippe Bascaules at Chateau Margaux

We also visited vineyards at Lafite-Rothschild, Haut-Brion, Montrose, Leoville Las-Cases, Pavie, Ausone and others without appointments.

In preparation for our trip, we compiled a list of questions that we hoped to have answered during our visits (see Appendix B). Our goal was to identify what makes the Bordeaux wines so special and what among those variables can work effectively in our vineyards.

If any judgment could be made to summarize our findings is that in Bordeaux the wine quality is all about the special nature of their soils. In California the dominance of sunshine is reflected in the power of their wines and in the Mid-Atlantic region the quality of our viticulture will likely determine our success. This is way too simplistic but probably will not be far from the truth.

What follows is a description of our visits sprinkled with my own comments. It is not absolutely factual and should be read more as a travelogue than a viticultural treatise. I did my best to record the ideas and thoughts of our hosts but cannot say that I got every word correct (it didn't help that I speak no French). It is a highly empirical report but I hope it will give readers insight into the viticulture practices used by some of the greatest wine growers in the region, if not the world. Appendix C is a metric conversion table.

Overview

There is so much good reading material on the history and general information about wine in Bordeaux that I will provide only a few brief details. The Bordeaux region is in the Aquitaine province of France in its southwest quadrant right on the Atlantic Ocean at 45° latitude. The Gironde, Garonne and Dordogne rivers define the region (Fig 2). From a wine perspective it might be easiest to define Bordeaux in four regions – Left Bank (Medoc), Graves/Sauternes, Entre-Deux-Mers, and Right Bank (Pomerol/St Emilion). The climate is maritime and mild and is moderated by the Gulf Stream. Winter freeze events are rare with the last catastrophic event in 1956. However, frost, hail, and untimely rains are all possible in any year and, in fact, we saw significant hail damage in some vineyards. They receive about the same amount of annual precipitation as the Mid-Atlantic but it is less humid and the critical months of September and October are drier. They do not have hurricanes. While the weather in any given vintage may make or break a wine ultimately it is the soils that are the essence of what make wines from Bordeaux unique among all wines. But this is far too complicated to explain here and I would encourage you to read from any of the excellent reference resources about these special soils. In 2002 the vineyard area of AC Gironde measured about 120,000 hectares and produced about 5.6M hectoliters of wine (62M cases) about 25% of the A.O.C. wines produced in France and 3% of the total world wine production. There are upward of 5000 different wine produced in Bordeaux from some of the world's best to an ocean of vin ordinaire. 89% of the wine is red although very fine dry and sweet white wines are grown.

Sunday

Isn't flying fun? Jeff arrives at Dulles from LAX 3 hrs late and just barely makes the international connection. He's sweating when he walks on 10 minutes before doors shut. A minute after he sits down Rutger is hammering him with vineyard development questions. So the viticulture adventure begins...

Chateau Haut-Brion (Fig 3) is the first, great wine in Bordeaux, given first position in the 1855 classification because of the price of its wines. Located south of the city of Bordeaux in a suburban area called Pessac-Leognan (formerly called Graves) it is a world away from the vast stretches of vineyards in the Medoc. But wine growing in Bordeaux is all about the soil and namesake gravel is immediately apparent on the surface. Just across the street is La Mission Haut-Brion so it is definitely a high-class neighborhood. It is immediately striking how small the vines are and this theme continued through our entire visit even in lesser areas on more fertile ground. Vines are cane pruned mainly to double guyot but canes are so short it almost looks like head pruning with about six shoots per vine. Veraison was just starting in Merlot and canes were almost fully

lignified. Leaves and clusters appeared to be quite large. While we were not able to walk among the vines at Haut-Brion we noted that a neighbor's vineyard has significant erineum mite (erinos) damage to leaves. Flying in we noticed big puddles so it had rained hard recently. We found out that it has been a wetter than normal year so far. We did not see mildews but found quite a bit of esca (Fig 4) and magnesium deficiency. Vines were aggressively hedged which has led to lateral growth at the tops of the canopy, particularly in Merlot. It was hard to detect any shoot positioning work at all. This is very simple canopy management but the reason may be there is not a lot to manage. Many of these same observations carried forward to visits to Chateau Pavie and Chateau Ausone (Fig 5) in Saint Emilion. Both have spectacular sites among the shallow hills of St. Emilion but the viticulture is somewhat rudimentary. The notion of the power of the soil was beginning to sink in. These soils create small vines with short canopies so there isn't a lot to manage.

Monday

Cheval Blanc, Le Bon Pasteur and Petrus are all located in a small corner of the right bank where St Emilion and Pomerol meet, each within a few kilometers of the other. It is a prestigious neighborhood where Merlot and Cabernet Franc are elevated to their utmost performance.

From Michael Broadbent's The Great Vintage Wine Book: *...1947 was the first really eye-opening vintage of Cheval Blanc. I have been privileged to taste Cheval Blanc '47 on ten occasions from 1959, when it was impressive but seemed unready, through the 1960's, when it was consistently rich and lovely. Last tasted from a chateau-bottled magnum: colour still very deep and fine; a complacent, abundantly confident bouquet, calm, rich, distinguished...slightly sweet, plump, almost fat, ripe, incredibly rich, high in alcohol. A magnificent wine. ***** Drink now – ad infinitum?*

This is the only wine that I know of that Mr. Broadbent chose "ad infinitum" as the maturity date. It is from Chateau Cheval Blanc (Fig 6) and considered a landmark wine in Bordeaux. Kees van Leeuwen (Fig 7) is the vineyard technical director at Cheval Blanc and his other job is a tenured professor at the University of Bordeaux. This is a man with impressive credentials and one of the greatest vineyards in the world is his research playground. He is a brilliant viticulturist and combines training in soil hydrology with viticulture. His terroir work is widely known and he was one of the organizers of a recent international conference on terroir in Bordeaux. Cheval Blanc covers 37 hectare of vines and is 58% Cabernet Franc and 42% Merlot. Vines are planted 1.3m x 1.0 m at 8000 vines per hectare (Fig 8). At Cheval Blanc they have problems with Fanleaf virus and Arabis mosaic virus and both are nematode transmitted. 2-3% of vines are affected by Fanleaf. The strategy for control is to eliminate the virus rather than the nematodes. Affected plants display reduced yields as well as leaf symptoms but only modest effects on grape quality. In fact, they did an experiment comparing the fruit from ArMV, GFLV and unaffected vines and found the ArMV wines to be superior. In Merlot there is increased shatter but this can benefit yield regulation. Fumigation is eschewed because it cannot get deep enough and cover crops with nematicide properties are being tested. They have found them to be very specific. Soils are left to rest for 3 ½ years before replanting. Esca exists in Sauvignon Blanc and Cabernet Sauvignon. So far it has

been a wetter than normal year in Bordeaux. Average yields are 35-45 hectoliters per hectare (hl/ha). Merlot (Fig 7) was at 50% color and thinned to one cluster per shoot with no wings. The flavor objective is more fresh fruit rather than jammy qualities that come with overripe grapes. Riparia gloire is used on sandy and clay soils to devigorate vines. Depending on the type of gravel 101-14 is used. Gravel, clay and sand are the three main soil types at CB and contribute very different styles of wines to the final blend. We were able to taste nine wines in three flights, each with sand, gravel and clay between Merlot, Cabernet Franc and Cabernet Sauvignon and the differences were striking. In all cases the wines from sand were the lightest but not in a negative sense – they just had less concentration. The Merlot on gravel was a stunning wine, perhaps even more so since the wine were experimental using micro-vinification methods with no oak. Canopies were light and Kees said they look for 2m² of leaf surface area per kilogram of fruit. This ratio, along with a canopy height to row width ratio of 0.8 is considered important to achieving a balanced vine. We fussed quite a bit over this ratio and determined in the end that the canopy height is the actual length of canopy from shoot base to tip (not from the ground to top of canopy). Even though two shoot position passes are made, strict shoot positioning was not considered a priority but the canopies are small and quite open. Vine locks were not used but wire clips are. There was occasional crossing of shoots and crowded areas. Canopies tended to display open areas where shoots were not positioned. Hedging is an important cultural practice in Bordeaux and the machines were very active during our visits. CB had a brand new set of over-the-row tractors in use that are amazing to see work. Sprayers are air-assisted and cover 4-6 rows depending on the machine. Hedgers do two rows at once. Typically 4-5 passes are made during a season. Canopy shape is more of a box than a flat panel in the classic Smart configuration. Cover crops are used in selected areas mostly to devigorate vines and different selections of grasses are used. CB epitomizes the blend of technology and tradition in Bordeaux. Much of the viticulture is grounded in tradition but tuned with the latest precision viticulture concepts. We saw a tractor in the field with side-scanning normalized digital vegetation index (NDVI) equipment (Fig 9) that is used to measure and map canopy features. This is done much more effectively from the ground than aerial imagery because the cover crop and other vegetative noise are eliminated and just the canopy is read. Even though intimate knowledge of the soils at CB has developed over the centuries, highly sophisticated soil mapping is being performed using electromagnetic conductivity and resistivity to better understand the soil features over the entire vineyard. Kees explained that resistivity is used to account for the interference that metal grape stakes may cause in the data. The understanding of the soil is all about knowing how to deal with moisture, either too little, too much or occasionally just the right amount. For Kees the main goals are small berries by stressing the vines before veraison and shoot growth cessation before veraison to achieve optimal ripeness. Everything is directed at achieving those two key objectives. In a wet season these principles are tested.

