WINE
the past 7,400 years

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Version 4 has numerous corrections and additions, new maps, and 95 figures.
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(photo: Polly Goode)

Wine is one of the foundations of Western Civilization. The story of wine is that of medicine, religion, war, discovery, science and dream. It was foolish of me to believe that I could tell that story in a few pages, or even in a thousand. Yet, I was tempted to try. And once again, I found the strength to yield to temptation. May this piece entice you to search further and discover more of life through this unique window: The story of wine...

One not only drinks wine, one smells it, observes it, tastes it, sips it, and one talks about it.

Edward VII (1841-1910)

CONTENTS

1. IN THE BEGINNING…

Quickly, bring me a beaker of wine, so that I may wet my mind and say something clever.

Aristophanes (448-385)

1.1 THE IMPORTANCE OF WINE TO THE ANCIENTS

Wine and beer are both very ancient alcoholic beverages[1,2]. But wine is special. It can be produced only once a year, in the fall, when the grapes were mature. Beer can be brewed almost anytime. Further, if the must has enough sugar, natural fermentation produces wine that contains 12 to 14% alcohol, that is three or four times more than beer. Wine gave people a buzz. It was a magical beverage, associated with gods and religious occasions. For thousands of years (until the Arabs invented distillation), wine was not just the most potent beverage but also the most powerful antiseptic available. Wine and vines were desirable commodities for trade by many early Western civilizations. All of this made wine special for religious, social, medical, and commercial reasons.

The importance of wine to the Ancients can be seen in many places. Vine cuttings in silver sleeves were sometimes buried with the dead, probably in the hope that vineyards could be planted in the afterlife. Wine-related bas-reliefs were carved on Assyrian buildings. Vines were prominent on many ancient coins.

Ancient texts often mentioned wines, vineyards, and the wine trade. An early example is the Code of Hammurabi (1795-1750BC), a King who reigned in Babylon and produced the earliest-known publicly displayed laws. The code consists of 282 articles, and three of them (108-110) discuss wine taverns, which were held by women, and the wine trade: if she overcharges for wine, she will be thrown into the water (drowned); if conspirators meet in a tavern and are not delivered to the court, the tavern-keeper shall be put to death; if a 'sister-of-god' opens a tavern or enters a tavern to drink, she shall be burnt to death. Not a lot of fun, but it was important enough to be codified.

Fig. 1: *Greek drachma (Dionysos and a cluster of grapes) from Naxos (Sicily), dated 500BC.*

There are many references to wine in the Bible, such as a famous wedding where water was changed into wine. Note that this feat was earlier attributed to Bacchus. Noah took vine cuttings on the Ark and, as soon as possible after the Flood, planted a vineyard. He obviously knew how to do it and why, a point ignored by Benjamin Franklin, who credits Noah with being the first to plant vines:

'Twas honest old Noah first planted the Vine,
And mended his Morals by drinking its Wine;
He justly the drinking of Water decried;
For he knew that all Mankind, by drinking it, died.

The Neolithic (8,500-4,000BC) is the period, when *homo sapiens* first established permanent settlements. This involved an enormous change of lifestyle: constructing permanent housing (this means architecture, engineering, materials science), domesticated animals (at first, sheep and goats), and farmed. The latter implies the safekeeping of seeds from one planting season to the next. The earliest-known clay pottery appeared about 6,000BC and could have been used first for that purpose.

Another major issue was safe drinking water. Even today, whenever wars or natural disasters displace people into temporary camps, getting clean water is an immediate concern. Water becomes easily contaminated when a group of people settles for an extended period of time. Unless water is filtered, boiled or chemically treated, people are at risk of dysentery, cholera, and other water-born diseases. In Neolithic times, wine was used.

1.1.1 Wine makes water safe(r) to drink

The amount of alcohol in wine is high enough to kill many harmful bacteria, particularly in water. Maybe it was the availability of wine (and therefore, of safe drinking water) that allowed the first settlements to survive. In any case, mixing wine with water was of tremendous importance to the Ancients[3]. For millennia, wine was always drunk mixed with water, sometimes even seawater, in water-to-wine ratios ranging from 2-to-1 to 5-to-2. Today, during Mass, priests still mix wine with water, a symbolic gesture that has roots in Neolithic times.

Ancient Greek Law was first codified[4] by Zaleucus of Locris, about 650BC. This is 30 years before Draco of Athens and 'Draconian law'. Zaleucus' law states: '*if anyone drinks unmixed wine without a physician's prescription to effect a cure, the penalty is death.'*

Fig. 2: *Zaleucus of Locris, piercing his own eyes to spare the sight of his son, condemned under the harsh laws he himself promoted.*

In 58BC, Julius Caesar invaded Gaul and encountered a number of Celtic tribes. He wrote[5,6] of being stunned that these barbarians drunk unmixed wine! In *De Re Militari*, Vegetius warned that armies must not use '*bad or marshy water, for the drinking of bad water is like poison.'* And later, he writes *'If a large group stays too long [...] in one camp, the water becomes corrupt.*'

Similar advice persisted throughout history. Numerous armies were devastated by disease after running out of wine and being forced to drink contaminated water. Historians such as Lemmert have often emphasized the correlation between a poor vintage and the outbreak of disease. One example deals with the year 1602: *'there was a severe winter, a cold April, a hailstorm in the summer. The wine was*

scarce and of poor quality. In this year, there was plague in the Palatinate, through Saxony and Prussia.'

Note that wine was produced in India in the 4th and China in the 2nd millennium BC. However, it appears that only the wealthiest people consumed wine and other fermented drinks. But in Asia Minor, and later throughout the Mediterranean basin, wine (and beer) was drunk daily at all levels of society. The better wines were expensive and the poor were probably stuck with something akin to vinegar, but wine was available for everybody.

The Romans made sure to supply their troops with wine so that they had something safe to drink. In the first century, they even built a harbor and planted vineyards around Bordeaux in order to ship wines to their troops in England.

Beverages made with boiled water (coffee and tea) became popular in the West only in the 1700s. Vallee[3] quotes Frederick the Great who, in 1777, was upset at his soldiers for drinking coffee: '*His Majesty was brought up on beer, and so were his ancestors and officers. Many battles have been fought and won by soldiers nourished on beer, and the King does not think that coffee-drinking soldiers can be relied upon to endure hardships in case of war*.'

1.1.2 Religion

The Oxford *Dictionary of Ancient Deities*[7] lists 36(!) gods associated with wine. Such gods existed in all the Ancient civilizations around the Mediterranean basin. Deities were associated with nature, fertility, harvest and wines since the earliest times. The Ancient Egyptians worshipped *Gathor* (the protectress of wine), Re (who perspires wine), *Horus, Osiris* (also the protectress of brewers) and many others.

Dionysos, the Greek god of wine and fertility, was often pictured with clusters of grapes growing out of his head. In Rome, he became *Bacchus*, possibly after *Bakkhos*, an ancient vegetation god. He became associated with debauchery quite late, during the Roman Republic.

'Bacchus': a convenient deity invented by the Ancients as an excuse for getting drunk.
Ambrose Bierce (1842-1914?)

Fig. 3: *Bacchus (Vatican collection), with a judiciously located vine leaf, absent in most representations of this god.*

Early Greek wine festivities, held in the spring, the *Anthesteria*, evolved into *Dionysia* in Athens, then *Bacchanalia* in Rome, where they degenerated into very wild parties. Today, there are still numerous wine festivities throughout Europe at vintage time.

In Roman Mythology, Bacchus is the son of Jupiter and Semele, a woman from the city of Thebes. This relationship disturbed Jupiter's legitimate wife, Juno. She convinced him to appear in front of Semele in all his glory, as thunder and lightening. Semele did not survive this appearance. Jupiter saved the unborn Bacchus by sewing him into his own thigh, and later delivered the baby himself. The details of how this was accomplished are very sketchy. But Bacchus is the god who was born out of the thigh of Jupiter, something not just very special, but a virgin birth...

Wine is the 'blood of the vine'. The association of wine and blood is very ancient. It still exists today, during Mass.

The Muslims refrain from consuming alcohol. However, the Qur'an[8] recognizes the importance of wine when describing the gardens of paradise (Surah 47.15):

***A similitude of the Garden which those who keep their duty* [to Allah] *are promised: Therein are rivers of water unpolluted, rivers of milk whereof the flavor changeth not, rivers of wine delicious to the drinkers, and rivers of clear-run honey*.**

Note that 'water', 'pollution', and 'wine' occur in the same sentence…

1.1.3 Medicine

Wine was one of the very few antiseptics available for millennia. The resin from the Terebinth tree was known to have antibacterial properties, but not nearly as powerful as alcohol. Records of medical uses of wine date back over 4,000 years. Hippocrates, the father of medicine, recommended different types of wines to treat different ailments. He also advised that '*infants should be… given their wine diluted and not at all cold*'[9], and specified which wine should be given to infants. At the age of three, Roman children were given a small jug for their first taste of wine.

The 'Ebers Papyrus' (~1500 BC) reveals that the Ancient Egyptians sometimes relied on beer mixtures as remedies.

Louis Pasteur (1822-1895) talked about wine as '*the most healthful and most hygienic of beverages*.' During his tenure as President, Thomas Jefferson (1743-1826), promoted wine: *'No nation is drunken where wine is cheap; and none sober where the dearness of wine substitutes ardent spirits as the common beverage'.* He also believed wine to be healthful.

The health benefits of (moderate) wine drinking are recognized by modern medicine. In Europe, a daily glass of red wine is often recommended to treat mild anemia; a class of chemicals called *flavonoids* (antioxidants in gape skins) appears to have many beneficial properties; another class of chemicals, called *polyphenols,* prevents[10] heart disease, arteriosclerosis, and maybe some cancers.

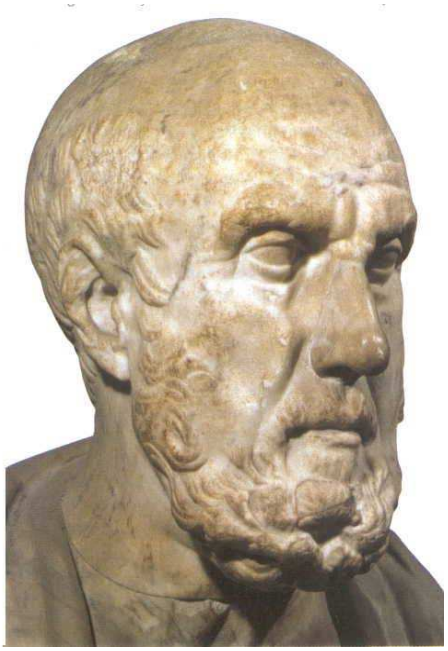

Fig. 4: *Hippocrates of Kos (460-375BC).*

1.1.4 Trade

Viticulture most likely spread through the trade of wine, vine cuttings, wine jars, and even resin from the Terebinth tree[11]. The latter was used to coat the inside of wine jars and amphorae.

The Phoenicians traded wines and vines around the Mediterranean sea and beyond, all the way to Porto, on the Atlantic coast. They established many wine regions and vineyards, some of which are still famous today: *Sherry* in the south of Spain, or *Hermitage,* in Southern Côtes du Rhône.

1.1.5 Social drinking

Drinking wine certainly lubricated the interactions between people, just like it does today. But this went beyond just having a good time. Socrates invented the *symposium* ('drinking together'). He delighted in discussing philosophy with his followers while drinking wine. I like the idea. Socrates had the reputation of being able to outlast his guests… Note that the Greek symposium was for men only.

1.2 THE ARCHEOLOGICAL EVIDENCE

In the past decade, the archeological proof of winemaking, even wine technology, has been unearthed in several Neolithic sites in the Zagros Mountains of North-Eastern Iran[1,2]. The oldest site to date is called *Hajji Firuz Tepe* and is dated 5,400-5,000BC. '*Tepe'* (or rather '*tappe*', in Farsi) refers to a small hill or mound, something an archeologist would dig up when looking for an ancient site.

Six wine jars (each about 10 inches tall, with a capacity of about 2.5 gallons) were found. The proof that they did contain wine comes from the chemical analysis of the residue in the jars. The infra-red absorption spectra show the presence of tartaric acid and its salt, calcium tartrate. Tartaric acid is the main acid of grapes and occurs naturally only in wine. One often sees the tiny crystals in the deposit at the bottom of a glass of (a few years old) wine. They look like tiny grains of salt. The German name is *Weinstein*, literally 'wine-stone'. The presence of these crystals in the jars proves that wine was kept in them for some months, if not a year or longer.

Fig. 5: *One of 6 wine jars at Hajji Firuz Tepe[2].*

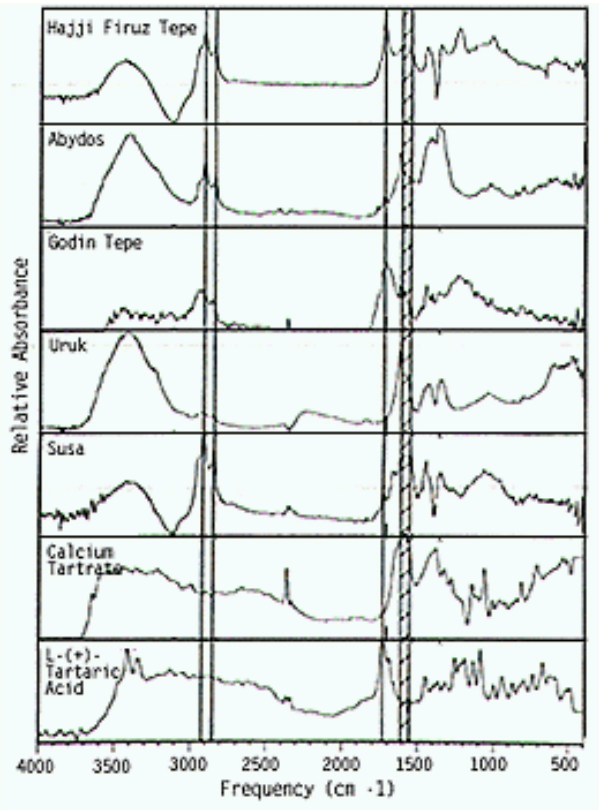

Fig. 6: *Infra-red absorption spectra[2] show tartaric acid and calcium tartrate in ancient jars.*

This Neolithic wine was probably made from the native *vitis vinifera sylvestris* grape. 'Vitis' means that it is a vine, 'vinifera' that its fruit contains enough sugar to make wine, and 'sylvestris' that it grows near or in a forest, as the vine needs support from the trees to grow. This wild vine can still be found around the Mediterranean basin.

Fig. 7: *Vitis vinifera sylvestris.*

This vine is sexual. The plants are male or female, and there are few self-pollinating hermaphrodites. But farming led to the elimination of male plants that do not produce fruit, then of females that were no longer pollinated, leaving large mostly hermaphrodites. Large concentrations of hermaphrodite pips (they are larger than those of female plants[12]) provide archeological evidence of cultivation.

The cultivated hermaphrodite vines evolved into *vitis vinifera vinifera* to which (nearly) all of today's wine-producing varietals belong.

Nothing is known about the Neolithic wine-making technology. However, it is impossible to cultivate grapes and not end up making some kind of wine. The yeast grows right on the skin of the grapes. If mature grapes are squeezed into a jar, the yeast (on the skin) has access to the sugar (in the juice), feeds on it, and breaks the sugar into alcohol and carbon dioxide. After a couple of days, there is wine. Not a Chateau Lafite, but wine nonetheless. Making great wine is an art, making good wine is a science, but fermentation is a natural and unavoidable process.

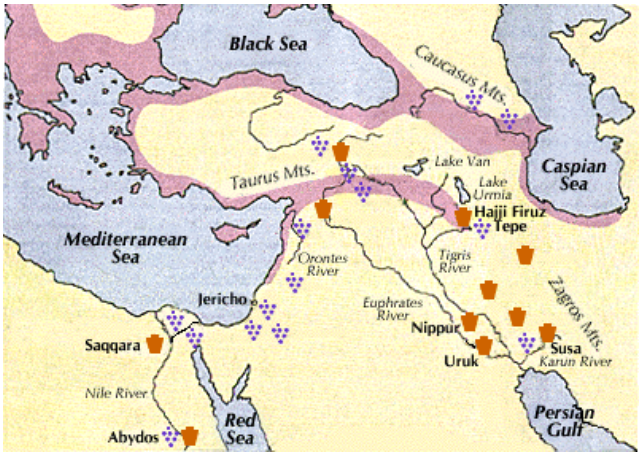

Fig. 8: *Wine jars ('jar') and accumulations of hermaphrodite vine pips ('grape') have been found throughout the Near East[2].*

Another residue found in the Hajji Firuz Tepe (and most other) wine jars was resin from *Pistachia Terebinthus*, the terebinth tree. The inside of the jars were coated with it. Such a coating water-proofs the jar, but why this particular tree? It turns out that its resin has antibacterial properties. Its presence in the wine slows down the oxidation of the wine by hampering the development of *acetobacter aceti*, the bacteria which turns alcohol into acetic acid, the main component of vinegar.