Cheval Blanc seems to epitomize the modern Bordeaux winery with its blend of grand tradition with cutting-edge science. I do not believe that I have ever been to a vineyard that has a better understanding of what makes great wine at its particular location. But here, as in almost every place we visited, I did not encounter knowledge or practices that we are not already aware of in Pennsylvania. It is a matter of finding a low to moderate vigor site (limited water holding capacity and nitrogen exchange) and applying very good viticulture to the right variety planted on the correct rootstock. Of course, there is only

one Cheval Blanc in the world and there are an infinite number of variables that contribute to the uniqueness of its wines. But others can capture many of these qualities if the right place is found. If we in the Mid-Atlantic believe that Cabernet Franc is in our regional identity future then we should look to Cheval Blanc as the apex of what this grape can do.

One of the most pleasant experiences of visiting in Bordeaux are the beautiful rooms at each property designed to host tastings (Fig 10). In most cases, wines we tasted were already set out with fine stemware as we arrived at the room. As part of his terroir trials, Kees let us blind-taste nine wines: 2004 Cabernet Sauvignon, Merlot and Cabernet Franc each on clay, gravel or sand (Fig 11). This was an amazing demonstration of the subtle differences in terroir (AJEV. 55:3. 2004. p207). The 2004 Petit Cheval Blanc (their second label) was very elegant and supple with delicious fruit. The 2005 Cheval Blanc was classic, a great wine in every respect and a joy to taste.

We met Michel Rolland, the noted wine maker and blender in Virginia in May and from that encounter arranged a visit to Le Bon Pasteur (Fig 12), his family's winery in Pomerol. Bordeaux red and white wines typically blended to take full advantage of terroir features and Mr. Rolland is an acknowledged master. There are five basic red varieties used in varying proportion according to region and style – Cabernet Sauvignon, Merlot, Cabernet Franc, Petit Verdot and Malbec. Among the whites, Semillion and Sauvignon Blanc are most important especially in Sauternes. We learned at Cheval Blanc that matching the correct variety to soil and climate characteristics (although soil is the primary consideration) is absolutely critical to wine quality. The great skill of the blender is to take the parts and mix and match them to make the best possible wine. Mr. Rolland was in South Africa at the time but we were able to visit with Dany Rolland (Fig 13), a fine oenologist and winemaker in her own right, Ludwig Vanneran, their wine maker and Benoit Privot, the property manager. The vineyards at LBP total 6.6 hectare are scattered around northeast Pomerol near Maillet. The vines near the winery had gravel on the surface with a clay layer at 80cm. Vines are pruned to double guyot with 6 buds per cane and thinned to 1 cluster/shoot. Malbec is used for additional yield and color in the blend but the wine is primarily Merlot (80%, ENTAV 181) and Cabernet Franc (20%). Cover crop is used in areas to reduce vigor but also for biological diversity. Normal harvest dates are between September 18 and 25. Many vineyards pick too early and Mr. Rolland is known for his patience. Wings are removed to improve fruit maturity and average yields are 35 hl/ha. Rainfall in the area averages about 1000mm/yr (VA is 1300mm) and they spray about 10 times during the season. Roots penetrate into the soil to a final depth of about 10m and gravel is present to 3m – gravelly soils are preferred. Daytime temperatures average 20-28C and nighttime 12-15C in summer and down to 8C in September. Most vines that we saw are trained to VSP with the fruit wire about 50cm from the ground with 2.5-5cm diameter wood posts, although we saw a few new vineyards with steel or plastic posts. Nothing fancy in trellising with one pair of movable catch wires and two fixed wires. Merlot is less upright so some vineyards have begun to use 2 sets of movable positioning wires (Fig 14). We were told that growth hormones were being tested to loosen clusters – gibberellic acid to elongate the rachis and to ethephon to hasten ripening. Both of these practices have been tested in California and not widely adopted in wine grapes. I consider their use in wine grapes to be quite risky.

The winery was very traditional with cement fermenting tanks along with stainless steel tanks and a modern hydraulic vertical basket press. We tasted the 2001 Le Bon Pasteur which had wonderful ripeness and concentration but well balanced especially in the alcohol, acidity and oak. I noted throughout the tour how seamlessly the Bordelais integrate oak into their wines. It is never an awkward or unpleasant feature of a wine despite the frequent use of a high percentage of new oak. But the wine that really caught my attention was a white wine blend from Chateau la Grande Clotte, a blend of Sauvignon Blanc and Sauvignon Vert. It was fruity, fresh, and clean with good acidity and balance with a little greenness in the background. Perhaps it was so refreshing because we were just outside in the hot sun but, after all, this is what a great summer white is all about?

If you play finesse on a great terroir, you have the classics of Bordeaux. Power is not a natural element in Bordeaux, because we don't have the same amount of sun as California or Australia. When we play in hot field, it is like a boxer who is boxing above his weight. When you box above your weight, you know how it will end. Sadly.
– Christian Moueix

I met Christian Moueix when I was a grower in Oregon. In Jancis Robinson's *Great Wines* Christian focused almost completely on the vineyard as the source of great wines. I wrote to him to express my gratitude that in a world of wine maker stars it was possible for one well respected individual to give credit where it is due. Christian was not able to be at the vineyard but we had the very good fortune to meet with his son Edouard (Fig 56). There is a remarkable likeness between father and son - both are tall and very handsome, well-spoken and completely absorbed and passionate about wine, although for many years, Edouard avoided the wine business. He studied at UC Berkeley and had other career plans but was drawn, over time, back to the family business. I think all wine lovers should be glad for this change of heart. It is clearly evident from every word he spoke that he brings tremendous knowledge and passion to the family business.

The winery and vineyards at Chateau Petrus (Fig 15) are on a small country road and are rather unassuming until you notice that every piece of gravel and every blade of grass appears to have its own place. This is the mystery that special places like Romanee-Conti and Petrus conjure up. Exactly what is it that makes these terroir so unique? They look so, well, ordinary. Petrus is situated at the top of Pomerol an area that looks very flat but even the slightest grade can have an enormous impact on drainage. Edouard referred to it as a "bump" on the plain (Fig 16). This bump has a double layer of the magical blue clay (Fig 17) that has remarkable shrink-swell properties that seem to promote the balance of water retention and drainage, encouraging roots to go deep. Edouard showed us some blue clay on the surface and it has the most amazing textural properties – almost platy in nature but well structured. Petrus is tiny by first growth Medoc standards, only 11.5 hectares planted to 95% Merlot and 5% Cabernet Franc. Vine density is 6500 vines/ha, not the highest that we encountered and yields are typically 35-40 hl/ha. The clay is thick on the slope and allows for a slow penetration of water into the soil. The surface drains well and the vines almost always lack water. Rock is mixed into the soil to 0.5m below the surface. 40cm of soil cover the blue clay which roots penetrate in dry vintages when the clay cracks. In wet vintages, the danger is that the clay is too wet and swells causing the roots to suffocate. The clays are excellent at naturally regulating the stress on the

vines. Rows are planted according to slope, not sun. Pruning is single guyot (double is not adapted well to the soils in the region). Shoots are thinned to 5-6 shoots per vine (Fig 18). Leaf pulling is done on the morning side of the vine. Cabernet Franc contributes 2-5% to the wine depending on the vintage. Old vines lend power and tannin to the wine. They crop low and stress early. Vines less than 12 years old are not used in Petrus – young vines do not develop complexity, they are “fruity, easy, nice.” Average vine age is 38 years but we saw 56 year old vines. Rainfall at harvest is the dread of all wine growers. In Bordeaux, as in the Eastern U.S. it determines the quality of the vintage. Chateau Petrus is noted for its effort to cover the vineyard with plastic tarps to exclude water but this we not successful, nor were efforts to artificially reflect light hasten ripening. The use of plastic ground coverings is now not allowed under A.O.C. regulations. A complex system of drainage has been installed including vacuum-assisted equipment that will help the soil to drain (Fig 19). We learned everywhere in Bordeaux that drainage is critical not just in terms of soil properties but relative position to natural and man-made drainage features such as ditches, streams and slopes. Edouard is against reverse osmosis or concentrators in wine making yet tarping the vineyard was considered acceptable. He referred to it as “lazy winemaking” and insists that every possible effort must be made in the vineyard to harvest fully mature fruit. I have wondered about the practicality of concentrators in Eastern wine making but clearly everyone has their own intervention threshold. We heard from many wine growers that global warming is definitely having an impact on vine growth in Bordeaux. Petrus sits on a high spot in Pomerol in a rain shadow that pushes clouds along the Dordogne and to the north so it receives less rain than many of its neighbors. At harvest 150 pickers are able to harvest Petrus in two afternoons. Since the parent company of Jean-Pierre Moueix has many properties, the harvest crew is rotated among vineyards but Petrus is always the priority. Magdelaine is clay and sand. Trotanoy is clay and gravel that can yield exceptional wines – Edouard hinted the 1971 Trotanoy may be better than the Petrus. The weather is the key to picking and he will check it 15 or more times a day. The decision to harvest is made according to flavor development and weather forecast and is so critical to making the best wine. He used the analogy of a ripe peach. The flavor when it is at its peak of ripeness is fleeting – it is there then it is going away. The Merlot has to be picked at the right moment. They are harvested into small boxes and processed straight away, visiting 3 conveyor systems prior to the fermenter. We viewed the simple but elegant (and small by Medoc standards) barrel room and then had the privilege to taste the 2005 Petrus (Fig 21) which was a wine of such great complexity and depth even in its infancy as to defy description. I hope I get to try it 20 years from now if I’m still around.

The Moueix family also own Dominus (Fig 20), a winery in Napa Valley near Yountville. The vineyard is of historic significance and once belonged to John Daniel, the founder of Inglenook. It is one of the few high quality dry-farmed vineyards left in the valley. Their bi-continental experience gives them a very unique perspective on wine growing, especially since Bordeaux and Napa are arguably the two best places to make red wine in the world. While warm and dry vintages often yield the best wines in Bordeaux and the Mid-Atlantic the problem of excessive sunshine is not something we worry about. It is too hot for Merlot in Napa so Cabernet Sauvignon is the main grape in Dominus with some Cabernet Franc and Petit Verdot for good measure. The dominance of sunshine is the key factor in California. It is so imposing on the terroir that it creates a certain sameness in the wines according to some of our hosts (my opinion, not his).

Edouard talked at length about the current situation in the Bordeaux wine trade. It is not pleasant. A handful of great estates are doing as well with their quality and finances as ever before but there is a vast sea of mediocre wines that go unnoticed and these vigneron are struggling to survive. We were told by some that 20,000 hectares need to be removed to bring balance to the supply. Here the cultural differences between the U.S. and France become clear. In America the wine industry has never been subsidized and has learned to live with the harsh realities of the global wine market. The weak simply go out of business or change crops. In France there is a great expectation that the government will save the vigneron who refuses to change his behavior to accommodate an ever changing world. So they block roads, spill tanks of foreign wine, and even burn wineries but in the end, nothing changes. Wine consumption has gone down from a peak of 42 gallons per person per year to 17. Australia is now a huge exporter of wine. Those are the realities. Edouard also explained the changing dynamics of the traditional negotiant system in Bordeaux especially under the influence of wine critics like Robert Parker, Jr and the Wine Spectator. The trade has turned into a shell game where all the importers are trying to get the Parker wines and ignore the rest. Petrus is secure but can you really feel good about your business and industry if you know the vigneron up the river cannot put food on the table?

What makes Petrus so special? This is the great mystery of wine. Some components are well-defined. It is clearly a unique geologic feature that has special soil properties and when the climate and Merlot merge with this soil wonderful wine is the result. There is also great stewardship of the land by the Moueix family that comes with the resources and passion necessary for the terroir to fully expressive. But there are also infinite intangibles that interact via a mind-boggling complexity of relationships that create a wine of this character. I wonder as I look at the perfectly trained vines on a formidable site if there is anything that can be done to make the wine even better. I'm pretty sure the Christian and Edouard think about this every day.

Tuesday

Too much finesse kills finesse. Finesse shouldn't be about thinness. The truth is that the great vintages of the past weren't marked by elegance and finesse; they were marked by the generosity of nature. That is what the garagistes have understood; it is that which we struggle to achieve within the limits of what nature allows. – Jean-Luc Thunevin

The image of Bordeaux and perhaps more correctly the left bank is of grand chateaux and aristocracy. The tradition is palpable here and change does not come easily or often. Even small changes can cause a stir so when outsiders arrived in town (mostly St Emilion) and started making small amounts of very good wine, the pot was stirred. Le Pin in Pomerol was the first “garage wine” to attract attention because of its quality and prices that rivaled its esteemed neighbors, Petrus in particular. The modus operandi of the garagistes is to find small parcels, not always on very good terroir and apply extremely attentive if not radical viticulture and wine making to produce wines of great concentration and character. Over time, as many garagistes have prospered, they have been able to acquire better vineyards. Perhaps the most successful of the “garagistes” is Jean-Luc Thunevin at Chateau de Valandraud (Fig 22). The chateau is not quite the

image of Bordeaux. We visited a very small and tidy office on the main street in St Emilion and a new, small but highly efficient and functional winery outside of the village. The emphasis is always on the grape. Monsieur Thunevin is a former forestry worker, disc jockey, bank employee and wine merchant. He emphasizes that he started out with little money, if not few prospects, and simply, along with his wife, Murielle (who tends the 4.5 ha of vineyards) worked very hard to build the business. They are doing what many in the Mid-Atlantic aspire to do.

We began the day with Jean-Luc by circling around to the east side of St Emilion where the limestone cliffs are steep and imposing. We stopped at his first vineyard (Fig 23) which is located at the bottom of surrounding slopes, not an ideal place for grapes. But with considerable effort in drainage and cover crops he has been able to produce good grapes. As reputed, the viticulture work here is fastidious. If terroir is comprised of soil-climate-vine-viticulture then perhaps a weakness in one component can be compensated for by strengthening others. Here, a lesser soil is bolstered by great attention to detail in the vineyard. Removing laterals in the fruit zone opened up the clusters to sun and air. The training was both double and simple guyot although he mentioned that he liked cordons and spurs because they produced smaller clusters. Crop was thinned to 1 cl/shoot, a common practice in these high quality vineyards across Bordeaux (Fig 24). Yields are in the 50 hl/ha for this particular vineyard in a deeper soil.

Vine density and size is a marked difference from Eastern viticulture. Typical spacing in the A.O.C. regions was 1.3-1.5m x 1.0 m with vine densities between 6-10,000 per hectare. Even as we drove into the outlying areas, including around our hotel in Pessac, vines were small as density decreased. It was easy to see, as Jeff and I walked around the vineyards near the hotel, the potential of certain places on a slope or on a ridge or hilltop that might attract a garage winemaker. The viticulture in these areas is mostly done by machines and canopies were sloppy - I would guess one pass at shoot positioning, two at most. We noted a new method for defoliation – using a machine that burns the leaves and, at times, scorches berries as well. Economics in the vineyard is a big issue once you leave the name-brand chateau. But it is nonetheless striking the amount of land in the region that can support small to moderate vine size viticulture and how this is drastically different from our own experience. I wonder what it is in the nature and history of the soils that accounts for this small vine size?

Jean-Luc took us to a new Chateau Ausone vineyard in the flats away from the winery where they are planting on 1.3m x 0.6m spacing pushing 15,000 vines per hectare (Fig 25) all in an effort to reduce yield per plant to miniscule levels. How far can they take the plant density and what are the economics of this? We even heard of growers trying 20,000 vines per hectare. It almost appears to be a silly game with diminishing returns that cannot be measured in wine quality but only in price per bottle. This particular field has very deep sandy soils with low humidity and water goes straight through it. In all of our visits we never heard very much respect for sandy soils. It will be interesting to see what Ausone can do with this field. The rootstock was 3309 which the bordelais like in sand.

Jean-Luc explained that marginal sites can be overcome with great viticulture – low yields, controlling vine vigor, proper shoot positioning and density, correct vine

spacing/density, crop thinning and pulling leaves so lots of light can get to fruit and into canopy, no laterals on the bottom or top of the canopy. He likes the flavors from high density plantings and says vines have deeper roots. It is all about controlling yield to get concentration in the fruit. Clays have lots of energy so they require a cover crop to moderate vigor but it is the best soil and offers wines with the most depth.

We drove far out of St Emilion among vines that had wider spacing and made inexpensive wines. These are the vigneron that are being upset by the global wine market. We visited an engineer/tinkerer who invented a high tunnel system to cover vines that he claims reduces disease, improves set (in Merlot, for example), helps clusters to color more evenly and hastens ripening. What's not to like? It's like a grow tube for a mature vine that is kept on until July. He also has a machine that lays special plastic materials on the ground to cover the vineyard at harvest to exclude rain. Is this a viable idea for our region?

At a second Valandraud vineyard we saw a fascinating demonstration of terroir differences. Jean-Luc pointed at his own first vineyard and said the wine from it sells for 200 euro (Fig 26), a few meters away another of his vineyards yields wines for 20 euro (Fig 27) and across the road his neighbor's vineyard which was not well-tended sold wines at 3 euro (Fig 28). Throughout our drive Jean-Luc defined vineyard quality in terms of the price per bottle. I had never heard vineyards measured in that way but maybe it isn't a bad idea. What surprised me was that he said each of the three vineyards was essentially in the same gravelly soil. The difference between his 20 and 200 euro vines is mainly vine age. The older vineyard is 40-50 year old vines, the lesser wines come from vines on 10 years old. He illustrated the power of viticulture with vine age to influence quality. Low yields and vine densities up to 15,000/ha achieve quality goals – in the St Emilion A.O.C. they are allowed up to 60 hl/ha but he insists 30 for great wine. Working the vines organically is important as much for getting the vigneron into the vineyard as avoiding the use of synthetic pesticides and fertilizers. High quality canopy management is critical, especially leaf pulling. Finally, he prescribes absolutely ripe grapes at harvest and accepting the risks that this requires and hand sorting of every bunch, every berry prior to the fermenter. Not surprisingly, the winery is a very simple affair, basically a pole barn but with all necessary equipment to make great wine. There are those who complain that all of this is excessive. Perhaps that is why the garagistes remain small in their production so they can devote this level of fanatical attention to their wines. But even on a larger scale he cited the example of Chateau Angelus which has normal soils but practices excellent viticulture to raise the quality of their wines (also with the help of Michel Rolland). He also hears complaints that his wines are just copies of a New World international style to which he replies, "Whatever our technique, whatever our ambition, you cannot pick a ripe grape in Bordeaux and make a Californian wine. But if anyone wants to compare Valandraud to a Harlan, or a Grange, then that's a fine compliment to me."