Pliny the Elder called the resin of the terebinth tree the *'best and most elegant resin'*. Its presence in the wine jar certainly allowed the wine to be preserved much longer than it would without this particular resin.

Resinating the wine by partially or fully coating clay jars was done systematically during Antiquity, and this resin was traded. Today's only remnant is the Greek 'Retsina': the resin of *Pinus Halepensis* is added to the must. Note that the Greeks

themselves rarely drink that wine. It is for tourists. Beware.

To date, no chemical proof of winemaking as ancient as in the Zagros Mountains has been found in the nearby Caucasus Mountains, between the Black and Caspian seas (today's Georgia). However, it is likely that wines were made there in ancient times. Winemaking has survived there ever since, as shown by Stalin's impressive collection.

Fig. 9: *Stalin's wine cellar in Tbilisi, Georgia. (photo: New York Times, 3/22/1996).*

Thus, the history of wine begins with the earliest permanent human settlements in Neolithic times, at the end of the last major Ice Age. Although much older (fossilized) pips and vine leaves have been found in Europe and North America, there is no evidence of wine or organized viticulture associated with them.

1.3 THE FIRST EXPANSIONS

From its early days in Neolithic villages, viticulture quickly expanded, probably through trade. Recent archeological finds[13] show that as early as 5,000BC, Neolithic farmers traveled by ship along the Mediterranean coast from the Middle East to the Atlantic. Ancient settlements existed, but no evidence of winemaking has yet been unearthed.

It is impossible to trace precisely how viticulture spread from early Neolithic sites to the Middle East and North Africa. But viticulture quickly expanded, most probably through trade. By the time of the Sumerians, Babylonians, Hittites, and Assyrians, vineyards flourished along the banks of the Euphrates and Tigris rivers as well as on the eastern shore of the Mediterranean Sea.

The famed cities of Babylon, Ur, and Tyre were important trading centers already in the 3rd millennium B.C. Wines were shipped from there throughout the known world, transported in clay jars. However, animal skins, or even barrels were also used. In 500BC, Herodotus described palm wood barrels used for the transport of wine from Armenia down the Euphrates and Tigris rivers. Since palm wood is notoriously hard to bend, making tight barrels must have been difficult. Organic materials such as animal skins or wood barrel rarely survive for long periods of time and no such wine vessel has been recovered to date. Most ancient depictions show clay jars.

Wine and viticulture spread around the Mediterranean and northward into Europe in three main waves. First, the **Phoenicians** traded as far as they could sail. They exchanged vines and wines for other goods, then sailed home. Then the **Greeks** established colonies. They planted vineyards and taught local people how to care for them. Finally, the **Romans** invaded most of Europe and planted vineyards everywhere: they needed wines to supply their troops. This was essentially done by the end of the first century. Thus, three of the major civilizations which dominated western antiquity contributed to the spread of viticulture, each for its own reasons.

The next major expansion of viticulture, world-wide this time, would begin more than 1,000 years after the fall of Rome, as vine

cuttings and seeds accompanied the Spanish Conquistadores to Central, then South, then North America. Later, the Dutch introduced vines in South Africa and the British in Australia.

The **Phoenicians** ruled the Middle East for over one thousand years, starting around 1,400BC. Their kingdom included modern Iran, Iraq, Turkey, Lebanon, Israel, the Sinai peninsula and, at its height, much of Egypt. In 1,110BC, they laid the foundations of the port city of Cadiz, very near Jerez (where sherry is made). Even though vines were cultivated in the Iberian Peninsula before their arrival, the Phoenicians contributed in terms of technology and trade. Their presence in Portugal, on the Atlantic coast of Europe, is documented as early as 1,000BC.

The Phoenicians sailed north all the way to Britain (to get tin from modern Cornwall) and south along the coast of Africa. They founded the city of Carthage in 814BC, as well as commercial outposts in Cyprus, Sicily, Corsica, and Spain -- whose name derives from a Phoenician word meaning the 'rabbit coast'. The Phoenician alphabet is the first in history to consist of single letters. The Greek alphabet derives from it.

The Phoenician dominance abruptly ended in 333BC when their allies, the Persians, were crushed by Alexander the Great. The Phoenician civilization was ultimately eclipsed at the end of the Punic Wars with Rome in 146BC.

1.4 EGYPT

Some 700 wine jars were found in the tomb of Scorpion I (3,150BC) in Abydos[1,2], a few hundred miles south of the Nile delta. These jars already had the typical shape of the amphora. The inscription on some clay stoppers described the type of wine, its production date and region, and the name of the winemaker: the same information one finds on today's wine labels.

Fig. 10: *One of about 700 amphorae from the tomb of Scorpion I, in Abydos[2].*

Even though the Egyptians introduced viticulture to Minoan Crete in the 2nd millennium BC, their key contributions to the history of wine are technological.

They invented the ***amphora***. It is brilliant technology: simple, inexpensive, efficient. Clay is found almost everywhere and an amphora is easy to make. The typical amphora is quite thick, about one inch. It had a pointed tip which allows it to be partially buried in sand to secure it during storage or transport. The inside is partially or fully coated with resin. Note that the Greeks and the Romans usually coated only the neck, not the whole interior. The preferred coating uses the resin from the Terebinth tree.

Amphorae were used by everybody: the Egyptians, as well as the Phoenicians, Greeks, Romans and others, with only minor changes in shape over the millennia. Wooden barrels became popular quite late, in the first century. Thus, ***clay*** (jars and amphorae) was the material of choice to ferment, store, transport, and age wine for over 5,500 years!

The Egyptian wine-making technique is painted on the walls of a number of tombs. The workers pick the grapes, which are then treated by foot. The must is poured into amphorae which, when full, are stoppered with clay. Small holes in the neck allow the carbon dioxide to escape during the fermentation. The holes are then sealed with clay and the wine is ready to age, often

for many years. Nobody knows how the Egyptian wines tasted or which varietals were used, but they were readily available to the wealthy.

Fig. 11: *Egyptian amphora (fragment of a mural in an Egyptian tomb).*

The Egyptians also discovered ***glass*** as early as the second millennium BC[14-16]. Glass-making technology is closely related to metallurgy. Both involve high temperatures, furnaces and molten materials. Glass consists of silica (sand) and metal: the higher the metal content, the lower the melting temperature. The Egyptians' main source of metal for glass was *natron* (sodium carbonate). They discovered that adding trace amounts of specific metals to the melt produces glass of various colors: add some gold for red or cobalt for blue for example. The Egyptians imported cobalt from Persia specifically for that purpose.

They made sophisticated (small) glass jars by covering a clay shape with frit (bits of solid glass), heating it to melt the glass, then removing the clay after the glass solidified.

The Phoenicians expanded the Egyptian technology and mass-produced glass cups for wine drinking. They invented glass blowing around 100BC. The Romans made (rather opaque) window panes, vases, and sophisticated decanters. None of that glass was clear, because of impurities in the raw material and poor temperature control. None of it was sufficiently thick and strong to make wine bottles.

Fig. 12: *Egyptian glass jar[17] dating back to the 18th dynasty (1539-1295 BC).*

The first clear (and fragile) glass, '*cristallo'*, would be produced on the Island of Murano, just off of Venice, in the 15th century. This achievement involved purified source materials, elevated temperatures maintained for long periods of time, and temperature control during cooling. The first sturdy bottles date back to the 1631, and the first large-scale (industrial) production of wine bottles to the early 1900s.

1.5 GREECE

The Greek civilization first emerged in Mycenae around 1600BC. The earliest clay tablets already mentioned olive oil and wine, a combination at the heart of Greek (then Roman) culture. The cultivation of

olives and grapes requires only 160 to 180 days of work per year, allowing for leisure time, something still highly appreciated today by Mediterranean people.

The Mycenae kingdom was defeated by the Dorian invaders from the north around 1,200BC. The Dorians extinguished the light of the Mycenaean civilization and ushered in the 'Greek Dark Ages'.

The emergence of the city-states (Argos, Corinth, Sparta, or Athens) occurred some 450 years later and marked the beginning of Greece as a major power in the ancient world. By then, a wide range of wines were produced throughout the country. Each region, each island had its own style and reputation. The wines from Chios, Lesbos, or Samos, for example, were reputed to be excellent, as were the dark wines from Kos, which were sometimes sold mixed with seawater. The wines from Rhodos were described as powerful, though less delicate than those from Lesbos.

Democritus, the philosopher best known for formulating the atomic theory of matter and believed to have lived to the age of 100, was proud to claim that he knew all the Greek grape varieties.

In the mid-5th century BC, wine laws, first enacted on the island of Thasos, regulated the minimum quality of wines that could be sold. Later laws (~425-400BC) dealt with the earliest date for the grape harvest – thus guaranteeing that only mature grapes were used for winemaking[18].

Even though few light dry (white) wines were produced (Hippocrates recommended those for a few medical conditions), we know from numerous descriptions in the Greek (and Roman) literature that typical Greek wines were heavy (high alcohol content) and sweet. They were always drunk mixed with water.

A high concentration of sugar in the must was achieved by a variety of techniques. One was to twist the stem of grape bunches and leave them to raisin on the vine. Another was to harvest very ripe fruit then let it overmature on beds of straw. This is still done today to make the French 'vin de paille' and the Italian 'vinsanto'.

Wines were often aged and a variety of spices added to them such as aromatic herbs, honey, pepper, gypsum, cinnamon, or perfumes. In some cases at least, this must have helped mask some odd flavors. This style of wine remained popular until the 2nd century, when much lighter and drier wines from the Roman provinces began to dominate the market.

Like the Phoenicians, the Greeks exported viticulture everywhere they went, but they systematically colonized their settlements. The Greeks arrived in Sicily in the 8th century BC. Sicilian wines (such as *Mamertime*) maintained a reputation of excellence for centuries. Sicily still produces very interesting wines, including dessert wines such as Marsala or Zibbibo.

From Sicily, the Greeks moved to southern Italy (where Etruscan wines already existed). On the coast of France, the Greeks established the city of *Massilia* (Marseilles) around 600BC. It is likely that local vines were already being cultivated there by the Celts.

While the Greek influence was concentrated along the coast of the Mediterranean basin, there is one piece of evidence that they also traded deep inland. During the winter of 1952/3, a huge Greek bronze vase was unearthed at Mont Lassois, between Paris and Beaune, from the tomb of a Celtic priestess (or princess) who died around 500BC.

The 'Vase of Vix' is 5'4" tall (1.64 meters) and has a capacity of 260 gallons (1,100 liters)! It is beautifully decorated in typical Geek style. It must have been brought there in pieces and reassembled by the artist who designed it. A fantastic gift by any measure. I know of no proof that it ever contained wine, even though some authors refer to it as a 'wine-mixing vase'. There was no vineyard in Burgundy until the Roman invasion, some five centuries later.

Fig. 13: *The huge Vase of Vix.*

The Greeks reached the peak of their civilization with Plato (428-347BC) and Aristotle (384-322BC). Athens became the leading military and trading power after defeating the Persians (Darius then Xerxes) around 480BC. But then, its disastrous wars against Sparta weakened both powers. By then, the city of Rome was growing. Rome overcame Greece in 146BC (and Egypt in 31BC). However, many Roman authors kept singing the praise of the Greek wines from Lesbos, Chios, and other island for centuries. The trade in Greek wines continued long past the Roman invasion.

1.6 ROME

During the Roman kingdom and much of the republic, the Greek influence in wine-making and drinking was everywhere. The wines were heavy and sweet. The best ones were aged for decades in amphorae.

Fig. 14: *Clusters of grapes treated by foot by Roman slaves in a shallow stone vat.*

The Romans invented the wine press. The grapes were collected in a stone vat and a heavy stone was rolled over them and crushed them. The juice was collected from openings at the bottom of the vat.

The Romans also engineered the *dolium*, a very large clay jar (~300 gallons capacity). It was used for aging and storage (normally buried up to its neck), as well as shipping. Note that such large clay object require very large furnaces.

Fig. 15: *A Roman wine press.*

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Fig. 16: *The ~300 gallons Roman dolium.*

The Romans improved glass-making. They manufactured relatively flat (but not very transparent) window panes. They also blew beautiful wine decanters.

Fig. 17: *A 4th century Roman glass decanter (photo: New York Times).*

The Romans realized that transporting wine by sea often improves it. This will be re-discovered in the 1600s as English merchants shipped port wines from Portugal to England via the fishing waters off Newfoundland. Portuguese explorers also found that the crude early Madeira wine improves substantially by shipping through the tropics and the equator.

Wine was an integral part of everyday life since the earliest days of Rome. Wines, viticulture, varietals, pruning, aging and other wine-related issues have been discussed by Horace, Pliny the Elder, Virgil, Cato, and many others. At the 1st century BC, wine taverns were common in cities.

Although most Roman wines were white, the residual sugar and the age gave them an amber color. The dark-yellow color and aged look were sometimes obtained by smoking the wine.

Fig. 18: *Amphorae ready for shipping.*

Specific regions, even single vineyards, gained strong reputations. The wines from *Falernum* on the southern slope of Monte Massico (between Rome and Pompeii) and *Surrentium* (south of Pompeii) were praised by many Roman authors. They were aged as long as 30 years. Most authors describe the Falernum wine as being of amber color, especially after aging. This is typical of sweeter wines which visibly darken with age. Some believe that the descendent of the *Falernum* grape is the *Aglianico*.

The heart of Roman wine country was the coastal region between Rome and Pompeii, the busiest wine-shipping ports.

The last decades of the Roman republic were marked by expansions into continental Europe, starting with Caesar's invasion of Gaul. Except for the coast of the Mediterranean Sea, where viticulture existed long before Roman times, most of today's European vineyards were planted by the Romans. One reason for planting them was to supply the Roman garrisons all over western Europe.

Fig. 19: *Some of the famous vineyards in early Roman times. The city of Pompeii is just south of the Vesuvius (map: Kristin Reid).*

In 58BC, Julius Caesar invaded Gaul. For the first time, the Romans moved into regions that could not be accessed by ships. Goods such as wine now had to be transported overland. With few (or no) roads, amphorae were a most impractical means of transporting wine.

The Celts had a solution: barrels, made of (pine) wood. They used them to store and transport beer, wine, oils, and other goods. Caesar himself hardly noticed this: the Latin word for wooden barrel, *cupa*, is mentioned[5,6] only once in his writings, and then not in conjunction with wine. But one cannot be sure which word he might have used to describe wooden barrels that were new to him.

What is certain is that Roman barrels appeared at the turn of the millennium. By 400AD, they were so widely used that amphorae had mostly disappeared.

This marks an important turning point in the history of wine. The material in which wines has been fermented, aged, and transported for over 5,500 years, clay, was being replaced by wood.

Fig. 20: *Wooden barrels gradually replaced amphorae in the 2nd century. Amphorae all but disappeared around 400AD[19].*

The use of clay amphorae continued of course in some regions (Sicily, for example), but in most of Europe, wines were fermented, stored, and shipped in wooden barrels would everywhere from

northern Italy to England. This would last until the first glass bottled appeared in the mid- or late-1600s.

The first vineyards planted by the Greeks and the Romans in their colonies were on the south slope of hills (Hermitage, Sancerre, Montagne de Reims, etc.). The idea was that southern exposure would allow the production of traditional-style wines. Since vines and olives always had been cultivated together, it was not known that vines can prosper in climates too cold for olive trees.

The vineyards around Bordeaux were established by the Romans around 40 or 50AD. The 4th-century Roman poet Ausonius is one of many who wrote about this region and praise its wines. Ausonius even owned a vineyard there. In his memory, one of the best Bordeaux wines was named after him (in 1781).

The Romans picked Bordeaux as a center on the Atlantic for practical reasons. Vineyards along the wide estuary of the Gironde River were right where a safe port could easily be built and wines shipped north to the British Isles to the Roman garrisons. Several Roman vineyards were also planted in Burgundy in the early 200s and, one century later, along the river Loire.

On August 24, 79, the massive eruption of Mount Vesuvius destroyed not only the cities of Pompeii and Herculaneum, but also most of the 78 vintage and a lot of vineyards. Pliny the Elder died in the eruption, and Pliny the Younger describes that the survivors saw daylight for the first time only three days after the eruption. The cities were not rebuilt or the vineyards replanted for a long time.

In 1996, a joint project involving an Italian wine producer (Mastroberardino) and the Archeological Superintendence of Pompei identified where the Roman vineyards were located and which varietals were used. A few cases of 'Pompei wine' (85% Piedirosso, 15% Sciascinoso) was produced in 1999.

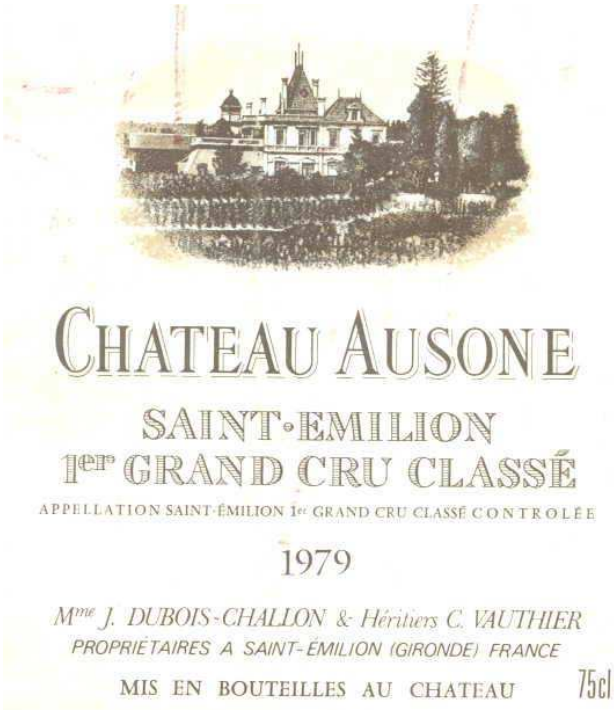


Fig. 21: *Chateau Ausone, named after the Roman poet Ausonius.*

The eruption of the Vesuvius severely disrupted the wine trade for years. A great demand for scarce wines ensued. Many farmers planted vines as a cash crop. New vineyards popped up everywhere, often at the expense of food crops. This threatened Rome's food supply. Further, many wines from the provinces gained greater access to the Roman market. The result was a collapse in the price of wines and a shortage of grain. The situation became so serious that, in 92, Emperor Domitian banned the planting of new vineyards in Italy and ordered half the vineyards in the provinces to be converted into food crops. Widely ignored, this edict was repealed in 280 by Emperor Probus, in an attempt to restore economic stability in Gaul.

There was something new and remarkable about many of the new vineyards planted in the Roman Provinces. They were not located along a warm coastal region, bathed in sunshine, with hardly a winter to speak of. Instead, they were inland, as far north as Burgundy,

Alsace, Champagne, or even southern England, where the growing seasons are shorter and the winters harsher. The grapes produced less sugar, the wines were not as heavy and sweet as those from Greece, Sicily, or Pompeii. These new wines - all of them white - were light and dry. At first, they were regarded as inferior in Rome, but people's tastes evolved. By 200 or so, light white wines were very popular as far south as Rome itself.

In the late 300s, it was already obvious that Rome had too many provinces to administer, too many miles of frontier to defend, too many hordes of aggressive barbarians pushing against its borders, too many incidences of epidemics in large cities and military camps. Further, the European climate, warmer than average in the 3rd and 4th centuries, was changing. Vineyards which were successful as far north as Belgium and southern England were gradually abandoned. A long period of misery was about to begin.

The Roman Empire began to crumble under its own weight in the late 4th century. After the death of Theodosius I in 395, the Empire first split into an Eastern Empire, centered in Constantinople, and a Western Empire, centered in Milan, then Ravenna. The Barbarians exerted increasing pressure on the western and northern borders of the Roman empire. They were pushed themselves by warriors from the far East.

The floodgates of the invasions opened on a cold night of December, 406. The Rhine froze solid, the Barbarians crossed it by foot at Mainz, sacked the city, and moved on. Seventy years later, the Western Roman Empire fell. The Eastern Empire would survive another thousand years.

Note that one aim of the Barbarians was to ‘be like the Romans’. After all, Rome had been the symbol of power, wealth, and civilization for centuries. Many Barbarians embraced Christianity, and developed a taste for wine. In a number of ways, the Church gained power. Latin remained the language of choice for official functions, not just in the Church but also in government and later Universities. The professors at Collegium Majus (the old University in Krakow, Poland), still lectured in Latin as late as the 18th century. Isaac Newton wrote the *Principia* in Latin in 1686, and then *Optiks* in English, more accessible to the wider public.

2. THE MIDDLE AGES

Quand le vin est tiré, il faut le boire.

old French saying

2.1 BACKGROUND

As the Roman Empire crumbled, waves of Slavs, Alamans, Franks, Vandals, Goths, Huns, … were invading various parts of Europe and competing for land and power. The Visigoths sacked Rome in 409-410. Attila the Hun devastated much of Europe for a decade, until his death in 453. Most of Europe was a mess: battles, lootings, massacres, no laws or order, little or no political or economic stability for decades.

Note that not all the 'Barbarians' were barbarians. One example is the enlightened Theodoric the Great (454?-526), an Ostrogoth who took Ravenna in 493. His reign was characterized by remarkable religious tolerance (a sign of civilization absent in much of today's world), relative political and economic stability, and many artistic and architectural achievements.

Theodoric and his times were there exception, not the rule. An account of major events and everyday life in that period is in the *History of the Franks*[20] by Gregory, 19th bishop of Tour (539-594). Violent death by murder or torture is described often and in detail, as if it were a natural cause of death. He also casually mentions dysentery, the plague, and famine, of which peasants were often the victims.

Around 500, the Vandals occupied the north African coast, southern Spain and much of Italy (until 533). The Visigoths dominated most of the Iberian Peninsula and a bit of southern France (until 711). The Ostrogothic Kingdom included northern Italy, Switzerland and Austria. The Saxons dominated eastern England. The Franks controlled a territory which included most of France and Belgium. The Celts had retreated to Brittany and western England. Ireland, mostly untouched, maintained Greco-Roman and Christian traditions.

The Franks were ferocious fighters. In 451, they stopped Attila the Hun in Châlon (Champagne) and, in 507, king Clovis defeated the Visigoths, which secured his southern border. Paris and Aix-la-Chapelle became the principal cities of the Frankish kingdom. Clovis established political stability within a region which was to become France.

The 6th century was marked by natural disasters, famines, epidemics and general misery. Mount Vesuvius erupted again in 513, an earthquake destroyed Antioch, another severely shook Constantinople, floods ruined crops, and the great 'plague of Justinian' (558-590) decimated the population. This was the first major outbreak of bubonic plague in history. Within two years, it killed[21] some 70,000 in Constantinople and doomed Justinian's ambitions to reunify Imperial Rome.

The long period of instability greatly affected wines. Trade was disrupted, traveling difficult and risky, owning goods precarious. The upscale Roman market for quality wines was gone, and much of the technical infrastructure had disappeared. In particular, amphorae were gone for good (except in a few

southern islands and parts of the Middle East), and the Roman ability to age wines was forgotten. That anything of the old system survived at all is remarkable. Latin, though, remained the universal language.

The Christian religion was adopted by many barbarians and not only survived but gained strength. Indeed, with the Edict of Milan (313), Emperor Constantine (285-337) restored to Christians any confiscated properties and granted them the tolerance that other religions enjoyed. After 320, the Sun-God no longer appeared on Constantine's coins and soldiers had to attend church parades. The only remnant of the long popular Sun-God became the halo around the heads of saints, as if they were standing in front of the Sun. Constantine declared himself a Christian in 324 and Emperor Theodosius (346-395) made the faith the official state religion.

Thus, by the time of the barbarian invasions, the Church was well established, with a hierarchy, an administration and land. Most if not all of this survived. The conversion to (Roman) Christianity of King Clovis (and therefore all the Franks) in 496 consolidated the position of the Church. Its power would rarely be challenged until the French Revolution of 1789.

Since wine is needed for mass, vineyards were planted near churches, abbeys and monasteries. Gregory of Tours mentions[20] wine dozens of times, but I found only one reference to cider and none to beer. Wine was drunk by the wealthy as well as the common people. In *The History of the Franks* (III.19), he writes that the hills west of the city of Dijon '*…are covered with fruitful vines, which yield so noble a Falernum-type wine that the inhabitants have been known to scorn a good Mâcon*'. This reference to the 'Falernum' indicates how highly regarded this famous Roman wine still was. Gregory mentions Bordeaux and its bishops, but not its wines.

In the early 7th century, something unexpected happened: Islam. This new religion emerged from Medina and Mecca and spread like wildfire. It soon dominated a territory ranging from Afghanistan to the southern border of the Byzantine Empire (roughly southern Turkey), the entire Middle East, Egypt and North Africa, and most of the Iberian Peninsula, which the Moors controlled after expelling the Visigoths at Guadalete in 711. By 800, almost half of the known world was Muslim.

In the north, Charlemagne, the first Holy Roman Emperor, consolidated the Frankish empire, which included much of Western Europe, from the river Elbe to Italy, France, and a touch of Spain.

Thus, between 450 and 800, the western world has completely changed. The Roman Empire was a distant memory and Italy had become a weak kingdom. Charlemagne controlled much of Europe, the Slavs the east, the Byzantine Empire the south east and Constantinople. Islam was pushing into France at one end (it was turned back at Poitiers in 711) and Turkey at the other.

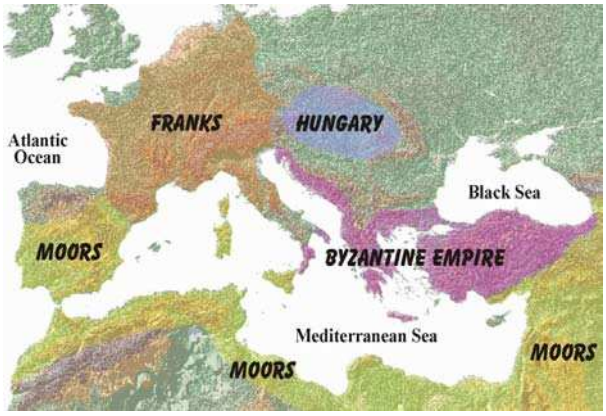


Fig. 22: *The main players around 800 (map: Kristin Reid).*

2.2 ARAB CONTRIBUTIONS

After the Barbarian invasions, the Arabs became the custodians of Civilization. They translated ancient texts and further developed medicine, technology, and science (in particular mathematics and astronomy). Intellectual centers thrived in the Middle East and Southern Spain, in particular in Cordoba where Albucasis (936-1013), the father of surgery, lived. He developed most modern-looking surgical tools, and wrote a 30-volume medical encyclopedia.

Throughout the Middle Ages, new knowledge arrived in Western Europe from Islam (and China). The Arabs maintained glass-blowing skills and, in the 8th century, invented distillation. 'Alembic' (*al-anbiq*) and 'alcohol' (*al-koh'l*) are Arabic words.

Distillation allows the extraction of the essence from flowers or fruits, but wine can be distilled as well. The process is based on the difference in the evaporation temperature of water (212°F) and alcohol (172°F). One evaporates the condenses alcohol. High alcohol concentrations can easily be produced. To obtain nearly pure alcohol, several distillations are required.

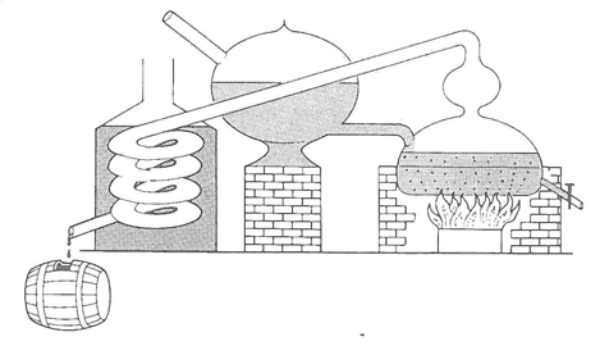


Fig. 23: *Alembic (or pot-still): the pre-heated wine (jar at the center) evaporates into the boiler. The vapors (mostly alcohol) are sent through a water-cooled spiral and drip into a barrel.*

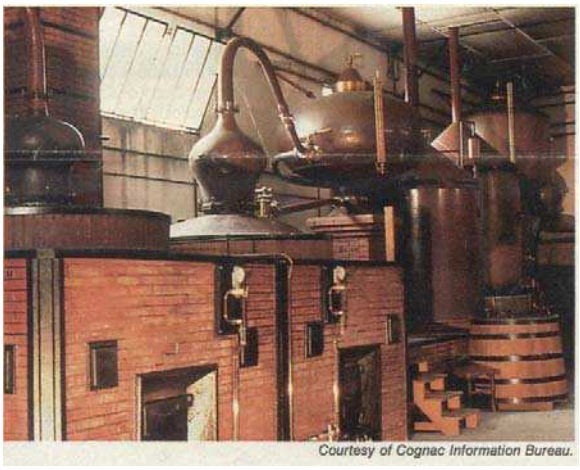


Fig. 24: *Copper alembic (Cognac Chamber of Commerce).*

Distillation was a technology brought back to the West by the Crusaders returning from the Middle East. Distilled alcohol first appeared in Italy in the 12th century and quickly gained importance, mostly for its medicinal value as an antiseptic. Nothing stronger would be found until Sir Alexander Fleming (1881-1955) discovered penicillin in 1928. Alcohol also served as an additive to strengthen wine and stabilize it during transport by sea.

Alcohol as referred to as *quintessence*, literally the 'fifth element' - something important enough to rank with air, water, fire, and earth. In Germany, *gebrandtewein* ('burnt wine') became the Dutch *brandewijn*, the origin of the word 'brandy'. In France, the regions of Cognac and Armagnac began to produce distilled wines. Ports, Madeiras, and other fortified wines are obtained by adding grape alcohol to a wine, usually before the end of the fermentation.

Of course, distillation also resulted in alcoholism. The Qur'an contains the earliest language which limits or outright bans the consumption of alcohol[8]. It mentions wine or drinking seven times, but only two verses contain strict

language against its consumption and one (Surah 47.15, quoted above) promises to the believers 'rivers of wine' in the gardens of heaven.

Surah 2.21:
They question thee about strong drinks and games of chance. Say: in both is great sin and (some) utility for men; but the sin of them is greater than their usefulness…
Surah 4.43:
O ye who believe! Draw not near unto prayer when ye are drunken, till ye know that which ye utter, not when ye are polluted save when journeying upon the road, till ye have bathed…
Surah 5.90:
O ye who believe! Strong drink and games of chance and idols and divining arrows are only an infamy of Satan's handiwork. Leave it aside in order that ye may succeed.
Surah 5.91:
Satan seeketh only to cast among your enmity and hatred by means of strong drink and games of chances, and to turn you from remembrance of Allah and from worship.
Surah 16.67:
And of the fruits of the date-palm, and grapes, whence ye derive strong drink and (also) good nourishment. Lo! herein is indeed a portent for people who reflect.
Surah 83.25:
They are given to drink of pure wine, sealed.

The word used is often *khamr*, wine from grapes. The second Caliph clarified the issue in the hadith literature: '[wine] *comes from five kinds of fruit: grapes, dates, honey, wheat, and barley. Wine is what obscures the intellect'*. One is left wondering as to which fruit produces honey or reasons other than alcohol which obscure the intellect. Endless interpretations followed about the letter and the spirit (pun intended) of the law.

Over the centuries, the production and use of wine continued in Islamic countries. Recipes suggested how to mix wine and water (typically, 1/3 wine with 2/3 water). The Moors encouraged the production of wines by non-Muslims (they taxed the product) and sometimes enjoyed wine themselves.

There are many references to wine and drinking in the Arab literature, such as in the poems of Abu Nuwas (757-815) or the comments of Judah ben Solomon Harizi (1170-1235): '[wine is] *an unreliable emissary: I sent it down to my stomach, and it went up to my head*'. Omar Khayyam, famous 12th century Persian poet and scientist, often mentioned wines and drinking, as in[22]

Yesterday this Day's Madness did prepare;
Tomorrow's Silence, Triumph or Despair:
Drink!
for you know not whence you came nor why:
Drink!
for you know not why you go nor where.

2.3 EARLY MIDDLE AGES

By the fall of Rome, vineyards were established in almost all of Europe and the Middle East. A few belonged to the secular nobility, most were associated with abbeys, monasteries and churches. The clergy had land, cellars, patience and abundant manpower. The 'Mystical Wine Press', a stained glass window in the Church of Sainte Geneviève in Paris, shows Christ on the cross, pressing on the wine press. His blood mixed with wine flows for the faithful.

The Church enjoyed the protection of kings and emperors who, by the way, wanted good wines for themselves. Vineyards were later owned by hospitals and universities as well. Today, the most famous hospital-owned vineyards are those of the Hospices de Beaune in Burgundy, while the University Pierre et Marie Curie (Paris) still produces a delicious *vin doux naturel* from its vineyards in Banyuls-sur-mer.

King Guntramn, grandson of Clovis, gave a vineyard to the abbey of St. Benignus near Dijon in 587. In 630, the Duke of Lower Burgundy gave several vineyards to the abbey of Bèze, in the heart of Burgundy. These will become Gevrey, Vosne, and Beaune. In 775, Charlemagne gave the hill of Corton to the abbey of Saulieu. He demanded that a white varietal be planted there (red wine tainted his white beard). The vineyard became the famous 'Corton-Charlemagne', which today produces a most distinguished chardonnay.

In 867 Charles the Bold gave land in Chablis to the Chapter of St. Martin de Tours. The monks quickly discovered that the region produces exceptional wines. Since the river Yonne flows into the river Seine, the region also has easy access to Paris.

At the time, the location of vineyards was selected for practical reasons: they had to be near a large city or a major river, thus facilitating the sale or shipping of wines. Overland transport was difficult, slow and dangerous. The regions around Paris and near the rivers Rhine, Loire, or Rhône were favored, while Burgundy was at a disadvantage.