Kees later explained that Jean-Luc has proven the contribution of fine viticulture in making great wines. He said that Thunevin took marginal sites by the river and made them better - gradually moving up and away from high water tables to better terroir. He also proved the importance of finding a good terroir but that alone is not enough to make great wines - proper viticulture must be applied. Years ago I asked Jim Law if he had his

choice in the Mid-Atlantic between a great site and great viticulture which he would choose. He picked great viticulture and I think I would agree. I have seen poorly farmed vineyards with great terroir potential. They often are able to overcome incompetent farming with the power of their other terroir features. One is forced to wonder what the true possibilities for the site would be if it was farmed correctly. We need to move much more aggressively towards defining and finding great sites and applying the necessary viticulture. We know the latter. Knowing the right vineyard sites is still a work in progress

There was a time when the hilly vineyards of Fronsac, just west of Libourne were better known than Pomerol and St Emilion. The clay, limestone and sandy marl soils are very highly regarded. Merlot and Cabernet Franc are the principal grapes now but Malbec used to be widely planted. We visited Kees van Leeuwen at Chateau Richelieu where he is advising a Dutch investment group that hopes to bring glory back to this historic estate that was founded by the family of the notorious 17th century cardinal of Three Musketeer fame (read the novel by Alexander Dumas, or, if you must see any of the dozen or so movies). Our hosts tell us that Cardinal Richelieu housed his mistresses in the chateau. There are 12 ha under vines comprised of 75% Merlot and 25% Cabernet Franc. The vineyard was beautiful situated on a south slope descending gently towards the chateau (Fig 29). We arrived to find Kees with general manager Arjen Pen and their wine maker looking at soil pits dug in the vineyard. The profile was amazing with about layer of light brown top soil about 18" deep followed immediately by a layer of clay and then almost pure white soft limestone (Fig 30). Effective rooting depth was 2.0 m. The soil is not fertile and the pH can reach 8.2 causing problems with iron chlorosis. At high pH organic matter breakdown is very slow, twice as slow as in the normal 6-7 range. On the other hand low pH between 5.5-6 will slow nutrient uptake and below 5.5 aluminum toxicity becomes a concern. Kees says it is unclear if there something intrinsically special about the relationship between limestone and wines. He did a detailed terroir study of Chateau Beycheville in St. Julien and found no good explanation from the mineral standpoint and believes that it is more of a water availability issues connected to limestone that may offer more finesse to the wine. We talked about vine density and Kees told us that competition between vines does not work in fertile soils, only in low to moderate nutrient soils. Spacing in the vineyard was 2m x 1.5m and cover crops were used. The vines looked old and the vineyard a bit ragged but the site suggests great wine is possible. It was one of those difficult situations to decide if it is better to keep old vines or bulldoze it and replant with new clones and rootstocks on higher density. Esca was prominent in older vines. The subject of trunk renewal came up and Kees believes that if the old roots are retained that a vine with new aerial parts will retain the "old vine" benefits. This is an important consideration in our replacement viticulture system in the Eastern U.S. Kees explained that soil vigor is related to two key attributes: water holding capacity and nitrogen release. The latter is influenced by the presence of organic matter and pH. If the soil vigor is correct, Kees likes 10-20,000 vines per hectare for the best wines from vines with low yields but high overall yields per hectare but acknowledges that this is very expensive to develop.

We tasted five wines including the 1999 that was made before the new group arrived which was very rustic, quite light, thin, and had aged prematurely. Subsequent vintages in 02, 03 and 05 gained weight and power with the help of Stephane Derenoncourt, a very

charismatic if not controversial consultant. Yields are currently 40 hl/ha. The 2005 seemed over-the-top in almost every respect in the sense of classical Bordeaux but would be the object of great debate between the Parkerphiles and the traditionalists. The 2003 demonstrated attractive, plummy fruit with superb balance and refinement.

Frans Roskam at Chateau Cantenac (Fig 31), and his American wife, could be a typically ambitious young couple in the U.S. trying to take a traditional estate and push it to the next level. Vineyards in the flats below St Emilion have sand-clay and sand-gravel soils that grew bigger vines with more crop. Vines average 35 years and are 75% Merlot, 24% Cabernet Franc and 1% Cabernet Sauvignon planted at 6500 vines/ha. 101-14 and 1103 are the rootstocks although 1103P seems to be too vigorous for the soil and displayed big clusters and berries. Barrel tasting wines revealed elegant and full-flavored wines with good balance and concentration. A mobile bottling line was working hard when we arrived which is apparently quite common for smaller estates.

Wednesday

We left the lovely hills and St Emilion for the left bank beginning with a stop at the Institut National de la Recherche Agronomique (INRA) research station south of Bordeaux in Vellenave d'Ornon where we met with Dr. Nathalie Ollat (Fig 32), a grapevine rootstock researcher who has worked for 18 years at INRA. Prior to her rootstock research Dr. Ollat focused on vine trellis systems. We got lucky and were able to sit down with Dr. Ollat in a conference room and toss questions at her like darts for over an hour. She started by explaining that there are three other INRA research stations working on grapes at Colmar, Angers and Montpellier. Germplasm collections are located at Montpellier and Bordeaux. Genomics is an important part of current research with a focus on pest and virus control. Rootstock breeding started in the 1800s with the introduction of phylloxera in southern France. Rootstock research is focusing on viruses such as fanleaf and leafroll which are now big problems in vineyards all over France. Leafroll is present and spread by mealybugs but there are probably other vectors. Fanleaf is spread by the *Xiphenema index* nematode but there is currently no rootstock effective against *X. index*. However *Ripara spp* appear to be less sensitive than *Rupestris spp*. They are looking for resistant genes in muscadine varieties from the southern U.S. states. The muscadine varieties are hard to use as rootstocks and have the advantage of being resistant to powdery mildew and downy mildew. Non-pathogenic improvements include lime tolerant stocks since over a quarter of all French vineyards are on high lime soils. They are also trying to identify rootstocks that will lower vine vigor and yields. Genetic engineering is accepted by nurseries but is a controversial subject in the French wine industry. Despite this INRA continues its genomics research. There might be a solution for viruses since the genetic transformation would be quite specific. But for rootstock adaptation to environmental conditions it will be extremely difficult since the plant and environmental system are so complex.

Fercal is poor against nematodes and tends towards greater vine vigor and is difficult to propagate. 41B is less vigorous than Fercal but grows more strongly than 110R. Gravesac is used in gravelly soils with low pH that are typical of the Medoc region. It has about the same vigor as SO4 but appears to produce better quality fruit.

Dr. Ollat noted that the influence of rootstocks on vine vigor is diminished as soils become more fertile and water availability increases. This is a common observation among wine growers everywhere. This is compelling reason to find low to moderate capacity soils for wine production. When placed in these soils Riparia Gloire demonstrates less vigor than SO4. The difference in a fertile soil will be an overall increase in vine vigor and yield across rootstock types. Yield and vigor work in tandem. Testing across 100 vitis species they have found that high vigor is complemented by high yields. INRA is still looking for devigorating stocks for fertile soil conditions.

In the search for a lower vigor rootstock Riparia species have become the center of attention. There is currently only one sanitary selection available in France – Riparia Gloire de Montpellier. Riparia stocks were among the first brought to France after phylloxera arrived and were studied intensely since the time of Ravaz in the early 1900s but were set aside as too weak a stock for an industry focused on production and yields in the 50's and 60's. Now that the industry wants to reduce vine vigor, Riparia is back in the spotlight. In the past six years they have evaluated 30 different clones. Riparia is drought sensitive and not lime tolerant. It has the interesting property of decreasing shoot growth but maintaining crop size. 101-14 has the opposite performance. The Riparia clones that we saw in the test vineyard are R. *Pulliat*, R. *Portalis* and R. *Meiss* #6 (Fig 33). There are also three clones of 101-14 that are now virus-free and shown to have different performance qualities. Vine vigor is imparted to the vine through soil characteristics. The rootstock is a conduit between soil and scion but there is not a clear understanding of how rootstocks influence vine vigor. Dr. Ollat explained that increasing vine density does not decrease vine vigor through root competition. Soil area does not correlate to vine vigor. In the final analysis it may reduce an individual vine's growth but yield/ha and vegetative growth will increase. In an experiment using nitrogen and irrigation rootstock effects were still unpredictable. It is a matter of the complex interaction between soil, stock and scion. She gave the example that own-rooted Riparia Gloire is a very vigorous vine with huge leaves but when grafted it reduces vigor to the scion. These relationships affect all aspects of vine performance and are extremely complex and unpredictable, for example, roots work because of carbon movement from leaves to roots and roots send nutrients to leaves. The roots are the most susceptible part of the plant. When sugar is lacking (for example if you cut off the leaves) sugar export stops to the roots before fruit clusters.

Of course, we had to ask Dr. Ollat to rank rootstocks in order of vigor. And, of course, her list did not exactly match our own rankings. SO4 is the most vigorous stock, is less drought tolerant and in vigorous soils it won't stop growing. It is very vigorous for the first 10 years and then it will settle down. 110R is more vigorous in warmer regions and less cooler areas. It is drought tolerant and widely used in SE France despite the fact that it is a poor match for Syrah*. Continuing in descending order of imparted scion vigor are 3309C, 420A, 101-14 and Riparia Gloire. Half of all grafted vines use 3309 making it the mostly widely used rootstock in France

*As in California Syrah is suffering from a disorder that causes vigor to decrease and eventually vines die. Dissected plants have graft zone necrosis that occurs early and 110R appears to be very susceptible but the cause is unknown.

It is no wonder that it is the default rootstock in the Eastern U.S. The switch of 420A/101-14 was the only surprise here but a significant one on the low end of the vine vigor scale. Her comments about 101-14 is that it actually decreases yield and not vine vigor and is sensitive to drought especially after planting. She made the important point that in order to create a vine of modest size and vigor the plant has to be managed during its first years to be modest in size. This would mean a judicious use of fertilizer and water during development. 101-14 is a good example of a rootstock that will moderate vigor if tamed while young. After 5-7 years the frame of the vine and the habit of vine vigor are set. Vine vigor is also correlated to the amount of carbon available so leaf area has an impact. Canopy height (shoot length) and vine vigor will increase together. If water and nutrients are plentiful then vigor will be difficult to control. Cover crops may be helpful in this situation.

The relationship between cover crops and rootstocks is not well understood. Cover crops will tend to force roots down. Cover crops use a lot of nitrogen but the exact relationship between nitrogen and rootstocks is not known. Vine performance will vary significantly according to the type of cover crop.

Another way to decrease vine vigor (and yield) is to cordon train and spur prune. A long cane is less balanced than cordons. Arched canes give short and long shoots, it is better to lay canes flat on the wire. Number of buds per plant depends on vine row spacing. Cesare Intrieri in Italy set the number at 10/m. Two cordons are better than one long one.