As for Bordeaux, its wines were mostly unknown because of its isolation. The Romans established it to ship wines to their troops in northern France and England, but the region's wines were quickly forgotten after the collapse of the Roman Empire. Their revival would have to wait until Eleanor of Aquitaine in the 12th century (see below).

The climate also played a role in the rapid expansion of vineyards throughout Europe. After a cooler period in the 5th and 6th centuries, the 'medieval warm epoch' benefited viticulture in Europe from about 800 to 1300. Note that well-calibrated data exist for only a few locations[23]. However, since wines were produced during that period as far as several hundred miles north of London, summers had to be longer and winters milder than they are today.

In 793, the Vikings raided the monastery of Saint Catherine in Landisfarne on the East coast of England. Until their defeat at Hastings in 1066, they terrified the populations on the coasts of northern Europe, sailed up the rivers and threatened cities (and vineyards). Paris, Tours, Bordeaux, and other cities were sacked. As a result, lands farther inland were sought for planting vineyards.

The Viking were not just pillaging. They also traded all over western and eastern Europe, and the Middle East, founded the city of Dublin, and established colonies in Iceland, Greenland, and Newfoundland. Their rulers were 'first among equals' and they had a high sense of democracy, which was lacking elsewhere in Europe. On the other hand, they also pillaged and had no taste for wine.

In the early Middle Ages, red as well as white wines were produced, but wine presses were expensive, and only the wealthy estates (larger abbeys or monasteries) were well equipped. Common wine was obtained by foot-treading – which probably resulted in blush-type wines. This was often done in open air, probably to limit carbon dioxide poisoning.

The barrels were usually left outdoors: wine cellars appeared only in the late Middle Ages. The alcohol level was often low (around 7-8%), the acidity high, and the wine unstable[24]. It was not known that barrels must be kept full to compensate for evaporation and leaks. If they are not, the wine is continuously exposed to oxygen and quickly turns to vinegar.

When one drew wine from a barrel, the rest of it had to be drunk quickly, hence the saying '*quand le vin est tiré, il*

faut le boire' (when wine is drawn [from a barrel], all of it must be drunk).

No wine survived very long: there were no airtight amphorae or bottles in which wine could age. There was no resin from the Terebinth tree to slow down the vinegar bacteria. Wood barrels leaked and the wine oxidized. Documents show that the price of a six-months-old wine was only about half that of a new one and, beyond a year or so, most wine was undrinkable.

Fig. 25: *Treading grapes in the Middle Ages[25]. The must…*

Fig. 26: *... was poured into wooden barrels[25].*

Precious few technological advances took place during this period. Most wine producers appear to have known less about winemaking and aging that the Ancient Egyptians or the Romans.

Trade barriers were in place everywhere to protect the local production, which itself could not reach distant markets for the same reason. Even the best red wines (which were produced in Burgundy) were not found in Paris, while the wines from Bordeaux and the Rhône were essentially unknown. There was a demand for the sweet wines from Lebanon, Crete, or Sicily, but these were very rare and expensive.

The wines produced along the Rhine were mostly shipped to England. Some wines were shipped from Bordeaux to Scotland and Ireland (a large importer). Few wines from Champagne reached Paris because Champagne is at the crossroads of major trade routes: Flanders-Switzerland and Paris-Rhine.

The region of Champagne was the spiritual center of France. This is where St. Rémi (bishop of Reims) baptized Clovis in 496 and where Hugh Capet was crowned in 987. The kings of France were always crowned there as well. The wine produced in Champagne at the time was nothing like the delicate bubbly we know today.

2.4 LATE MIDDLE AGES

The year 1096 marked the beginning of the Crusades. These bloody expeditions had little impact on the history of wine, except that the returning crusaders were exposed to Arab technology. One important example is distillation.

Europe enjoyed warm and long summers from the late 800's to the early

1300's, the 'Medieval warm period'. In 980, the Norse established settlements in Greenland. In the year 1000, Leif Erickson, son of Eric the Red, reached Newfoundland at l'Anse aux Meadows. He also brought Christianity to Greenland (but I know of no evidence of winemaking associated with this). In Europe, the average harvest took place as much as one month earlier than it does today, and commercial vineyards thrived as far north as the Welch border in England. During this climactically favorable period, quality wines will be produced in Burgundy and the region of Bordeaux will be rediscovered.

Then, a sudden and dramatic change occurred. It is known as the 'Little Ice Age'[26]. It started far north, and is the most likely reason the Vikings had to abandon their settlements in Greenland (and Newfoundland?). In continental Europe, the Little Ice Age began with the unusually cold winter of 1309/10. Then, incessant rains started late spring 1315, and hardly stopped for three years! The few crops that managed to grow never matured, the food supplies rotted or run out, the soil eroded. The domestic animals were the first to starve and were eaten, then a massive three-year long famine ensued. Tens of thousands of people starved in central and northern Europe.

Vines were attacked by the Downy Mildew, and wine became scarce. The harsh winters of 1317-8 and 1322-3 compounded the misery. Unpredictable weather would last for centuries, with occasional warm summers and many bitterly cold periods. There were very cold winters in the 1430's, resulting in widespread famine (1433-1438). In the mid-1450s, viticulture was abandoned in England. It has resumed only in the past couple of decades. The 'official' end of the Little Ice Age, in the mid-1850's, coincides with the Irish potato famine.

Approximate climatic data are obtained from tree rings, ice cores, historical accounts, logbooks of ships, accounts of wine harvests, and other sources. Such records are not available everywhere and for all periods. Reasonable data in Europe give us a pretty good idea of the average climate in central and northern Europe for much of Antiquity and the Middle Ages.

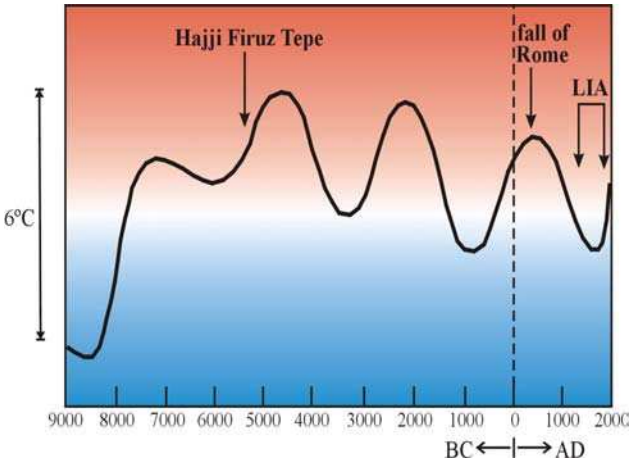


Fig. 27: *Average temperature fluctuations in the Northern Hemisphere[27] since the end of the last major Ice Age. The 'Little Ice Age' ('LIA') lasted from 1315 to ~1850.*

Waves of Black Plague hit Europe with a vengeance. The first one started in Messina (Sicily) in 1347, when a ship from the Middle East arrived with most of its crew dead or dying. Other waves swept through Europe in 1361, 1371 and 1382. Outbreaks of plague continued in Europe throughout the 17th century. In the early epidemics, the death rate was so high (on the average, about one-third of the population died between 1348 and 1350!) that the entire social structure changed. Medieval agriculture was labor-intensive and the severe lack of manpower meant famine in many places.

The feudal structure was shaken as the serfs, virtual slaves attached to a

piece of land, sharply dropped. Labor was scarce, and it became increasingly hard to enforce serfdom. In order to boost their populations, cities like Tours offered freedom to serfs who could avoid capture by their landlords for a year and a day.

2.4.1 Benedictines and Cistercians

Monastic viticulture on a grand scale began late in the 10th century, first with the Benedictines (black habits) of Cluny near Mâcon. The monastery, founded by Bernon in 909, benefited from a pontifical exemption, meaning that it was under the direct authority of the pope and independent of the King.

This was something new. Until 11th century, all bishops were nominated by the king, a principle imposed by Charlemagne. Pope Leon IX (1049-1054) then his successor Gregory VII, pursued a policy of emancipation from the temporal power. In 1075, the Pope decreed that only the Pontiff of Rome can be called Universal, only he can depose and appoint bishops. He can also depose emperors...

Cluny and its dependent monasteries quickly became powerful. In order to counteract their influence, the Cistercians (white habits) founded the monasteries of Molesme (1075) then Citeaux (1098), just east of Nuits-St.-George. They followed the same rules of St Benoit, but applied them to the letter, with principles of penitence.

Monastic life (pray, work, rest) quickly became very popular. There was an increase in the appeal of religion, partly because of the new fervor associated with the Crusades, partly because of the insecurity of cities caused the frequent Vikings raids, and partly because life in a monastery was overall safer than in the cities or small rural communities.

The Cistercians were known to be quality-fanatics. They had plenty of time, manpower and other resources. It is said that they even tasted soil samples before deciding where to plant new vineyards. They brought the chardonnay grape to region of Chablis and introduced the notions of *terroir* and *cru*. 'Terroir' refers to the soil, exposure, slope, and other physical characteristics of a vineyard. 'Cru' relates a wine to the grapes that grow in a specific geographical location.

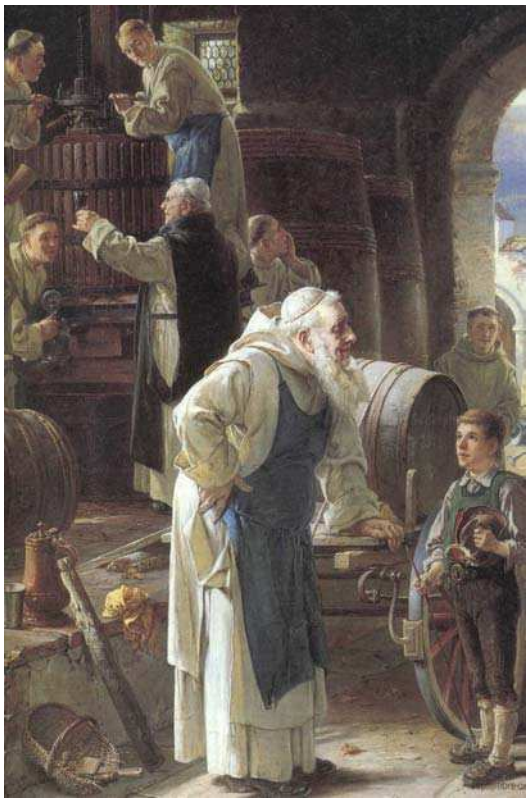


Fig. 28: *Cistercians monks[28]. Note the wine barrel, wine press, and tools.*

The number of Cistercian abbeys[29] grew enormously until the onset of the Little Ice Age in the early 1300s. Daughter-abbeys of Cîteaux, Pontigny, Clairvaux, and Morimond grew from a handful in 1100 to 697 in 1300. This does not include hundreds of nunneries. These abbeys were built from Portugal to Russia and from Sicily to Scotland.

Most of these were impressive collections of churches and other buildings, and had substantial land for farming and viticulture. Many abbeys had fantastic cellars for keeping wines – the first wine cellars ever dug.

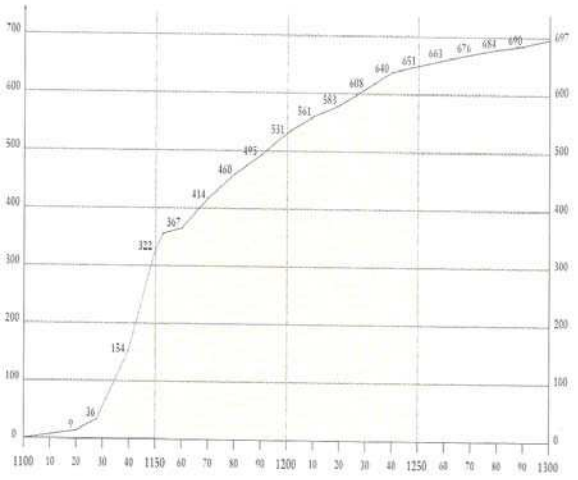


Fig. 29: *Total number of Cistercians abbeys in Europe from 1100 to 1300[29].*

2.4.2 The Dukes of Burgundy

The (first) Golden Age of Burgundy lasted from 1364 to 1477, owing to four powerful dukes, wine lovers dedicated to excellence. The arts prospered, the monastic orders grew, and the emphasis on wine quality rather than quantity was enforced. At its height, Burgundy included much of northern France, Belgium, Luxemburg and the Netherlands, a size that made it a threat to the king of France. The dukes established strict quality standards which survive in today's Burgundy.

The first was Philip the Bold (1364-1404). In 1395 he ordered the prolific but common *gamay* varietal pulled from the region and replaced by the *pinot noir*: No gamay has grown in Burgundy proper since then (it thrives in Beaujolais). This was the first government regulation limiting which varietal(s) is allowed in a given geographical area. These regulations survive to this day throughout France, a legacy of Philip the Bold.

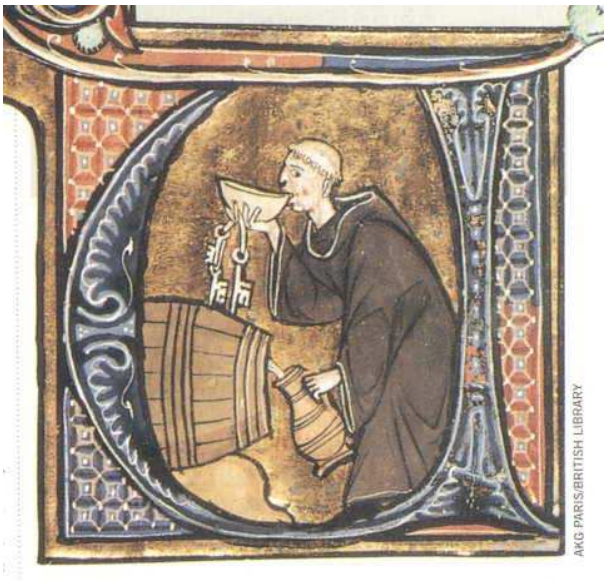


Fig. 30: *The lucky monk in charge of bringing wine to his brothers and nevertheless friends.*

Philip was succeeded by John the Fearless (1404-1419), then Philip the Good (1419-1467). The latter was not good to everybody: he is the one who captured Joan of Arc and delivered her to the English, who burned her for heresy in 1431. But we will remember him for declaring the flat lands around Dijon off-limits to the pinot noir. None grows there still today...

In 1443 Philip's Chancellor, Nicolas Rolin, built a public hospital for the poor in Beaune. The goal was to relieve some of the misery caused by the Hundred Years' War. The first patient was welcomed on January 1, 1453. Today, the Hospices de Beaune are famous for their wine auctions (below).

The last of the four great Dukes of Burgundy was the impulsive and ambitious Charles the Bold (1467-1477).

He ran into a problem: the miserable-looking but dangerously smart Louis XI, the 'Spider' King of France. Worried about the power of Burgundy, Louis manipulated Charles into fighting the Swiss, who were pretty tough at the time. Charles lost two important battles and was killed before the walls of Nancy. Burgundy never again challenged the power of the King.

2.4.3 Côtes du Rhône

Between 1307 to 1377, the papacy moved from Rome to Avignon (southern France, along the river Rhône), This coincides with the reappearance of the wines from Côtes du Rhône, in particular the *Château-Neuf-du-Pape*.

Popes Clement V and John XXII were also very fond of the wines from Beaune, which were transported to Avignon at great expense to grace His Holiness' taste buds. This trade increased the awareness and reputation of Burgundy wines throughout Europe.

Fig. 31: *One of the (many) wines produced in Château-Neuf-du-Pape*

2.4.4 Champagne

The role of Champagne wines in the late Middle Ages was minor. The region was located rather far north. Before the onset of the Little Ice Age, vineyards thrived much farther north. But since the early 1300's, Champagne was as far north as wine could still be cultivated. The summers were short, late spring and early fall freezes common. The grapes had enough sugar to make reasonable wine (sufficient alcohol content) only in the warmest summers. The wine tended to be acidic and light.

The fermentation was rarely finished by the time the temperature dropped and the yeast went dormant. The following spring, it awakened and the fermentation resumed. As a result, the wine was not only acidic but had a tendency to be bubbly. These were considered signs of poor quality. However, there was a lot of it, and in the early 1400s, the wine trade was the largest business in Reims.

2.4.5 Bordeaux

Bordeaux wineswere not known in the early Middle Ages. The city and its bishops are mentioned, but its wines are not[20], at least until (one of) the most remarkable and powerful women in all of history arrived on the scene: Eleanor of Aquitaine (1122-1204).

In 1137, she was married to Louis VII, King of France, and bore two daughters (Alice and Marie). In the 12th century, married women remained married, especially with the King. But not her… As Louis became increasingly recluse (and boring), she divorced (!) him on March 21, 1152. On May 18 the same year, she married the fiery Henry Plantagenet, soon to become Henry II of England. This added the region of Aquitaine (and therefore the wine region of Bordeaux) to the crown of England. Henry already had inherited three other French regions: Maine, Aujou, Touraine.