Rootstock performance can be very difficult to predict. INRA does not do field experiments with rootstocks because of the variation between sites. A specific stock may show variable behavior from one year to the next. Even when five propagation units of the same plant are planted in an experiment, four might be very strong and one will be weak. Researchers in South Africa have done extensive research on root growth behavior which, as expected, depends on the soil. Some rootstocks are better at crossing soil impermeable layers than others. 140R can penetrate and go deep. If roots can go deeper they will, depending on the soil. Density of roots is related to the rootstock type. RG has more fine roots. 110R and SO4 have more root density. The effect of rootstocks is the interaction between the stock and scion and not the root systems size and depth. It is the effect of the combination through the grafted zone. There are connective vessels but it is not well understood how they work. One interesting potted study she showed us used two rootstocks on one scion to see what the blended outcome would be on scion characteristics (Fig 34).

Jean-Philippe Roby is the director of viticulture education at ENITA Bordeaux. It was really an honor for us to meet with him (Fig 35). He is very familiar with the viticulture of the region and we had far too little time to talk with him. Jean-Philippe and Kees cooperate on many research projects including a significant soil study at Chateau Beycheville. We discussed the vine decline situation in Bordeaux vineyards which is quite severe in places where black goo transitions to black arm and then to esca. They are dealing with 4-8 different fungi. The symptoms are most obvious in September and October around harvest and especially in a dry summer when vines are stressed. It is typical to paint pruning wounds in the winter with Topsin, Dreft or latex and not just big

wounds but all pruning cuts. They also wait until sap flows or “tears” appear. They prune long and come through to make second cuts to proper bud numbers.

We briefly talked about the problem of mid-cane blind buds and short shoots on Cabernet Sauvignon. Jean-Philippe said this is a problem when canes extend beyond 6 eyes and they will switch to cordon/spur for more even growth where this is a problem. Greater carbohydrate availability in cordons appears to help the problem.

Regulating vine and berry size seems always to be on the mind of the bordelais. Jean-Phillipe spoke of setting berry size by regulating water in May and June. If the plant is stressed the berries will remain small. As harvest approaches the level of the water table is very important and drainage systems are in widespread use to make sure they stay where they belong. All of this depends on the nature of the soil and water levels are carefully monitored.

Petit Verdot is making a comeback in the Medoc. While clone 400 is still the most widely planted there are 37 different clones that are evaluated by vigor, cane weight, berry and bunch size. PV droops and is hard to train. It likes to be planted next to Cabernet Sauvignon where ripeness is good. Test plots have been established for 10 years and they will observe vine performance for 3 years. From this they may end up with 1-2 clones to recommend. All of the clones go through sensory evaluation.

He mentioned that the bordelais like to control the wine growing as much as they can. Organic practices rely heavily on the use of copper and sulfur but these are not the materials to use 10-15x a year, they rely on other chemicals as well. He prefers the biodynamic method if it can be managed properly.

At Chateau Lanessan (Fig 36) we discussed the great geologic feature of the Medoc is the gravelly soil that resulted from erosion from the Pyrenees after glaciation (Fig 37). The great pine forest to the west was planted to prevent sand dunes from inundating the vineyards. Soils are gravel with some clay. The clay holds water and prevents deep rooting. The vines are planted on the tops of the gravelly mounds and grasses in the lowlands. Shoots will begin to show just enough stress in July. Between row spacing are at 1.0, 1.2 and 1.5 meters but most vineyards now use 1.2m x 1m, 10,000 vines/ha, 3-4 eyes per cane and try to develop a homogenous leaf area. Canopy height is 1.5m with slightly over 1m of actually leaf canopy (Fig 38). 1.5m spacing is more productive, but 1.0m has better quality. We saw cordons with no fruit on them. Cabernet Franc can be very precocious and the plan was to convert back to canes. They like cordon because of smaller berries and clusters but having no fruit is not acceptable. Mg and K are often deficient in the late season and may cause berry shriveling. They try to achieve a Ca:Mg ratio of 2-5:1. The most important parameter is yield per m² of canopy, not yield per vine. Leaf area index is the secret. 1.2 m²/kg of fruit for Merlot and 1.5m² for Cabernet Sauvignon. Merlot yields are typically 40-45 hl/ha. On gravel soils PV likes 101-14. 3309 is considered to vigorous for Cabernet Sauvignon but is okay for Merlot. Gravesac is quite vigorous and Cabernet Sauvignon will ripen later. We were told it is not well suited for the gravel soils. Riparia Gloire de Montpellier is in much wider use now in Medoc.

Our last visit on Wednesday brought us to Chateau Margaux. You have all probably seen photos of the chateau but none do justice to the majesty of the long tree-lined drive with the classic Palladian mansion at the end (Fig 39). It is spectacular. The wine was brought back into prominence after some years in the doldrums by the Mentzelopoulos family in the late 1970s. Now it is often considered the best wine of Bordeaux. Its 80 hectare are planted 85% to Cabernet Sauvignon and 20% Merlot with smaller amounts of Cabernet Franc and Petit Verdot at a vine density of 10,000/ha.

I have been after Paul Pontallier to come to Pennsylvania to do a workshop in viticulture. I was introduced to Mr. Pontallier by Rich Harbich-Olsen, the wine maker at Raphael on Long Island where Mr. Pontallier has consulted for many years. While he was unfortunately on vacation at the time of our visit he arranged for us to meet with Philippe Bascaules, the Directeur d'Exploitation (Fig 40). When growers meet other people there is a few minutes of conversation during which each party casually but thoughtfully assesses the general level of knowledge of the other. I will admit to some disappointment when you have arrived at a great vineyard only to have a very congenial public relations person who has no viticulture knowledge show you around. I have found in most cases that if the other person knows what rootstocks and clones are planted then you have hit the jackpot and found someone who can actually teach you something about the vineyard. Philippe was just this person.

Phillipe has been at Margaux since 1990. He studied viticulture and enology and worked in Beaujolais for a year then came straight to Chateau Margaux. This must be the ideal career path! We started in a beautiful room that had some antique items such as hand-held ground injectors and bellows-sprayers used to battle phylloxera (unsuccessfully) as well as some amazing old vineyard tools. Philippe gave us the lay of the land around the chateau using some beautiful wall maps. It is a very intricate vineyard with many different soil types, elevations, water tables, slopes and much more we will never understand but they have learned about over the centuries. Water always looms above all other considerations and big drainage projects help to move excess water away from vines or keep the water table in check. Recently a large cooperative plan was developed to work with neighbors to divert their water away from the Margaux vines. Merlot is planted in clays soils in the lower vineyards closest to the river (Fig 41). Upper vineyards are gravel soils with Cabernet Sauvignon (Fig 42). Pavillion, the very fine second label of Margaux are in sandy soils. Any vines less than eight years old go into Pavillion. Vines in clay soils take longer to mature. The age of vines is very important to the complexity and density of the wines (Fig 43). Growing Cabernet Sauvignon on the climatic margin here means the fruit never gets overripe although they sometimes get disease problems. Unripe flavors can also be a problem in cooler years. Leaf pulling is done after bloom on the north or east side, especially in certain blocks. Leafing helps with the fruit ripeness and character but too much direct sun and the fruit is too ripe and loses elegance. Crop is regulated very carefully. Each pruner decides on the size of the vine in the winter, generally 3 buds per side. Older vines carry 1 cl/shoot, 6-7 cl/vine (Fig 44). Everything depends on the particular block and its soils. Cabernet Sauvignon on gravel can yield up to 55 hl/ha but 45 is the average at Margaux. On poorer sandy soils the yields may be even lower. Hot weather and early maturity are not preferred since it tends to concentrate defects which do not disappear as fruit ripens. Crop level is important but not always the only answer to quality. Date of harvest is determined when

the exchange between berry and vine ends. They like to wait for this physiological moment indicated by woody and mature seeds and a stemmy, shriveling pedicel. Immature berries have wet and green pulp when the berry is pulled from the stem and the pulp stays attached to the stem. When it is red this is a good sign. Texture of the skin should be easy to chew and eat and not bitter, like marmalade. 14-15 percent alcohol is the general goal. The berries should be full of sugar. Quality of the tannins are hard to access at lower sugars. In 2005 there was almost too much alcohol at 15.5 potential that brought the wines out of balance. The vines functioned exceptionally well and adapted to the drought conditions. In the heat of 2003 the vines did not function well. In most vintages Margaux is capitalized.

Rootstocks in gravel are RG, 101-14 and 3309. Clay on limestone receives 420A which is more vigorous than RG but more lime tolerant. For 30 years 3309 was the most widely used stock but that is change to Riparia Gloire. 3309 performs very well in blocks with older vines.

We came across this curious phenomenon at a few places we visited – the clones are chosen by the nursery. Petit Verdot 400 is criticized here as well as to productive although PV is considered important to the blend adding complexity, retaining acidity and offering power to the wine. Cabernet Franc appears to be a disappointment everywhere we go, maybe even at Cheval Blanc where it dominates the blend but is losing ground to Merlot. New clones are being vigorously sought after by everyone. There is one block of Cabernet Franc at Margaux and they would like to improve the clonal selection. Virus problems are everywhere but Philippe said they prefer to have virus than a bad clone. They also have Flavesence doree (grapevine yellows) that often comes from nurseries and is vectored by vine mealybug. Cabernet Sauvignon clones are 337, 338 and 191. Merlot 181, 182, 343 and 347. Clones are not considered as important as the strength of the terroir. They are doing their own Merlot trials with five different clones with micro-vinification over six years. As we were told elsewhere, clones selected 30-40 years ago were chosen for production ability, not quality. Now that is changing. The oldest vines at Margaux are 60-70 years old. 1% of the vineyard is replanted each year so every 100 years the entire vineyard is renewed. Ground is left fallow for five years before replanting.

Each block of vines is separated during vinification according to terroir. This is a very precise process. They will flag particular sections within blocks and pick those according to relative ripeness. Reverse osmosis is considered the equivalent of saignee but easier to do. In 2002 10-12% of the wine was bled off. They strive for a natural balance in the grape and try to do all the wine making work in the vineyard. The wines are much better if fruit comes in that requires no manipulation or intervention. It is unusual at Margaux that no fruit sorting is done at the winery. They feel that juice and berries on an open conveyor are too exposed to air and oxidation and VA can be a problem. All fruit is sorted in the fields by the experienced picking crew. Picking is slow and careful. A table is placed on the grape trailers so all clusters can be examined before going into the bins. Picking crews consist of five teams with 36 pickers each and 2 managers. They prefer to have young people who have never picked before can be trained to do exactly what they want for quality. They are slower but get better quality.

The winery is phenomenal. The first year cellar is very functional but graceful. The 2nd year cellar is magnificent. It was built in the early 1800s and has a monastic feel to it (Fig 45). There is a certain reverence necessary in the cellar with all that great wine aging quietly in their barrels. Grapes are delivered through the winery wall into two large, open, shallow concrete holding areas and then moved to 26 50-year old oak open top 150 hl fermenters. The fermentation room has an amazing sweet, nutty and honey aroma of old wood and wine.

We entered a small room with beautiful wall tiles to sample the 2005 Margaux from barrel. It was a classic Bordeaux red with lots of power but not heavy, more alcohol than normal as Philippe mentioned but all still well in balance. Philippe offered that the Merlot component gives a big impression but leaves a hole in the palate which the Cabernet fills in nicely. The overall attack is soft but builds up with very ripe tannins and a nice freshness and elegance of a young wine. Merlot was picked on September 23 and Cabernet Sauvignon on October 1, very ideal dates for a Bordeaux vintage.

The dates are instructive. If you read Parker there is a clear correlation between harvest dates and great vintages in Bordeaux. Over the past 80 or so years there have been only 20 or so of what might be considered classic vintages. All of these, if the weather is considered, were warm, dry and relatively early vintages. On the other hand, the consensus poor wines are made in cool, wet and late vintages. Growing grapes on the edge requires cooperation from Mother Nature in order to get the fruit fully mature. Most of the wine growers we spoke to feel that global warming is having an effect on viticulture in Bordeaux.

In the vineyard leaves are cut at 20cm for a balance of leaves and crop. Canopy height reaches 1.5m. The ratio of canopy height to row width is very important. 80% is normal, here it is 1.5m x 1.2m or on some very high density sections 1m x 0,8m. In fact, he would prefer to extend the canopy another 20cm (Fig 57). In 2005 the vine stress was significant and fewer leaves would have been better for the vine. Pressure bombs are used to measure pre-dawn stem water potential. At this time, veraison in 2006, pressure bomb readings were about -4 at pre-dawn. In 2005 daytime readings reached -14, which is about when irrigation gets turned on in California. This is big stress for Bordeaux.

Vines we observed had 3-4 shoots per side and 7-8 cl/vine. Vines have lots of leaves with some shoot positioning but nowhere near parallel shoot positioning, perhaps because the canopies are so small and compact and shoots are only 1m in length. There is not too much canopy to create shade issues. The canopies were not vigorous. Shoots are lignified and tips are shut down. There are very few laterals. The crop was severely thinned. 30 people work full-time in the vineyards.

The clay soils are cold, heavy and very water tight. They are similar to the blue clay of Pomerol in their shrink/swell nature. Water does not penetrate easily. This is a first wine soil. There is low vigor on the gravel on the higher sections of vineyard with greater slope. This is where Cabernet Sauvignon excels. Soil pH is 5.0. Some organic fertilization is done but not every year. Nitrogen is added at 20kg/ha in an organic form. Potassium is added at 60 kg and Mg at 20 kg. The potassium is used to drive the acidity of the wines down. Soils have plenty of phosphorus.

NW rows take advantage of the sun but rows behind the winery run E-W. Slope is the most important feature and drainage always comes first. Cover crops are used in some fields according to vine vigor. Different grasses are being used. Lower fields grow more strongly are likely to have cover crops.

We asked Philippe about the pressure at a great property like Chateau Margaux to always produce great wines, even in difficult vintages. He replied that Paul Pontallier is a great boss who has complete faith in the property and trust in his team so they really do not feel a lot of pressure. This is a great complement to the man and the vineyard. There is 400 years of experience growing grapes at the chateau. This kind of track record and knowledge helps to create confidence.

Thursday

Driving visits to Lafite-Rothschild (Fig 47). It was a gorgeous day in the 70s and clear blue skies. At L-R the slopes are greater than most vineyards we saw and the gravel content on the surface was extreme. Rows faced N-S and E-W depending on the slopes. Vines were very small, crop was extremely limited and shoot growth and canopy size minimal (Fig 47). This is super small vine viticulture at its extreme. The top of the gravel mounds grew Cabernet Sauvignon and must be among the greatest vineyards in the world (Fig 48). Giant octopus over-the-row, 8 row-per-pass sprayers were out working in tandem in the vineyards (Fig 49). The turn-around ability of these drivers is unbelievable. Also tractors were still out in the fields hedging vines and, in some places, they were still cultivating the soil, which we found odd so late into the season. We were told that botrytis sprays were being applied. During our visit we had some rain and it was humid and warm so there was a sense of lack of stability in the weather pattern resulting in some nervousness about the development of the vintage.

The hedging is an interesting practice. We were told that 4-5 passes was usual for a season. In the Mid-Atlantic 3-4x in our vigorous conditions seems to suffice. Apparently part of keeping a vine small is cutting it back frequently. Yet we did not see huge bull canes that needed to be tamed. Internode length appear to be very reasonable on most vines nor did the top hedging result in huge masses of small laterals, despite recent rains. What is special about the Bordeaux of good to very fine wines is the nature of the soil. Even driving along the freeway where one might expect poor and deep soils, we saw vines planted on quite close spacing and trained to 1.5m.

It is amazing to drive up D2 past all the great names – Leoville Las Cases, Pichon Lalande, Palmer, Latour, Mouton-Rothschild, Beycheville, Ducru-Beaucaillou, Lynch-Bage and so many more. Some of the great chateau sit right on the road showing off their turrets and stunning architecture.

The towns are not as charming as St Emilion. We drove as far north as St Estephe and then looped back by the river to Pauillac stopping along the way at Chateau Montrose (Fig 50) which holds a commanding position overlooking the river. The soil is almost pure gravel on the surface and vine size very small (Fig 51). I had the privilege to try a

1990 Montrose a few weeks ago (100 RMP – thank you, Jim) and it was a stunningly rich wine with great finesse and many years to go.

Vineyards at Latour and Las-Cases (Fig 52) are immaculately maintained and it was interesting to note the differences between them and lesser vineyards just across the road. That is the French way. The terroir is well defined, often delineated by a road or a ditch but nonetheless often a different wine at a vastly different price will be the result.

Our last stop was the university research vineyard to look at trellis and training trials. At the lower end of Haut-Medoc, the vines were vigorous and reminiscent of our own vineyards in the Eastern U.S. (Fig 53).

The Parker Effect

I used books about Bordeaux by Robert M. Parker, Jr and Clive Coates extensively as reference resources on particular wineries, vintages, and general background information both before the trip and to write this. They were very valuable guides. My personal preference has always been to read the English writers like Gerald Asher, Hugh Johnson, Jancis Robinson and Coates if for no other reason than they used words to describe wines, not numbers and I prefer the refined English style. But when you are in Bordeaux, there is only one name that really counts. His presence is palpable and often accompanied by a certain sense of discomfort or uneasiness. No matter what anyone tells you, including Mr. Parker himself, he has a huge influence on just about every aspect of wine in Bordeaux and most certainly at the upper echelons of the wine hierarchy. It is certainly a bad situation we have gotten ourselves into, both as wine producers and consumers, that we allowed a single palate, albeit a truly great one, to exert so much influence on how wines are made and what we consume. It is, in reality, and through no fault of Mr. Parker, a lazy mans' guide to wine. He is simply responding to our insatiable demand for numbers and an expert to tell us what to do. I regret this state of affairs because it is really the lazy consumer that gives Mr. Parker (and the Wine Spectator) so much power to influence what people drink.

*What it all boiled down to was that if you didn't make wines that Parker liked, you had a more difficult time selling your wine in America and had to sell it for a lower price... The incentive to change your style and make wines in what was assumed to be the Parker style was great. The French called those wine **parkerisé** – "Parkerized." - from "The Emperor of Wine"*

I feel saddened when I get the sense that wine growing in Bordeaux is being influenced and stylized to meet a certain formula that the producer thinks will please the influential palates. It is a terrible vicious cycle that the economic demands must be matched by a bottle price that can only be propped up with a high score. In a sense, the producers, even those in the highest ranks, are not able to exercise free will in wine making.

Bordeaux, as with all other cool climate, non-arid wine growing regions is at a distinct disadvantage to places like California, Australia and Chile that can use the power of sunshine to iron out many flaws either in the vintage or viticulture and enology. Yet the same principles apply to all of the wines no matter where they are grown. Oregon made a

huge leap when it stopped trying to be just like Burgundy and decided to find our own style of Pinot Noir. But eventually the Parker effect distracted the industry from this goal.