Bordeaux and its wines remained under English control for three centuries, until the battle of Castillon,

which marked the end of the Hundred Years' War (1337-1453).

The wine trade between Bordeaux and England increased enormously from 1154 to 1452. In 1226, Louis IX of France took *La Rochelle*, the most important port on the Atlantic. Soon afterwards, Bordeaux was licensed to store and ship large volumes of wines.

Fig. 32: *Eleanor of Aquitaine, one of the most fascinating women in all of history (effigy in Fontervault).*

The wine trade with Bordeaux was so large that the capacity of ships was measured by the number of barrels they could carry. The wines were shipped in 'tuns', large casks (about 950 liters) used for the shipping of wine. The French *tonneau* (100 cases = 1,200 bottles = 900 liters) comes from tun. Today, the capacity of merchant ships is still measured in tons.

A planting frenzy accompanied the increase in the wine trade, and the city grew substantially. Bordeaux wines established themselves as the best in the world. This would not be seriously challenged until late in the 20th century.

In the 1300s, the English drunk more Bordeaux wine (about 80,000 tuns) than they do today, with only 5% of today's population. They called it 'claret'. This is probably related to its light color (*clair* in French) but some believe that it referred to the powerful Earl of Clare who held fief in the region under Henry II.

The first long-macerated, barrel-matured, red Bordeaux wines would be produced much later, in the late 1600s, by the Pontac family at Haut Brion. Until then, red and white grapes were often pressed together, producing blush wine.

2.4.6 Italy

In Italy, the diet was still based on bread, olives and wine. The trade was limited because the country was politically divided and transportation difficult. Between the 11th and 14th centuries, the population increased from 5 to some 8 million people, and urban centers grew.

The merchant cities of Genova and Venice emerged. They soon became rich and powerful. The bankers of Florence, such as the Antinori, went into the wine business. By the 14th century, many of today's most important vineyards were planted with the varietals we know today: Barbera, Nebbiolo, Sangiovese, just to name a few. The reputation of Italian wines (in particular those from Tuscany) was growing. 'Chianti' was first mentioned in 1398. This wine is a peculiar blend of varietals (Sangiovese, Camaiolo, Malvasia, Trebbiano, etc.) which grow in the same vineyard, are harvested, pressed, and vinified together.

Venice gained a quasi-monopoly on the trade with the Orient, including the intense sweet wines from Lebanon and Cyprus. By the second half of the 15th century, the power of Venice had diminished, as the center of influence shifted from the East to the West. This shift was sometimes dramatic (the explorations of the African coast or the discovery of America) and sometimes

subtle (the move of the knights Hospitallers from Cyprus to Rhode). In Cyprus, the Hospitallers produced a dessert wine, the *Commandaria*, which is still produced there today.

2.4.7 Spain

In Spain, the Moorish influence was fading. By 1300 only Granada remained Moorish. In 1469, Ferdinand of Aragon married Isabella of Castille, thus unifying most of Spain under their dual crowns. They set to complete the expulsion of the Moors from Spain. On January 1, 1492, Boabdil, the last monarch of Moorish *Al-Andalus* surrendered the keys of Granada.

The Catholic fervor of Ferdinand and especially Isabella led to the ruthless Spanish Inquisition, and the expulsion of not only Muslims, but also Jews, and later Protestants. Note that the first new minaret in Granada in over 500 years was built in the summer of 2003. Ironically, it is located right between a church and a convent. The sisters at the Convento de las Tomasas are reported to be less than thrilled by the calls to (Muslim) prayer, starting at 5:30am. Someone up there must have a sense of humor after all.

The wines produced in Spain at the end of the Middle Ages for the most part of rather low quality. It was sometimes mixed with honey to increase its appeal and longevity. However, powerful deep reds (which would become known as ‘black wines’) were made in the north, along the river Duero. Strong and dry wines were also produced in the South, near Jerez and Cadix. These ancestors of the sherry, not yet fortified, were exported to England where they were known as *sack*.

2.4.8 Portugal

Portugal gained independence from the Moors in 1130 but its trade with England was still very small in volume and limited to the north of Portugal. Its friendship with England, sealed at the Treaty of Windsor in 1386, still lasts today.

3. RENAISSANCE TO WORLD WAR II: EUROPE

Wine is sunlight held together by water.
Galileo Galilei (1564-1642)

3.1 BACKGROUND

The second half of the 15th century marked the start of a new era in the history of Western Civilization. Leonardo da Vinci was born in 1452. The Renaissance, alive in Italy for a century, was about to explode throughout Europe. In 1453, Constantinople fell to the Turks and Bordeaux to the French. The latter marked the end of the Hundred Years' War and of England's control over Bordeaux wines. Gutenberg printed the Bible in 1455. Martin Luther was born in 1483. Columbus left Palos, Spain, for America in 1492.

In 1494, under the arbitration of Pope Alexander VI (a Spaniard), Spain and Portugal divided the New World among themselves at the Treaty of Tordesillas: all newly discovered land west of a line of longitude 370 leagues west of Cape Verde Islands would be Spanish and the rest Portuguese. Spain ratified the treaty in July and Portugal in September.

In 1498, Vasco de Gama rounded the Cape of Good Hope. A thirst for exploration and knowledge engulfed the western world. 1492 was also when the last Moors were kicked out of Granada. Religious intolerance was growing....

In the 1600s, fortified wines were first mad and the benefits of the noble rot discovered. The first brand-name wines of modern times were sold and the reputation of Bordeaux wines consolidated. Modern Champagne was born and practical glass bottles manufactured. Fermentation and aging were studied and (partly) understood.

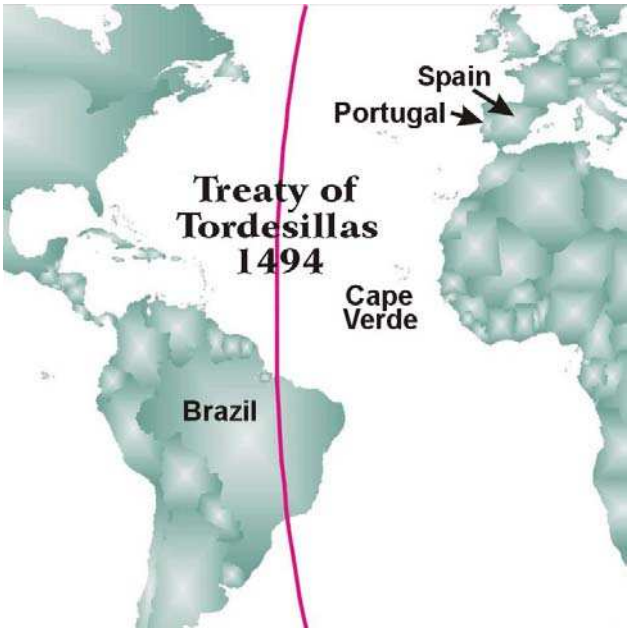


Fig. 33: *The treaty of Tordesillas split the New World between Spain, west of the line, and Portugal, East of it (map: Kristin Reid).*

A cataclysmic period for wine began in the mid-19th century and lasted over a century. It started with natural disasters: powdery mildew, phylloxera, and downy mildew, and was followed by man-made ones: World War I, Prohibition, the Great Depression, and World War II.

3.2 THE 1500s

In 1517, Martin Luther nailed 95 theses on the door of the Wittenberg castle church. They questioned the sale of 'indulgences' -- payments to the Church for the forgiveness of sins. Although the nailing of 'thesis' to the Church door was done routinely to generate discussion or debate over specific issues, Luther's arguments did strike a sensitive nerve. He was excommunicated in 1521, but Protestantism was born and spread fast. It soon broke into Lutheranism, Anglicanism, Zwinglianism, Calvinism, Anabaptism, just to name a few. Its power threatened, the Roman Catholic church invigorated the holy inquisition and began the Counter Reformation. Religious wars raged across Europe from 1545 to 1650. Everyone knew that God was on their side...

One of the most intolerant religious leaders was John Calvin (1509-1564). He ruled Geneva with an iron fist, closing bars and imposing his righteous views on everybody. He even executed a child for hitting his father... Yet, a significant part of his salary was paid in wine: 500 muids per year. A 'muid' is an old Dutch unit of volume, equivalent to 3 bushels. There have been numerous definitions of the bushel, but it could be as much as 8 imperial gallons. Calvin drunk a lot of wine. He was also suspected of secretly brewing beer…

In France, on St. Bartholomew's Day (August 24) 1572, thousands of Huguenots (as the French Protestants were called since about 1560) were massacred. The civil war raged until Henry of Navarre, born a Huguenot, became France's Henry IV and converted to Catholicism: *Paris vaut bien une messe!* (Paris is well worth one mass!) he claimed. On April 13, 1598, he granted freedoms to Protestants, thus (temporarily) halting the religious wars. The Edict of Nantes was revoked by Louis XIV on October 18, 1685. Fearing for their lives, large numbers of Huguenots fled France.

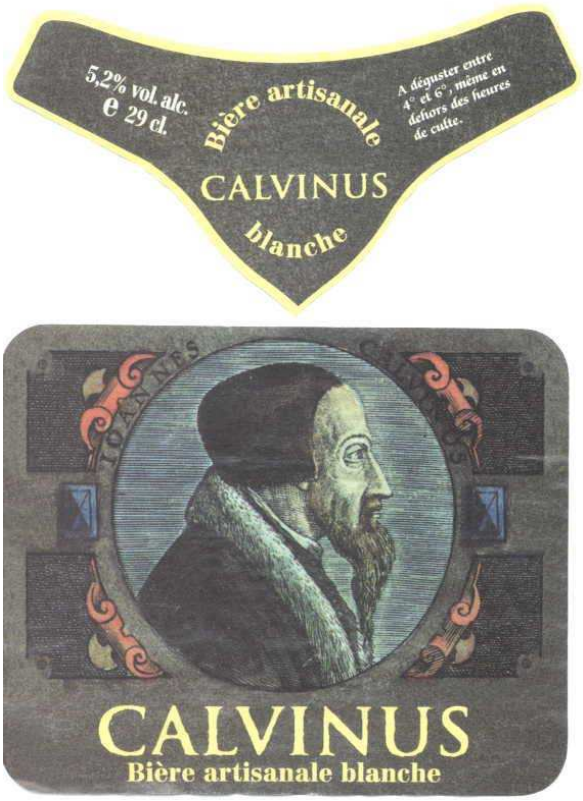


Fig. 34: *Calvinus beer is sold in Geneva.*

In the 1500s the wine trade was dominated by England. The country had close ties with Portugal since 1373 (these ties are still strong today). English ships carried the powerful red wines produced in the Upper Douro Valley of Portugal, sometimes via the fishing waters off Newfoundland.

The early wines from Porto were produced with a primitive technology: the grapes (often with stems) were treaded by foot in stone vats (*lagares*) and the free-run juice was fermented in goatskins: There were no trees in the Upper Douro valley, and therefore no barrels, and the first bottles would

appear in the late 1600s. The English merchants often added a measure of brandy to the wine before shipping, to stabilize it and mask the off-flavors.

Fig. 35: *The dry, rocky Upper Douro Valley where few trees grow[30]. The first terraces were carved by hand in the late 1600s.*

At that time, wines with high alcohol content were sought after because they kept longer than light wines. They were often drunk mixed with water. Brandy was routinely added to barrels of drinking water onboard ships.

In the 1400s much of the Spanish trade was in the hands of Sephardic Jews. In 1492 Spain expelled those who refused to convert to Catholicism. Most of them fled. A large number of English merchants moved to Spain and filled the trade vacuum. They established basic quality controls for wine production. Ironically, many of the Jews who fled Spain went to England, France and the Netherlands, where they went back to the wine trade, often with Spain.

The relations between England and Spain were stormy. They turned very sour after Henry VIII divorced Catherine of Aragon in 1533. Matters slowly improved, but then Sir Francis Drake captured the Spanish fleet off the Isthmus of Panama, in 1572. Fifteen years later he attacked Cadiz, seized 2,900 pipes of sherry and brought them to England. This turned out to be a blessing in disguise, as sherry became very popular in England and a new and lucrative market emerged for sherry.

In 1588 King Philip II of Spain sent a huge fleet against England to capture the country and, he hoped, convert it to Catholicism. But it sailed just as one of the coldest decades of the Little Ice Age was beginning. His 'Great Armada' ran into all sorts of problems, including violent storms which forced the fleet around England, Scotland, and Ireland before returning to Spain. Half the 130 ships were lost as well as twenty to thirty thousand men (only 1,500 died in battle). This failed expedition crippled Spain as a seafaring power. Philip II died in 1598, leaving Spain riddled with debts, and no longer a major power.

In eastern Europe, the Hungarian *Tokaji* was first mentioned at the end of the 15th century. It was a dry wine at the time. However, the Turks under Suleiman I defeated Louis II in 1526 at the battle of Mohàcs, and the region went under Muslim rule for 160 years. Wine making and drinking was tolerated but not encouraged. This was not an auspicious beginning for what would become one of the most amazing dessert wines in the world.

3.3 THE 1600s

From 1618 to 1648 the Thirty Years' War between Catholics and Protestants ravaged the Rhineland. This bloody war saw armies wandering through the countryside, looting and killing. The soldiers often brought with them diseases such as cholera, the plague, typhus and typhoid fever, which further decimated local populations. Vineyards were abandoned as cellars were

continuously looted and winemaking equipment destroyed. This was particularly true in Alsace which suffered greatly during this period. By the end of the war, the Germans were left with so little wine that beer became their everyday drink. It still is today.

In the early 1600s, the Dutch emerged as a major trading power. In England, the first thick and sturdy bottles were made, corks and corkscrews perfected. In France, the monarchy became stronger and the power of the Church diminished. This affected mostly Burgundy and Champagne, where the majority of vineyards had been planted by monks on church property during the Middle Ages. These vineyards were now bought by the new bourgeoisie of Dijon. Pierre Dom Pérignon made the first quality still wines in Champagne. Observational science had its first major hero in Italy, Galileo Galilei.

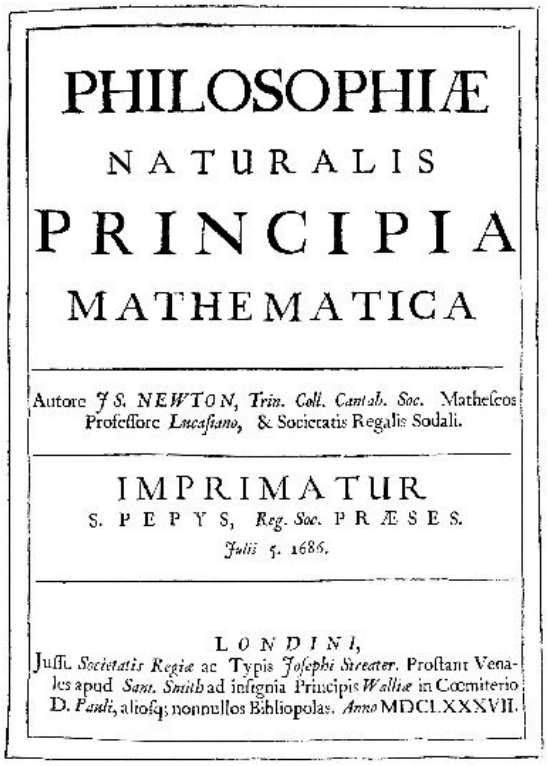
By the mid-1600s dozens of types of wines were commonly available in London. They had generic names such as 'Claret', 'French', 'Spanish', or simply 'red' or 'white', with no guarantee of origin. But on April 10, 1663, the diarist Samuel Pepys recorded[31] that '[at the] *Royall Oake Taverne in Lumbard-street'* [London]*, I drank a sort of French wine called Ho Bryan that hath a good and most perticular taste that I never met with'.* This wine was of course Château Haut Brion, the first recorded brand-name wine since Roman times.

Note that two years later (1665), Arnaud de Pontenac, the owner of Chateau Haut Brion, opened an upscale tavern in London, the famed 'Pontac's Head', from where he distributed his wines.

Samuel Pepys later became the President of the Royal Society. In July, 1686, he was asked by the young Isaac Newton for the 'imprimatur' of the Royal Society for his *Principia*. This is how Pepys' name appeared on the cover page of the first edition, prominent on the title page, with that of Newton.

Fig. 36: *Chateau Haut Brion, the first brand-name wine of modern times.*

Fig. 37: *The diarist Samuel Pepys[31].*



PHILOSOPHIÆ
NATURALIS
PRINCIPIA
MATHEMATICA

Autore *J. S. NEWTON, Trin. Coll. Cantab. Soc.* Matheseos Professore *Lucasiano*, & Societatis Regalis Sodali.

IMPRIMATUR
S. PEPYS, *Reg. Soc.* PRÆSES.
Julii 5. 1686.

LONDINI,
Juſſu *Societatis Regiæ* ac Typis *Joſephi Streater*. Proſtant Venales apud *Sam. Smith* ad inſignia Principis *Walliæ* in Cœmiterio D. *Pauli*, aliosq; nonnullos Bibliopolas. *Anno* MDCLXXXVII.

Fig. 38: *The first edition of Newton's Principia lists Newton, as well as Pepys…*

3.3.1 The Dutch trading companies

Since the mid-1200's, the Dutch were active members of the Hanseatic League, an association of some 160 German, Dutch and Flemish towns which traded from the Baltic sea to the Atlantic. The power of the league declined in the 1500s. The Dutch were then ruled by Maximilian (a Catholic Hapsburg) and Mary of Burgundy. Their son Philip married Juana La Locca, the daughter of the very Catholic Ferdinand and Isabella of Spain. Their son became Charles I of Spain in 1516.

Ten of the Dutch provinces were Catholic. But the seven northern ones had become Calvinist after 1567. In 1579, they banded together (Union of Utrecht), turned against Spain and the Inquisition, and declared themselves independent ('United Provinces', today's Netherlands). In 1648, they achieved independence (treaty of Westphalia).

With few natural resources, the Dutch turned to trade. They were very good (and aggressive) at it. Their fat ships ('flyboats') held twice as much cargo as English ships, their closest competitors. In 1615-1616, a fleet of six Dutch warships raided Spanish colonies in America, attacking and sinking any Spanish or Portuguese ship along the way. Within a century, the Dutch colonies stretched from North America (New Amsterdam on Manhattan Island) and, by the way of Africa (including the Cape), India and Ceylon, all the way to New Zealand. In Europe they dominated the wine trade.

However, most wines still survived at best one year, rarely more. They were light and fragile (low alcohol content, color and tannin). The constant shaking and temperature fluctuations during transport by ship would often cause the wine to go bad. Only the sweet and/or fortified wines were more resilient. As a result, the Dutch encouraged any innovation which helped the wines survive longer. One was *fortification*, which consists in adding grape alcohol to the wine. If done before the end of the fermentation, this kills the yeast, and the residual sugar makes the wine sweeter.

The Dutch promoted the *distillation* of some wines to produce the alcohol needed for fortification. It is then and under Dutch influence that the region of Cognac became famous. Its wine requires only two distillations to produce clean brandy, probably because of the highly acidic varietals used and the chalky soil.

They encouraged the fermentation of over-matured grapes (*vins pourris*), which produce stronger and sweeter wines. I do not know if this involved noble-rot wines and if so, at when these would have first been produced.

They also blended light, dry, and pale wines (most of the Bordeaux wines were

of that type) with stronger, albeit less distinguished, 'black wines' from Spain, Portugal, and the region of Cahors.

The Dutch introduced the use of *sulfur* to stabilize the wine: candles dipped in sulfur were burned inside barrels before they were filled with wine. This would also prevent any secondary fermentation to take place. In French, they were called *allumettes hollandaise* ('Dutch matches') or '*mèches souffrées*'.

In the 1650s the Dutch provided the technique and expertise for draining the marshes of Médoc (the so-called '*palus'* in Bordeaux). This entire region was soon covered with vineyards, destined to produce spectacular wines: Lafite, Latour, Margaux... In the early 1700s these wines sold for 60 British pounds per tun, while the common clarets went for as little as 8 pounds.

The success of the Dutch infuriated the French and especially the English, whose trading power was seriously threatened. In the late 1670s, Europe's total merchant fleet consisted of maybe 20,000 ships, of which about 15,000 were Dutch, and only 3,000 English and maybe 500 French. This situation led to protectionist legislations such as Cromwell's 'Navigation Ordinance' which forbade (the Dutch from) shipping between English and foreign ports.

It also led to skirmishes such as the 'Four Days' War' in 1667, when the Dutch destroyed 25 English ships at the mouth of the Thames. In 1652, Cromwell declared war against the Netherlands and seized 1,500 ships. In 1709, the English and French refused to issue passports to the Dutch in Bordeaux, cutting them from the most profitable wine market. The Dutch continued as traders but their dominance ended.

In France, Minister Colbert ordered the planting of oak forests in the Limousin and Tronçais to provide quality wood for a future French navy. These forests now provide the oak for wine barrels exported all over the world.

3.3.2 Champagne

During the Medieval warm epoch, making wine in Champagne was not particularly challenging, and wines were produced much further north. But, following the bitterly cold winters of the early 1300s, many vineyards had to be abandoned and Champagne was as far north as wines were still produced.

The short growing season meant a high acid/sugar ratio. Further, the fermentation was rarely finished by the time winter arrived and the yeast would go dormant. In the spring, the fermentation started again, resulting in a wine that was bubbly (because of the carbon dioxide produced by the fermentation) and cloudy (because of fermentation byproducts). These were regarded as signs of low quality.

Fig. 39: *Pierre Dom Pérignon (1639-1715), marketed as the father of Champagne.*

In 1668, Pierre Dom Pérignon became procurator at the Abbey of Hautvillers. He did not drink himself, but was a perfectionist dedicated to making high-quality wines. He identified the best vineyards and systematically tested the properties of blended wines.

Contrary to widespread belief, Dom Pérignon did not invent the bubbly Champagne we know today. Instead, he succeeded at producing high-quality *still* (not bubbly) white wines in the region. His wines remained still and did not turn cloudy. He also discovered how to make white wines with black grapes. Later in his life, he did attempt to control the bubble in sparkling wines. However, at the time, the nature of fermentation and the critical role of sugar in the process were not understood.

Despite his brilliant work and innovations, Dom Pérignon was not interested in sales or advertising. It is Louis XIV who made Champagne fashionable when, in 1695, he followed his doctor's advice to drink Dom Pérignon's light, white, still Champagne wines rather than rich red Burgundies.

3.3.3 Bottles

One of the key technological breakthroughs in the making of voluntarily sparkling wines was the production of thick and sturdy wine bottles. The first ones were made in the 1630s in the glass factory of Holden and Golenet in England. The invention is credited to Sir Kenelm Digby.

New coal (or rather, coke) furnaces were replacing the charcoal-burning ones. In 1709, Abraham Darby I was the first to smelt iron ore with coke on a commercial basis. However, there was too much sulfur in the coke and this rendered red-hot iron brittle. The new furnaces could not be used for wrought iron. The first coke furnaces[32] practical for the production of wrought iron would be developed much later, in 1750 by his son, Abraham Darby II. However, the early coke furnaces could be used for purposes other than wrought iron, for example glass.

The availability of glass bottles in which wine can be safely kept is a major development in the history of wine. From Neolithic times to the fall of Rome (over 5,000 years), a single material had been used to ferment, store, and transport wine: clay. Throughout the Middle Ages and up to the Industrial Revolution, only wood was used (barrels). But since the late 1600s, two materials were involved in winemaking: maceration and fermentation in wood (barrels), then maturation and aging in glass (bottles). For the first time in 1,200 years, wine could age again…

The earliest bottles were designed to stand. They had an irregular neck and the corks were tapered and inserted only part-way into the bottle. Thus, they could adjust to the shape of the neck and were easy to remove. Dom Pérignon perfected the corks for use with Champagnes. The first corkscrews (originally ‘bottlescrews’) appeared in the 1630s. Comparable devices were already in use to remove unspent bullets from muskets.

Fig. 40: *The shape evolved from bubble to cylinder, allowing bottles to lie on their side and wines to age (Sandeman).*

In the second half of the 1700's, the shape of port bottles changed from bubble-shaped, designed to stay upright, to cylindrical, which allowed them to lie on their side. The cork remained wet inside the bottle and did not dry and shrink. This isolated the wine from the air, allowing it to age, which improved it substantially.

3.3.4 The first Port wines

In the late 1600s, the English imported French oak barrels to the Upper Douro Valley in Portugal. These barrels replaced the goatskins in which the local wines were traditionally kept (for lack of wood for barrels and bottles).

Further, to prevent erosion and help retain moisture in the vineyards, the English also began the construction of extensive terraces, each holding 2 to 5 rows of vines.

Following the Dutch methods to stabilize the wine, the merchants often added some brandy before shipping. In 1678, an English merchant reported that an abbot at the monastery at Lamego (south of Régua in Baixo Corgo) added brandy to his wine *before* the end of the fermentation. The resulting wine was powerful and contained a lot of residual sugar: port was born[33].

In the late 1600's and early 1700, a large number of (mostly English and Dutch) wine merchants moved their headquarters to Vila Nova de Gaia, across the Douro River from Porto: Kopke (1638), Warre's (1670), Croft's (1678), Quarles Harris (1680), Taylor's (1692), Morgan (1715), Offley (1737), …

3.3.5 The noble rot

Hungary enacted its first Wine Laws under Turkish rule, in 1641. They regulated districts and the proper way to care for vineyards. The beneficial role of the 'noble rot' (the fungus *Botrytis Cinerea*) was accidentally discovered in 1650. Fearing a Turkish attack, the people of Tokaj (the city, some 120 miles north-east of Budapest) fled or remained within city walls to avoid being captured while working in the vineyards. The vintage was delayed and noble rot developed. The winemaker, a priest called Szepsi Laczkó, decided to ferment these grapes anyway. The result was the first Botrytis wine.

In 1660, the role of the noble rot in the production of luscious, sweet wines was recognized for the first time, and the laws for making the *Tokaji Aszú* were formulated. 'Aszú' refers to the pile of rotting grapes.

Botrytis Cinerea attacks the skin of mature grapes. It makes them thinner, thus allowing the water to evaporate. This concentrates the sugar without affecting the total acid content. When ready to be picked, the grains look rotten, but the juice is incredibly sweet.

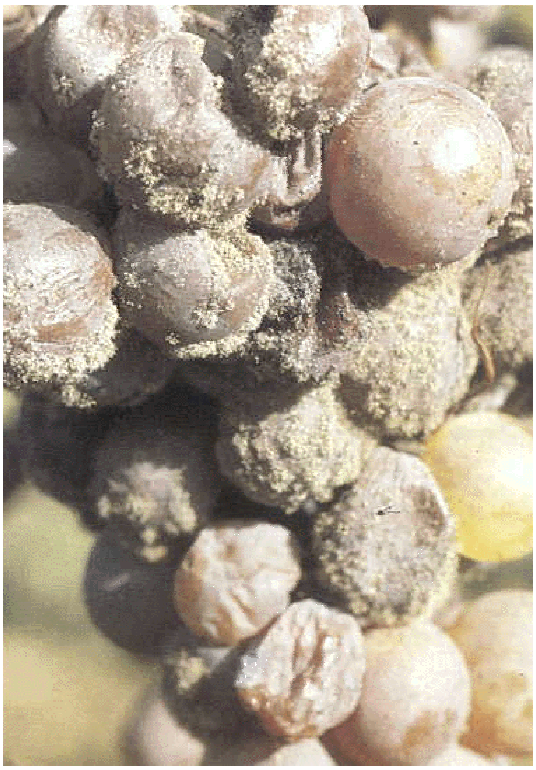


Fig. 41: *Sauvignon Blanc attacked by Botrytis Cinerea.*

The yield is low (at most, 650 gallons per acre) and the process is not without risk. Indeed, if the same fungus develops before the grapes are mature (*gray rot*), the crop is ruined.

But it is not enough to produce a great wine: One must also spread the word. In the case of *Tokaji Aszú*, this happened by accident and, as was the case for Champagne, it involved Louis XIV of France. In 1686, the Hapsburg expelled the Turks from Buda and Hungary had a Catholic ruler. This bothered Ferenc Rákóczi, prince of Transylvania and a Protestant. He tried (unsuccessfully) to secure an alliance with the French against the Hapsburg. In 1703, as a goodwill gesture, he gave a large amount of Tokaji Aszú to Louis XIV, who liked it a lot. The wine quickly gained a formidable reputation. The Tokaji Aszú and the South African *Constantia* competed for almost 200 years for the title of best (dessert) wine in the world.

3.4 THE 1700s

European politics in the 1700s was quite complicated, but this affected only marginally the history of wine. For most of this century, Frederick the Great ruled over Prussia and Catherine the Great over Russia. In France, Louis XIV died in 1715, leaving the country ruined. His successors Louis XV and Louis XVI were not very strong leaders. Spain was weak and Italy divided. England had financial interests and political difficulties all over its empire.

During the 1700s, many boundaries changed and strategic marriages were arranged, leading to wars about who should rule a given nation. The Seven Years' War (1756-1763) involved all of Europe.

The power struggles left populations in misery. This was compounded by some of the worst winters in memory. Crops were ruined, famine and disease common. During the winter of 1708-9, all the rivers down to the south of France froze solid and many vines died. The vineyards in Bordeaux had to be replanted. Later in the century, the terrible winters of 1783/4 and 1788/9 killed many trees and vines, and brought starvation to the countryside and bread riots to Paris. Nearly 90% of the Champagne vintage was lost, and the rest not mature enough to make any wine. Most vineyards in the North of France were abandoned.

The fall of the Bastille Prison in 1789 marked the beginning of the French Revolution. People were fed up with kings and emperors jockeying for power while they starved to death. Louis XVI was decapitated in 1793. Order was restored by Napoleon in 1799.

As for wines, the 1700s brought very important technological innovations: today's Champagne was born, the Chateaux of Bordeaux emerged, bottles and corks became commonplace.

3.4.1 The end of monastic viticulture

In Burgundy and Champagne, most vineyards had been planted by Benedictine and Cistercian monks, beginning in the 10th century. By the late 1600s, the church owned most of the land, but its political hold was diminishing as the King monopolized power and a middle-class emerged. An increasing number of vineyards were purchased by wealthy merchants. In the 1720s, the *négociants* (wine merchants) opened shop in Beaune. The first Champagne house was established in 1743 by Nicolas Ruinard in Epernay.

There is one vineyard particularly close to my heart, Romanée-Conti. Today, it produces the most (expensive

and) prestigious pinot noir in the world. In an average year, it produces a mere 6,000 bottles. Its tiny 4.4 acres are within sight of the Church at Vosne-Romanée. A pinot noir vine from it grows in my backyard, in Lubbock. Its history illustrates the fate of many Burgundy vineyards.

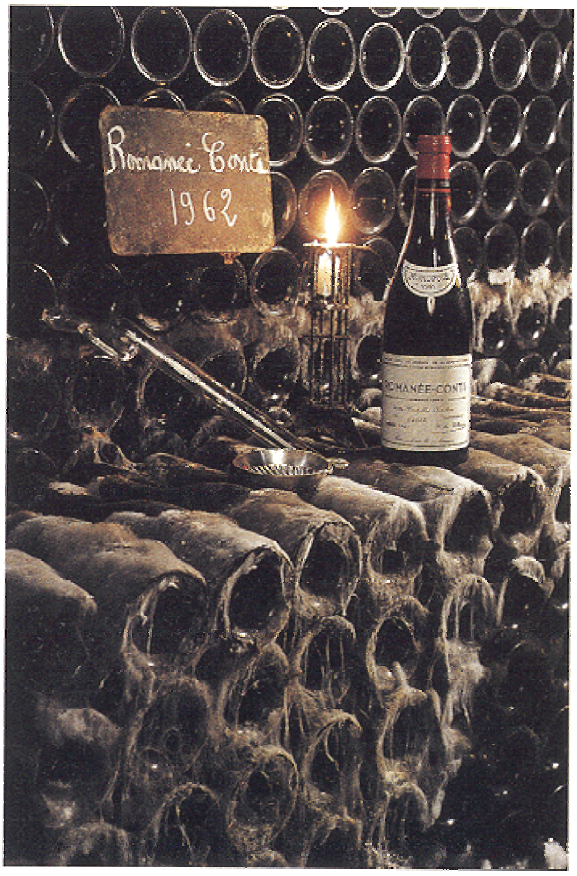


Fig. 42: *If you have one of those, do not hesitate to give it to me (from a postcard I received years ago).*

This vineyard was first mentioned in 1512, as *Le Clos des Cinq Journaux*, property of the monks of St-Vivant. Sold many times over the years, it became the property of the Croonenbourg family in 1651 and was renamed *Romanée* (the adjacent *La Romanée* is distinct). In 1760 it was sold to Louis François de Bourbon, Prince of Conti.

After the Revolution, all the vineyards in Burgundy were dispossessed and sold. *Romanée* was confiscated in 1794 by the Revolutionary Republic, and renamed *Romanée-Conti* in the hope that the 'Conti' name would help it fetch a higher price. By the late 1700s, it belonged to the Oratoire of Dijon and was named *Au-dessus de la Romanée.* It is now *Romanée-Conti* again.

3.4.2 Selling bubbles

Following the innovations of Dom Pérignon and the availability of higher-quality bottles, intentionally sparkling white wines started to be produced in Champagne. The trick was to bottle the wine with the right amount of added sugar. But how much sugar is 'right' was anybody's guess. The precise amount depended on how much residual sugar was still in the wine when it was bottled, something neither understood nor readily measurable at the time. Too little sugar resulted in a flat wine. Too much of it caused the gas pressure to increase and bottles to explode in the spring. In a typical year, as many as one-third to one-half (!) of the bottles exploded… Further, the secondary fermentation in the bottle left unsightly deposits (dead yeast and minerals) which made the wine cloudy.