The same might be said of Mr. Rolland who has been maligned as an advocate for a homogenous, international wine style. This may be true but no one is forcing anyone to wine made by Mr. Rolland or recommended by Mr. Parker. There are tens if not hundreds of thousands of wines made in the world of which only a very few gain the attention of Robert Parker, the Wine Spectator or Michel Rolland. The adventurous and wise consumer tries accepts this as one of the great challenges and joys of wine consumption and tastes as many as curiosity can stand. It is the singular joy of wine.

Travelogue

Fortunately for us Rutger has been to Bordeaux in recent years and was able to guide us to distinctive and pleasant lodging and dining. This was never a sightseeing tour and the main attraction was always the vines and we sped from one appointment to the next. While we all love vines, the greatest pleasure are the people, food and wines.

We rented a car at the airport. Be forewarned that most Europeans still drive standard transmissions. We didn't have time to actually visit the city which I had hoped to see. Bordeaux has long been the center of wine trade in southwest France but never considered much more than an industrial port city. However, I have read that it has recently been buffed up to a tourist attraction. I hoped to see where for centuries all that claret got loaded onto ships for England and beyond.

We spent most of our time on the right bank in the area around Saint Emilion and Pomerol. Saint Emilion (Fig 54) is a charming village with steep, narrow winding streets and buildings seemingly growing out of the rock cliffs. The Romans were here a long time ago. It is said they never met hill with a south slope they could not fortify and plant to grapes. Chateau Ausone with its terraced vineyards greets visitors along a steep rock face on the south side of the village. Yes, the town (Fig 55) was filled with tourists and there are plenty of souvenir shops but they did little to detract from the charm.

It is hard to be in France and not think about food, well, just about all the time. We experienced three delightful restaurants can be found right in St Emilion. L'Envers du Decors near the top of the village has a cozy, secluded tree-shaded courtyard in the back of the restaurant and the food was delicious, simple French bistro-style. Similar but located at the bottom of the hill is L'Huitrierie Pie or what Rutger called the oyster restaurant because of its list of fresh oysters. I had an absolutely delicious classic omelet with Perigord mushrooms with pommes frites. For a bit of a splurge you should try the Michelin one-star restaurant at the Hostellerie de Plaisance located on the top of the hill near L'Envers. Plaisance is owned by the owners of Chateau Pavie and the dining room is done in the French Renaissance style. The sommelier convinced us to try the wines matched to the prix fixe dinner menu and they were all superb. The desserts were memorable, certainly in number (5) if not taste and appearance as well.

One of the best moments was to be invited to the home of Kees van Leeuwen to meet his wife and three children and to sit in his backyard overlooking an ancient ruin towards a deep valley and the hills beyond. It was a precious moment to relax from mind-numbing viticulture gibberish to sitting peacefully with a glass of Petit Cheval.

From my first trip to France with my family my father told me to look out on the secondary roads for the little restaurants where the trucks were stopped at lunch. The truckers know where to find the good food. There is something so civilized about a restaurant that places bread and wine on the table before you bottom touches the chair. We were in a bit of desperate search for some lunch and found just such a place near Pomerol. There is no village of Pomerol so do not expect to find food in the area. This little bistro along N89 was filled with local vineyard workers who, along with us, enjoyed some very hearty home cooking.

We stayed in the Chateau de Roques (Fig 56), a very quirky but cozy chateau in the countryside about 15 minutes out of St Emilion near the village of Puisseguin. Get directions. I think rustic is the right term but only in the most charming way. A view from our window overlooking the vast expanse of vineyards helped to offset the lack of AC on warm and humid days. It was nice to go for a morning walk among the vineyards, even though they had been heavily damaged by hail earlier. I would certainly recommend Chateau de Roques as a base of operations. In Fronsac, just by the river is a very nice outdoor restaurant (I can't remember the name but it is just across the river from the tower) that Monsieur Argen Pen from Chateau Richelieu took us for lunch. The eel and mussels are delicious.

On the Left Bank I would highly recommend Lion d'Or in Arcins. There is no better place for local charm and cuisine. It is a bit of a 3-ring circus run by the Barbier family. Packed and noisy but with a very good vibe the local lamb is the classic dish and it is delicious. Chateau Cordeillan-Bages is a few dozen levels above Chateau de Roques in amenities but not necessarily in charm. It is a Relais et Chateaux property in Pauillac and very nice if you want a spa treatment. We mainly went for the space-age food at its fine restaurant that is too unusual to describe but well worth a visit.

Every day we enjoyed both simple and great wines from barrel samples of 2005 barrel samples to a very tasty and easy red wine served in a clay pitcher at a truck stop. There is something particular special about drinking a wine in its place of origin, no matter where in the world you may be. But it is more special in Bordeaux.

We were extremely fortunate that most of our hosts spoke very good English, something Americans take far too much for granted but it made our learning experience much better. Rutger and Jim speak French and that helps a lot in restaurants and hotels, getting directions and trying to figure out what time it is. There is a brief but helpful travel guide in the back of Parker's Bordeaux book.

We worked extremely hard on this trip to decipher Bordeaux viticulture in the context of our own experience in the U.S. Every moment in the car, at meals and meeting with people was spent talking about growing wine. A trip like this is exhausting and I suggest that if you go with friends that you all share a similar passion for something related to

wine. I was glad to get to enjoy the company of Jim, Jeff and Rutger because of their genuine interest in growing fine wines but also for their sense of humor, generous and friendly personalities and love of good food and wine. I remember that this is exactly why I fell in love with this business 30 years ago while traveling through the vineyards in the Rheingau. This is the best part of being in the wine business.

Observations and Final Remarks

I learned more in four days in Bordeaux than I knew in the previous 50 years. An experience like this is such an adventure for the palate and mind. Part of the great joy of being in the wine business is the camaraderie between wine growers around the world. We found everyone in Bordeaux to be exceedingly open and friendly to us and our endless inquiries. The best part of all for me is the intellectual challenge of making a really nice wine. If you are lucky and blessed with a great site it might just happen. But for most it is an ongoing project and a lifetime study that rewards curiosity and experiment, persistence and patience. There were many things that amazed me about what we learned in Bordeaux. Probably the most impressive feature is a terroir that supports small to medium-sized vines over such a vast area. Vine density and hence yield is very important. Just imagine planting 8000 vines per acre ($5 \frac{1}{2} \text{ ft}^2/\text{vine}$)! Imagine the cost! Yields per vine keep going down but at what point does it no longer make sense or a difference? Yet even on the highest density plantings (1m x 1m) they still thinned crop. The soils are really what are special here and they have put in centuries of study to understand their properties and which varieties are best suited for a particular soil relative to other hydrologic features such as water table, elevation and slope. That Kees' training as a soil hydrologist is completely logical in Bordeaux especially given his two viticultural imperatives: stop shoot growth prior to veraison and keep berry size small. His main tactics are to regulate water holding capacity and nitrogen exchange. They take great pride and care of their soils and there is a clear sense of stewardship among the great properties knowing the gift they have been given. The climate is moderate but every vintage is unique and there is an undeniable connection between warm and dry years and wine quality, same as here. One of the key advantages they enjoy over us is a little less rain during the critical harvest months. The viticulture is another surprise because it was not as rigorous as I expected. Parallel shoot position was not practiced at any vineyard we visited, including the vineyards of Jean-Luc Thunevin. Yet, there was a complete sense of understanding the vine treatment. We did not hear the term "vine balance" used very often. Perhaps that is just an understanding between the soil and the rootstock. Yet in the past when SO₄ was king and production was the mantra the wine quality clearly suffered. Lucie Morton has been telling me for years that the best way to control vigor is to hedge the vine and the bordelais certainly do that well and regularly (4-5x). There is a very capable blend of tradition and new ideas and technologies at the properties we visited and a clear recognition of the value of both.

We did not spend much time in wineries but saw that concrete tanks are still an important feature in processing. Also, sorting the fruit, sometimes as many as 3x prior to the fermenter is de rigor even in fine vintages.

The wine culture in Bordeaux is pervasive. There is a small vineyard in front of the entry to the airport. The food and wines make any visit to the region a great experience. The

people we met clearly work very hard but they also set limits and enjoy their local culture. At the great properties it was clear that it takes a lot of money and great passion and talent to maintain the lofty standards expected of them. It is big business, too be sure. The 2005 futures for Ausone are over \$1000/btl, \$700+ for Cheval Blanc and \$300+ for the Medoc first-growths and a stunning \$2000+ for Petrus.

Over the centuries a solid support infrastructure to the wine industry has built up in the region including research facilities at INRA and the University of Bordeaux. Training for professionals takes place at vocational institutions. There are all the vendors of equipment and supplies needed to keep an industry chugging along. The government, for better or worse, supports the wine industry.

Finally, we just have to be a lot smarter and better than our colleagues in France and California if we are to achieve their level of wines. California has the blessing of the sun and no rain. If we learned anything on this trip it is the necessity to control water. California has spigot viticulture, they just turn it on or off as needed. Even Bordeaux does not have the environmental challenges we regularly confront such as wet, warm and humid summers, hurricanes and winter freezes. Until we identify our best terroirs and then find and plant them, we will have to follow the heroic example of Jean-Luc Thunevin and excel in our viticulture. That is where our good wines will come from.

Acknowledgements

Adventures like this do not just happen without a lot of planning and preparation. I'd like to thank Rutger de Vink in particular for his ambition to make a connection to Bordeaux and cultivating the relationships that helped make this trip an educational success and will contribute to the quality of his wines. I cannot possibly offer enough gratitude to the wonderful people in Bordeaux who spent hours of their time, just before or during the critical holiday period, sharing with us their incredible wealth of knowledge and experience. I believe that collaboration between the Mid-Atlantic region and Bordeaux will help us to craft unique wines in a bordelaise style.

I would also like to thank the Pennsylvania Association of Winegrowers for helping to fund this exploration of wine growing in Bordeaux. Their contributions to the professional development fund of the Wine Grape Program are generous and greatly appreciated.

Recommended reading:

Someone in France told me that the reason why Americans and the French don't get along as well as we should is that we are so alike. I think there is a lot of truth about that. No matter what you think of the French if you are in the wine business you simply have to acknowledge that they make the best wines in the world so it is useful to understand them as well as their vines. A good book I recently read will help to illuminate the French mind and culture. It is called *Sixty Million Frenchmen Can't Be Wrong (why we love France but not the French)* by Jean-Benoit Nadeau and Julie Barlow. This is excellent background reading.

Please read Jim Law's article when it appears in Wine East. He states succinctly in two pages what it took me over 20 pages to do. Jim knows how to connect the dots in wine growing. In this article he compares viticulture in California and Bordeaux to our experience in the Mid-Atlantic region.

Reference resources: many of these books can be found in the Penn State library system.

1. Jeffords, Andrew. *The New France*. Mitchell Beazley. 2002.
2. Parker, Robert M., Jr. *Bordeaux: A Consumer's Guide to the World's Finest Wines*. 4th edition. Simon and Schuster. 2003.
3. Coates, Clive. *The Wines of Bordeaux*. University of California Press. 2004.
4. Johnson, Hugh and Jancis Robinson. *The World Atlas of Wine*. 5th edition. Mitchell Beazley. 2001.
5. Echikson, William. *Noble Rot: A Bordeaux Wine Revolution*. W.W. Norton. 2004.
6. McCoy, Elin. *The Emperor of Wine: The Rise of Robert M. Parker, Jr. and the Reign of American Taste*. Harper Collins. 2005
7. Wilson, James E. *Terroir*. University of California Press. 1998.
8. White, Robert. *Soils for Fine Wines*. Oxford University Press. 2003.
9. Virginia Tech Enology Group. Notes from their 2002 trip to France. <http://www.fst.vt.edu/extension/enology/France/France2002.html>
10. UC-Davis group tour to France in 2004. <http://wineserver.ucdavis.edu/DEVO/FranceTrip2004/index.html>
11. Law, Jim. *We Have to Work Harder Than They Do*. In a future issue of Wine East Magazine.
12. Van Leeuwen, Cornelius. Various articles on Terroir published in journals such as American Journal of Enology and Viticulture.

FYI: Opportunities to visit Bordeaux

Vinitec Bordeaux. November 28-30, 2006. It may be the largest wine and vineyard trade show in the world. A package tour is available that includes tickets to Vinitec, RT air (NY, Bos, DC), hotel, guided tours of Medoc and St-Emilion. \$2350, including all taxes. <http://www.bordeaux-expo.com/vinitech2006/index.asp>. Call Lionel at 410.889.6200 for information.

I am working with Pascal Durand of ENESAD in France and the Pennsylvania Association of Winegrowers to arrange for a 7-day group tour of Bordeaux in July/August, 2007. If you are interested in signing up for the trip, please contact me and I will add your name to the mailing list. It will be similar in nature to his previous NY Burgundy trip and the 2002 VA SW/S France trips (see web site above).

Appendix A: Figures 1-59.

I took over 500 photos during our visit. I tried to select a few that would illustrate some of the key concepts we learned but also give the reader a flavor of the culture we experienced.

[Figures 1 - 7](#)

[Figures 8 - 15](#)

[Figures 16 - 23](#)

[Figures 24 - 32](#)

[Figures 33 - 40](#)

[Figures 41 - 48](#)

[Figures 49 - 55](#)

[Figures 56 - 59](#)

Appendix B: Questions for Bordeaux Trip. Summer, 2006

Soils

Variety and soil interaction: how is the decision made to plant which variety in which place? Also mesoclimate effects.

What are soil attributes that differentiate between a very good site and a poor one? Is it just drainage? Texture vs. all other qualities.

What are the optimal nutrient, pH, organic matter, CEC for quality soils?

Can/should pH and soil nutrient values be used as a tool to limit vine size and vigor?

Cover crops good and bad

Can you make great wine in sandy soils? If not, why not?

What is special about the clay soils in Pomerol/St Emilion? Drainage? Why does it work so well?

What is the ideal soil? What are the ideal components? Rock? Gravel? Clay?

Does elevation and slope make a difference in Bordeaux? If not, why not.

Water in the Soil

Timing: when does water need to be absent? How to measure water – soil, plant?

Will vacuum-assisted drain tile be an effective method of water removal?

How do we keep water out of soil? What is the critical timing?

Climate

Are Bordeaux vintages simply hot and dry = good wine. Wet and cool = poor wine?

How much rain is too much? What is the rainfall distribution? When the worst time to get rain?

What is the role of temperature and humidity on vine performance and especially on grape ripening after veraison?

How important is diurnal temperature shift?

Are degree days (heat summation) a useful tool in Bordelais viticulture?

What is the importance of light? Diffuse-overcast and hazy (as in Bordeaux and Virginia) vs Direct (California). What is the best light environment? When?

How important is day length to ripening at 45 degree latitude?

What are the essential qualities in micro and mesoclimate that you seek in a region/vineyard/vine?

Why does Cabernet Sauvignon not always ripen well in warm places in Virginia despite >3500 GDD.

What would you do if 250 cm of rain fell on the vineyard in one day during harvest?

Any thoughts about the effects of global warming on viticulture in Bordeaux?

Grape varieties

Why does Cabernet Sauvignon not do well on the right bank?

Why is Cabernet Franc not used much on the left bank but some estates use a lot on the right bank?

Does anyone grow, use Carmenere in Bordeaux. Any other varieties grown secretly?

Look at and talk about Petit verdot and Malbec. What are the roles of these grapes in the blend?

Terroir

Is it possible to “upgrade” the terroir to improve quality? How?

Viticulture

Discuss cropping levels, crop estimation, green harvest strategies and timing, shoot density, shoot position methods, leaf pulling, hedging severity and frequency.

Explain your concept of vine balance? How important is it?

How do you feel about Richard Smart’s balanced vines concepts? Shoots/meter? Kg fruit/Kg of pruning weights?

How important is vine size? What is the ideal vine density?

How do we control vine vigor during the season with 5-10cm of rain per month? The goal is small berries and shoot growth cessation 2 weeks prior to veraison.

Young vine management and fruit quality relative to older vines.

Spray programs, especially for powdery mildew, downy mildew and black rot.

Insect pests? Treatments?

Esca and other vine decline pathogens?

What is ideal berry size and weight at harvest? Cluster size and weight?

What is the ideal kg per vine? Determined by variety, vineyard block (terroir),...?

When do you cluster thin? How do you crop estimates?

Is wing removal performed and when would it take place?

How does vine age affect wine quality? Why is this important to the French?

Is there a preference for cane or cordon. Is fruit quality different?

Is there a preference for single or double guyot? Do you use a renewal spur when cane pruning and why if you do?

What would be the perfect shoot density and under what conditions would higher density be preferred to lower density?

Is there a preference for leaf removal or lateral removal? Would you remove the entire lateral or only truncate it?

Explain when and how you shoot position vines.

What is the ideal number of leaves per shoot? LAI? Ideal canopy height, density?

What are the best rootstocks in use now? Are there clones of those rootstocks that are better than others?

What are the best grape variety clones?

What are your key measures of fruit maturity? When and why do you decide to pick the grapes?

Miscellaneous questions

What are the five (10?) most important things you do in the vineyard for wine quality? What are the 5 (10?) most important vineyard site characteristics?

View on machine harvesting, concentrators, reverse osmosis and other vineyard/winery technology?

How would you describe the essential difference in terroir and wine quality between wines from Bordeaux and California? What are the key factors that contribute to differences?

Remaining questions:

1. What makes Cabernet Franc so great at Cheval Blanc?
2. What about the soils is so unique over such a vast area that allows vine size to be moderate?
3. How do you make Petrus and Margaux even better? What is the next step or frontier for improvement?
4. What is the main viticulture difference between the small box (3D) Bordeaux canopy and the tall panel (2D) canopy configurations?

Appendix C: Conversions

F > C: subtract 32 and multiply by 5/9 or 0.555

C > F: multiply by 1.8 and add 32

or

$C = (F-32)/1.8$

$F = (C \times 1.8) + 32$

Hot day 104F/40C

Warm day 86F/30C

Mild day 68F/20C

Cool day 50F/10C

Freezing 32F/0C

0F/-17.8C

Body Temp 98.6F/37C

Boiling water 212F/100C

Ounces to grams: x 28.35

Grams to ounces: x 0.035

Pounds to kilograms: x 0.45

Kilograms to pounds: x 2.2

US gallon to liters: x 3.79

Liters to gallons: x 0.26

1 liter = 2.11 pints

1 case = 2.34 gallons

750ml = 16 x 1.5 oz pours

1 ml = 0.03 oz.

1 oz = 29.573 ml

Inches to mm: x 25.4

Inches to centimeters: x 2.54

Millimeters to inches: x 0.04

Centimeters to inches: x 0.394

Feet to meters: x 0.30

Meters to feet: x 3.28

Miles to kilometers: x 1.61

Kilometers to miles: x 0.62

Grams to pound: x

Pound to grams: x 454

Kilogram to pounds: x 0.454

Pounds to Kilograms: x 2.205

15.22 hl/ha = 1 t/a or 1 hl/ha = 0.0741 tons/ac

1 hl = 26.418 gallons

1 hl = 0.183 tons US

1 hl = 133 bottles or 11.1 cases of wine (bottle = 750 ml)

1 ton of grapes = 727 bottles or 60 cases of wine

Acres to hectare: x 0.40

1 ac = 43560 sq ft.

1 hectare = 2.47 acres

Square miles to square kilometers: x 2.60

27,000 gallons in one acre-inch

Vinifera vines use about 15-30 gallons of water per week at full canopy. 3-5 g/wk new vines.