The standard champagne bottle, with a cork tied to its necks, was introduced in 1735. In 1780, a man named De Maizière discovered that blending wines from different Champagne regions allowed a better control of the gas pressure and reduced the breakage. As a result, over a quarter-million bottles of champagne were produced in 1788.

The target customer was the upper-class woman. It was said that the Champagne 'coupes' (flat and wide glasses with a long foot) were modeled after the breasts of Marie Antoinette, wife of Louis XVI (and guillotined in

1794). If true, she had small breasts, but what a story... This is the reason coupes are always used at weddings.

[champagne is] ***the only wine that leaves a woman beautiful after drinking it.***
Madame de Pompadour (1721-1764), (yet another) mistress of Louis XV

3.4.3 The first chateaux

Before the 17th century, most Bordeaux wines were simply labeled 'claret' (a word still used today for 'Bordeaux wine' in England) and a few were named after the main town in the area of production. In the 1730s, five regions within Bordeaux were recognized: Graves, Palu, Entre-deux-Mers, Langon, Barsac, and Preignac. Only a few brand-names were known: Haut Brion, Lafite, Margaux ('Margo'). The Bordeaux wine trade was mostly with Ireland and England, the former importing almost four times as much wine as the latter.

Haut Brion was the property of the Pontac family, wealthy landowners involved in politics. In winemaking, they followed the Dutch emphasis on 'black wines'. These long-macerated, deep red wines had more color, body and a longer life than the traditional clarets. This trend spread through the region.

The idea of creating 'Grand Cru' wines appeared at chateau Margaux in the 1730s. Soon began the 'Second Hundred Years' War, the 'war of the chateaux' during which neighboring winemakers fought for prestige, name recognition and markets. Spectacular buildings were constructed just to show off, and the concept of 'chateau' appeared. This war culminated with the classification of 1855.

The 1700s was also when the sweet Sauternes and Barsac wines appeared on the market. The high humidity in the low-lying region of Sauternes was favorable to the growth of the *Botrytis Cinerea* fungus. 'Noble rot' wines were produced, but the producers did not advertise it, for fear of turning off a key customer: the Church. Sweet wine were the holy wine of the Sacrament, and the use of rotten grapes might not have been deemed appropriate.

The workers who picked the grapes received detailed instructions on how to select the grains that were perfectly 'roasted' and were ordered to keep their mouth shut. The reputation of chateau d'Yquem was well established by the time Thomas Jefferson visited the region in the 1780s.

Fig. 43: *One of Thomas Jefferson's Yquem 1784. His initials 'Th.J.' are visible (photo: New York Times).*

3.4.4 Regulations for ports

The Methuen treaty of 1703 diverted the wine trade from Spain to Portugal, which benefited from preferential tariffs. The production increased and, with it, fraud. Cheap alcohol replaced quality brandy, elderberry juice was added for color and dried pimento for power. The drop in quality was followed by a drop in prices, which collapsed around 1750.

The massive Lisbon earthquake of November 1, 1755 (estimated at 8.5 magnitude[34]) killed some 40,000 people. The (very authoritarian) Prime Minister of King Joseph, Sebastião de Carvalho, Marquis of Pombal (1699-1782) took control of the country.

Fig. 44: *Sebastião de Carvalho[17].*

Pombal supervised the reconstruction of Lisbon, curbed the power of the Inquisition, expelled the Jesuits, ended slavery in Portugal, and reformed the study of Sciences. He imposed a wine monopoly in Porto, set strict regulations about the production and export of Ports, and limited the areas where port could be produced. This resulted in a near revolution in Porto, where the English merchants were used to act as they pleased. He crushed this rebellion. He quickly made a lot of enemies. After the death of King Joseph in 1777, he was banished by the new monarch, Maria I. His strict regulations, the first large-scale government controls over wines and vineyards, were revoked.

3.5 1800 TO WORLD WAR II

The dawn of the 19th century coincided with the rise of Napoleon. Fifteen years of wars consumed Europe, from Lisbon to Moscow. In 1815, the Emperor was sent into his final exile to the island of St. Helena.

Napoleon's main wine legacy was the abolishment of the medieval ‘Salic code’ by which a father's entire inheritance went to his eldest son. He replaced it with the ‘Law of Equal Inheritance’ by which all property was equally divided among his (male) children.

This resulted in a fragmentation of many vineyards, which is particularly obvious in Burgundy. After a few generations, any estate large enough to sustain a family became a patchwork of tiny properties, each one too small to sustain a business. This led to extreme situations such as Clos de Vougeot, a 124-acre vineyard with 77 owners.

From 1815 to 1848, various revolutionary movements popped up across Europe. In France, the monarchy returned, but Louis XVIII was a weak king. His brother Charles X succeeded him in 1824 and attempted to restore an absolute monarchy. Mobs sent him fleeing to England in 1830. He was replaced by Louis Philippe. 1848 was the year of revolutions throughout Europe, and the year Karl Marx published the *Communist Manifesto*.

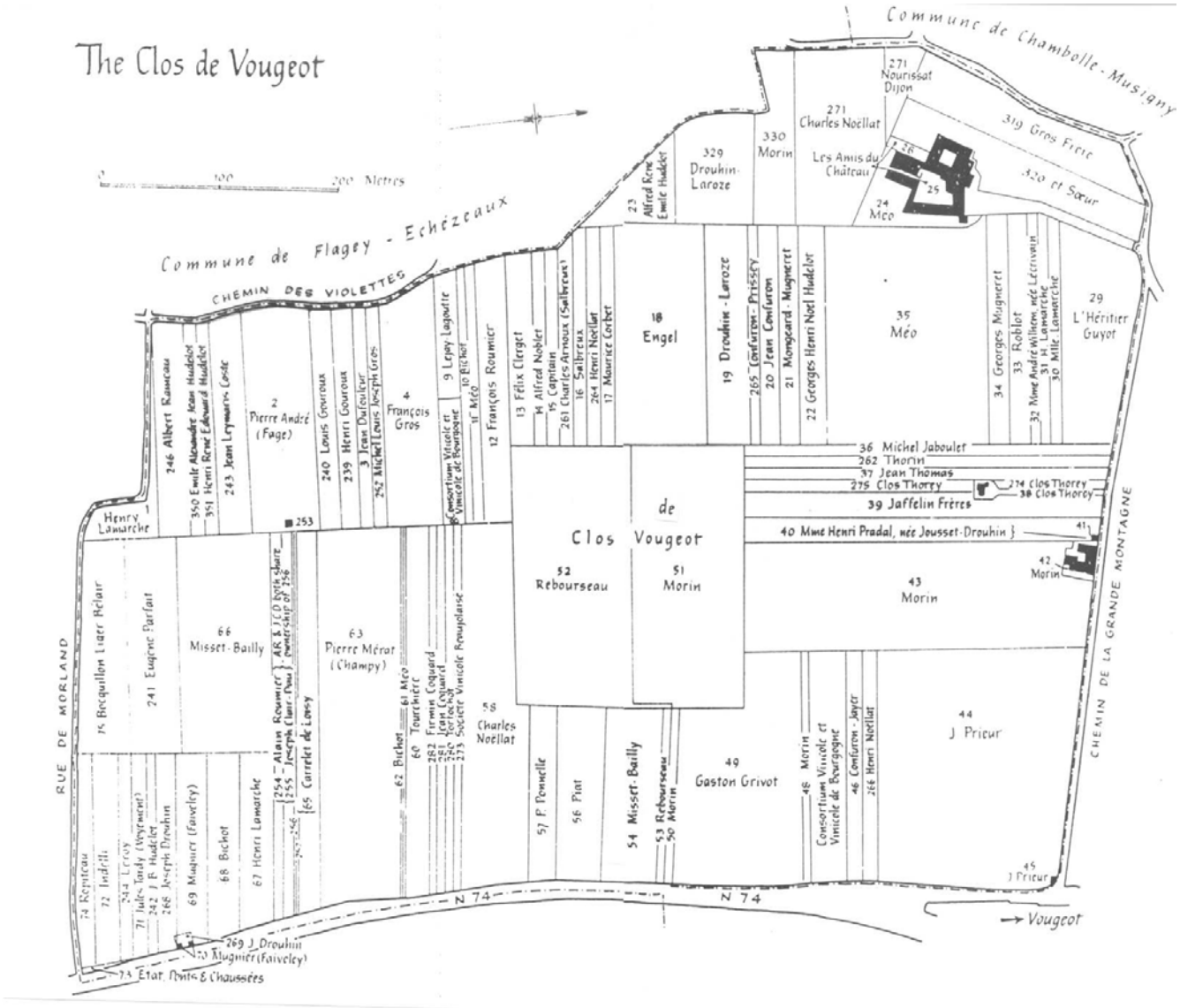


Fig. 45: *The excessively subdivided Clos de Vougeot vineyard. The best parcels are high-up, behind the building.*

The 1848 French revolution brought in the Second Republic, with Louis Napoleon president. He established the 'Second Empire' in 1852, and named himself Emperor Napoleon III. In 1870, it was replaced by the 'Third Republic'.

The first half of the 19th century was uneventful for wines. After the very cold 1805-1820 years, the wines benefited from increasingly good weather and trade. In Burgundy, a canal system was built and the new Paris-Dijon railway connection greatly facilitated commerce.

In 1855, Dr. Jules Lavalle from Beaune published the first unofficial ranking of Burgundy's vineyards. The same year, in Bordeaux, Napoleon III ordered a classification of the best Médoc wines.

In 1914 Archduke Ferdinand, heir to the Austro-Hungarian throne, was assassinated in Sarajevo by a Bosnian Serb nationalist. This touched off the events that led to World War I, the bloody war that didn't need to begin, ended by sheer exhaustion, and firmly planted the seeds of World War II.

Between the two World Wars, the maps and atlases used in German schools showed Alsace and Lorraine as being 'temporarily under French control'.

The general poverty that followed World War I was disastrous for a wine industry that has not yet fully recovered from two great natural disasters: mildew and phylloxera (see below). In 1917, the Russian Revolution began, shutting off the profitable Russian market.

The general poverty and despair that followed the end of World War I resulted in widespread alcoholism. Governments everywhere started pushing prohibition. The Finnish Diet forbade the import of alcoholic beverages in 1910. Several northern European countries heavily taxed alcohol and restricted its sale to state-run stores. The United States amended its Constitution. Prohibition is still debated today in New Zealand.

In 1922, Benito Mussolini seized power in Italy. The Great Depression began after the stock market crash in 1929. Constantinople became Istanbul on March 28, 1930. In Spain, the 1931 republican victory in municipal elections resulted in King Alfons XIII being deposed and the Second Republic established. Five years of chaos ensued and culminated in Francisco Franco's (1898-1975) *Manifesto* and the Spanish Civil War (1933-1936). Starting in 1933, Japan and Germany violated the spirit of the League of Nations by rebuilding their military machines and by aggression.

3.5.1 Science and technology

In 1800, Alessandro Volta discovered the electric battery, thus making electricity practical. In 1831, Michael Faraday invented the dynamo. In 1876, the first telegraph appeared… The industrial revolution was in full swing. More and more people migrated from the countryside to the cities.

Louis Pasteur (1822-1895) studied fermentation and oxidation. In 1857, he discovered that the basic chemical reaction in fermentation was caused by living yeast. The sugar in the must is food for yeast, which transforms it into alcohol and carbon dioxide: $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$. Emile Manceau (in 1895 at the Moët champagne house) and, independently, Eduard and Hans Buchner (in 1897) discovered that yeast produces enzymes, and they actually perform the fermentation.

Pasteur spent years studying wine and identified several of its key components. He also explained how oxygen transforms wine into vinegar. He realized that it also plays an essential role in the aging of wine.

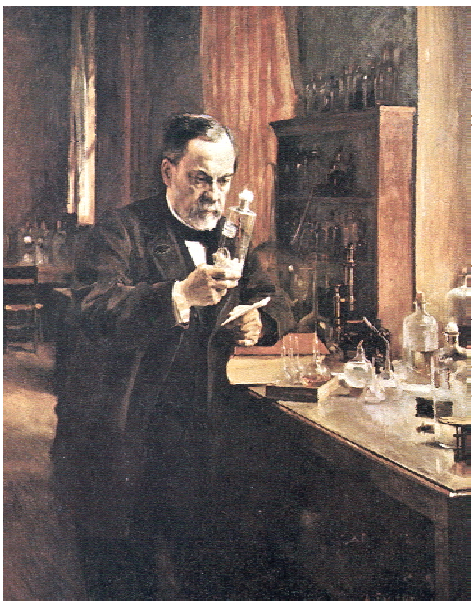


Fig. 46: *Pasteur, pretending to be at work.*

Bottle technology improved. The early wine bottles (mid-1600s) were designed to stand upright. Their shape evolved to allow *binning* (storing of wine in bottles lying on the side). The early corks were tapered to accommodate differences in the necks. They were pushed deep into the bottle and removed with corkscrews.

As the capacity of bottles was irregular, laws dating back to 1636 forbade the sale of wine in bottles: it was sold by measure. Many people owned bottles marked with a seal (initials or a heraldic sign). Handwritten wine labels first appeared in the early 1800s. Printed ones became common in the latter part of the century.

In 1821, Ricketts of Bristol patented a machine for molding bottles of uniform shape and size, but it was not until 1860 that selling wine by the bottle was legal. The large-scale production of molded bottles became possible with the 'Owens machine'. Michael J. Owens' (1859-1923) first fully automatic bottle-making machine was built in 1903. An improved version (1912) produced over 50,000 bottles a day! The last Owens machines stopped operation in 1982.

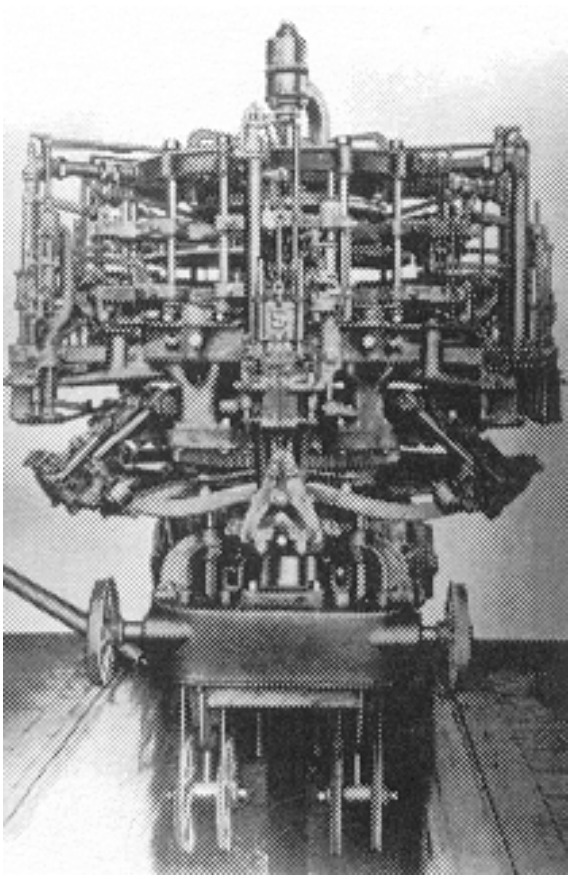


Fig. 47:*The complicated Owen's Machine.*

3.5.2 American fungi and pests

Vitis vinifera vines could not survive in the eastern United States until well past World War II, despite many attempts at planting them. The reason was the presence of viruses, bacteria, fungi, and bugs that are deadly to the European species. The numerous *vitis* species native to North America are resistant, but *vitis vinifera* is not. After the Europeans settled in America, the flow of people and goods across the Atlantic increased and it was only a matter of time before these American vine-killers made it to Europe.

P*owdery mildew* (or *oidium*) arrived in France in 1847. This fungus attacks all parts of the vine. Wine production took a nosedive. By 1852, the harvest was down by about 80% and the 1854 vintage was the smallest since 1788. Spraying with a mixture of sulphur, lime, and water controls the fungus. It is still a problem today, especially in wet years.

Fig. 48: *Powdery mildew.*

P*hylloxera* was first noticed in 1863 in Southern Côtes du Rhône. It is a small, yellow, root-feeding aphid, which does not do well in sandy soil but thrives elsewhere. The female is about four-

hundredths of an inch in size and produces a stunning billion babies per year (four to seven generations per summer). It would be difficult to see her chewing on roots were it not for the mass of eggs that surrounds her. Phylloxera crawls from vine to vine and can be carried by the wind, but its most efficient mode of transportation is man.

Fig. 49: *Infestation of Phylloxera Vastatrix.*

One after the other, almost all the vineyards in the world were hit: France in 1863, Turkey and Portugal in 1871, Austria in 1872, California in 1873, Switzerland in 1874, Italy in 1875, Australia and parts of Spain in 1877, Algeria, South Africa and New Zealand in 1885, Greece in 1898... For unknown reasons, phylloxera spared Chile, much of Argentina, Crete, Cyprus, Rhodes and a handful of vineyards, sometimes surrounded by affected ones.

In France, phylloxera destroyed 6.2 million acres of vines from 1875 to 1889 and the production dropped from 2.2 billion to 600 million gallons. The 1868 Commission identified phylloxera as the culprit. Everything imaginable was tried to control it: planting a live toad beneath each vine, flooding a vineyard with seawater, spray with chemicals. Nothing worked.

An American entomologist, Charles V. Riley, suggested grafting European varieties on American rootstock. Many American species resist phylloxera by growing a cork-like layer beneath the wound made by the bug as it feeds on the root. The 1881 Phylloxera Congress in Bordeaux discussed chemical means of control and, reluctantly, the grafting of French vines onto American rootstock.

Most French growers resisted the idea of importing the inferior American varietals to Europe and feared that the quality of wines might be irreparably compromised. Some growers created American-*vinifera* hybrids, the so-called ‘French hybrids’, but these provided only moderate phylloxera resistance and the quality of the wine was definitely lower.

So, the grafting of vinifera varietals onto American rootstock began, not just in France but throughout the world. In France, 6,200 acres were grafted in 1880, and 110,000 by 1885. The replanting of all the vineyards involved quality varietals, well-suited to the local climate. The grafting is still done today.

In the region of Cognac, the issue was not simply to find phylloxera-resistant rootstock, but to find rootstock that would thrive in the chalky soil of the region. The perfect rootstock came from the small town of Denison, in central Texas, where Thomas Munson was experimenting with vine rootstocks. Munson received the French Legion of Merit in 1888 for saving Cognac[35].

Europe begun importing thousands of tons of American rootstock to save the very European varietals they wanted to grow in America. This did solve the phylloxera problem but created a new one, which crossed the Atlantic on the imported vines: *downy mildew*. This fungus attacks young leaves and likes warm, humid summers. It first appeared in 1878. It is still a problem today.

Fig. 50: *Downy mildew.*

The fungus can be controlled by spraying the *Bordeaux Mixture*, a mixture of lime, copper, sulphur and water. Nevertheless, it is responsible for the low yields of 1886, 1910, 1915, 1930, 1932, 1948, 1957 and 1969. All these vintages followed wet growing seasons in France. Note that the systematic spraying of vineyards with sulfur in one form or another dates back to the Powdery and Downy mildew. Because of this, almost no wine is totally free of sulfites. The exceptions are of course the noble-rot wines.

3.5.3 Modern Champagne

Armed with the legacy of Dom Pérignon and a better control of the bubble, winemakers in Champagne fine-tuned their processes.

Around 1813 the first 'pupitres de remuage' were invented at *Veuve Cliquot.* These clever devices force the deposit in the wine to precipitate over time in the neck of the bottle, thus making it easier to remove the deposit. The method, called *dégorgement*, was proposed by André Simon.

Fig. 51*: The bottles are gently shaken daily, and given 1/8 of a turn.*

In 1820 better corks were produced in more than one piece, and corking machines became available. By 1850, the corks were branded and the wire muzzles applied by machine.

Stronger bottles and more accurate measures of the sugar (*liqueur de tirage*) needed to induce the secondary fermentation reduced the breakage to about 15% by 1837. Accidents still happened: in 1928 too much sugar was used and nearly 80% of the bottles exploded.

During the secondary fermentation and the aging, the bottles are kept in deep caves. They earliest were carved in the chalk by the Romans. There are many miles of caves under the city of Reims, where millions of bottles of champagne are kept.

In 1895 a scientist at Moët achieved consistent onsets of secondary fermentation (*prise de mousse*) by selecting yeasts from various regions. By the late 1800's, Champagne as we know it was sold.

Mercier, the owner of the Mercier Champagne House, came up with publicity stunts well ahead of his time. For the 1889 Universal Exposition in Paris, he built a huge barrel (200,000-bottle capacity), which was towed to Paris by 24 oxen. The three-week trip was a sensation, especially when an

axle broke, blocking a Paris street for days. At the 1900 Exposition, his tasting room was set in the gondola of a huge hot-air balloon. One windy day, the cables snapped, and the balloon took off with the gondola, the bartender, and several customers. It crashed 16 days later in Austria, and Mercier was fined 20 crowns for illegally importing Champagne across the border.

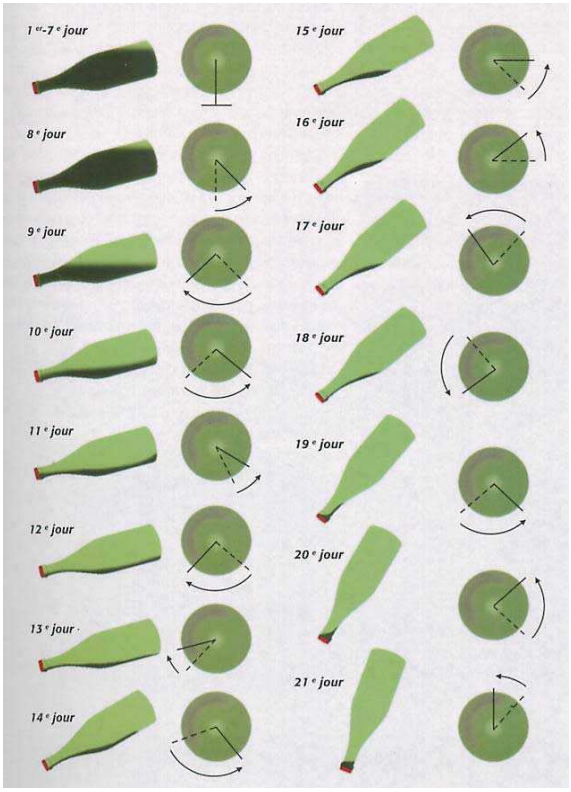


***Fig. 52**: A bottle spends one week nearly horizontal, then the angle is increased daily. After 3 weeks, the bottle is nearly vertical.*

The reputation of Champagnes grew tremendously between 1850 and World War I, despite many problems. After 1855, powdery mildew dramatically reduced the yields. Winemakers imported wines, and the quality of Champagne dropped. The Franco-Prussian War of 1870 temporarily interrupted the increase in sales. When phylloxera arrived in 1890, all the vineyards had to be uprooted. The 1908 vintage was poor, the grapes rotted in 1909, and almost no wine was produced in 1910. Then World War I began.

The Great War devastated Champagne. For four years there were trenches everywhere. Long and bloody battles, such as the *Marne,* raged in the heart of the Champagne vineyards. Somehow, grapes were picked and wine was made. It was said that the 1914 and 1915 champagnes 'have the blood of France running through them.'

After World War I, regulations aimed at protecting the brand name 'Champagne' appeared and in 1925, the current Champagne area was delimited. The law allowed only the pinot noir, pinot meunier and chardonnay varietals to be grown. The use of the inferior gamay was (finally) discontinued. A renaissance slowly began. In 1921, Moët produced the first cases of a new luxury brand, *Dom Pérignon*. It reached the market in 1936. But in 1939, World War II began. France was invaded in 1940, and a lot of looted wine made its way to Germany[36].

3.5.4 The 1855 classification

The earliest (unofficial) classification of Bordeaux wines[37] dates back to the early 1700s. It is found in the notes of Basin de Bezuns, intendant of Louis XIV. A 1770 ranking by Lawton was refined by Thomas Jefferson in 1787. His travel notes include a ranking of the red wines from Médoc and the dessert wines from Sauternes. His ranking was based on the recommendations of local merchants, who divided the Bordeaux wines into three categories. He also noted that old vines produce better wines than young ones.

In 1855, Napoleon III ordered a classification of the best Bordeaux wines. He wanted to show them off at the Universal Exposition in Paris.

The classification of 1855 was done by the *Syndicat des Courtiers en Vin de Bordeaux*. It included the districts of Médoc, Haut-Médoc, and Sauternais. One famous wine from Graves, Château Haut-Brion, was also included. The ranking was based on the prices fetched by the various wines over the previous hundred years or more, as given in the official records.

The best Médoc wines were divided into First through Fifth growths. In 1855, the First growths were chateaux Lafite-Rothschild, Latour, Margaux, and Haut-Brion. The first of the Second growths was Mouton-Rothschild. The Sauternes were divided into three classes, and the top class contained just one name: chateau d'Yquem. Classifications of the wines in other Bordeaux regions were done in the 1950s. They are discussed in a later section.

Fig. 53: *The spectacular Chateau d'Yquem.*

'Growth' is a translation of the French *cru*, which itself derives from *croître*, to grow. This may refer to a particular estate, to the chateau itself, or to the wine made from the grapes that grow there. In Burgundy, *climat* is used instead of *cru*.

The 1860s were prosperous for Bordeaux. An Anglo-French treaty signed that year reduced tariffs and facilitated exports. New markets emerged in Russia and the Americas.

In the late 1860s, mildew and phylloxera arrived, and the production plummeted. Winemakers blended the few wines they produced with Spanish and Algerian ones, and used excess fertilizers. The quality dropped. Bordeaux suffered through the end of World War II, but much less than Champagne or Burgundy, as no major battles were fought near Bordeaux.

The story of Bordeaux is incomplete without mentioning the Rothschilds[38]. The founders of the dynasty were the bankers Mayer Amschel and Gütele Schnapper. They sent their five sons to the strategic financial centers of the time: Amschel Jr. to Frankfurt, Salomon to Vienna, Carl to Naples, Nathaniel to London, and James to Paris. The latter bought Chateau Lafite in 1868 and died shortly thereafter. His descendants Edmond (1845-1934) then Elie (1917-) renamed it Lafite-Rothschild.

Baron Nathaniel's son went to France, purchased Brane-Mouton in 1853 and renamed it Mouton-Rothschild. Its wine was classified first of the Second growths in 1855. The wine's motto was:

Premier ne puis,
Second ne daigne,
Mouton suis.

('First I cannot be, Second I do not deign, I am Mouton').

Nathaniel died in 1870. His son James II began the construction of the chateau in 1882, and his widow Thérèse finished it. Their son Henri showed little interest in the property. In 1922 he ordered his son Philippe to care for it.

Baron Philippe's goal was to make of Mouton-Rothschild the best and most respected Bordeaux wine. He wanted to make it a wine equal in prestige to the Lafite, which belonged to his cousins,

descendents of James I. This goal was finally achieved when Jacques Chirac, then Secretary of Agriculture, signed the only change in the 1855 Classification. This occurred on June 21, 1973. Mouton's motto changed to:

Premier je suis,
Second je fus,
Mouton ne change

('First I am, Second I was, Mouton does not change').

Fig. 54: *Baron Philippe de Rothschild (1902-1988), who did so much for wine.*

Baron Philippe fought to impose chateau bottling for all Bordeaux wines. His first harvest bottled at the chateau occurred in 1924. The label was illustrated by Jean Carlu. This marked the beginning of the 'artist series' of Mouton labels, which now includes Chagall, Picasso, Dali, Cocteau, Worhol, and many others. The few vintages with no artist-decorated label are 1945 (it has the 'V' of victory), 1953 (the centennial year), and 1977 (which marked the visit of Queen Elizabeth, the monarch not the ship).

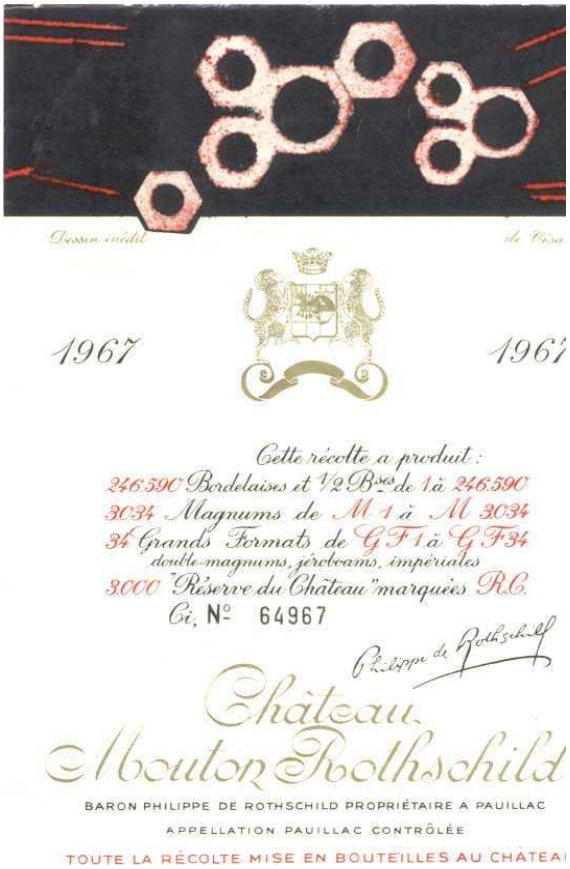


Fig. 55: *The 1967 Mouton-Rothschild label, decorated by César.*

3.5.5 Italy

From the 1600s, the Italian winemakers had been falling behind in terms of technology. Bottles and other innovations reached the country much later than elsewhere. The quality of wines was low. The Italians refer to this long period of stagnation as *decadenza*. When Italy was unified in 1861, the march toward progress finally began. But mildew and phylloxera soon arrived and ravaged the vineyards. The big economic boom and the renaissance of Italian wines would be delayed until after World War II.

3.5.6 Spain

Wines were produced throughout Spain but, since the 1600s, the only ones good enough for export were in the

south, near Jerez and Malaga. These wines were kept in 'butts', oak barrels of about 170 gallon capacity (the 'shipping butt' is about 20% smaller). Most of these wines were exported to England. In the rest of Spain, the level of technology was low. Wine was made in crude earthenware (*tinajas*) and stored in pigskins sealed with pitch and resin.

The Peninsular Wars (1808-1814) devastated the region, and French troops pillaged the sherry bodegas. After Napoleon's defeat, rebuilding took place with remarkable success. The exports increased to 70,000 butts of sherry in 1873, the peak of exports until past World War II. In 1850, a railroad linked Jerez to the north of Spain.

Powdery mildew arrived in 1850, but phylloxera reached Jerez quite late, in 1894, and Rioja even later, in 1901. This is about 30 years after Bordeaux. These 30 years were good for Rioja and Navarra. Their wines were sold for a good price to Bordeaux growers, who mixed them with the few wines they were able to produce themselves. Many Bordeaux growers sold the blend as pure Bordeaux. This brought a much-needed influx of French expertise to Spain, as well as capital investment. Among other innovations, the Spanish *barrica* (a 59 gallon oak cask) was introduced from Bordeaux at that time.

Official delimitations and quality controls for wines of origin were established in 1933 (the DO system), starting in Rioja. Jerez and Malaga followed in 1935. During the Civil War, the vineyards were neglected and many wineries destroyed. The nationalist victory brought Generalissimo Franco to power in 1939. The same year, World War II began.

3.5.7 French regulations

Following mildew and phylloxera, the volume of wine produced had produced dropped substantially everywhere. In many regions, winegrowers formed cooperatives to help each other and try to maintain minimum prices, which reached ridiculously low levels after World War I. This was caused by general poverty and prohibition. The cooperatives were often too small to control market forces. This encouraged the blending of lesser wines to brand-name wines in order to increase the volume. This further decreased the quality and therefore the demand, putting further downward pressure on already low prices.

In the mid-1930's, a *négociant* (wine dealer) in Burgundy, Maurice Drouhin, decided to go against the flow and focus on quality. He begun to purchase almost two-thirds of the production from the famous Domain de la Romanée-Conti, and refused to manipulate them. This idea took hold and an increasing number of *négociants* followed his lead. They developed the idea of *Appelation d'Origine Contrôlée* – a guarantee of origin for wines.

The government had enacted laws in 1905, 1919, and 1927, with the intent to stop the fraud (such as blending French with Algerian or Spanish wines) and impose geographical delimitations. These laws were not strictly enforced, as the government had other, more pressing, priorities.

Note that the first governmental regulations date back to the mid-1400s when Philippe the Good, Duke of Burgundy, dictated where the pinot noir and gamay varietals should and should not be planted. Next, came the Hungarian Wine Laws of 1641. In 1716, Grand Duke Cosimo III of Tuscany delimited the Chianti Classico region. The first delimitation of port wines by the Marquis of Pombal followed the 1755 Lisbon earthquake. Thus, the idea of quality control through government

regulations was not new. But it was not widespread. In the early 1900s, such control was badly needed.

The French law of 1935 created the INAO (*Institut National des Appellations Contrôlées*) which codified the *Appellation d'Origine Contrôlée* (AOC) system. The law dictated which regions have the AOC label, and the wines produced there had to obey strict rules governing the use of fertilizers, the density of vines, pruning, the maximum yield, the minimum alcohol content, and many other aspects of winemaking. The law spelled out which varietals were allowed in each region. You cannot grow chardonnay in Bordeaux or cabernet sauvignon in Burgundy for example. The wines had to be labeled using geographical names, not varietals: The AOC system forced winemakers to produce high quality by restricting the volume. Prices finally went up.

Fig. 56: *The great Corton Charlemagne.*

Since the French have always been in love with excessive bureaucracy, the system was adequately complicated. It still is today. In Burgundy for example, the wines are labeled by the **region** (e.g. 'Burgundy'), **sub-region** (e.g. 'Côtes de Beaune'), **village** (e.g. 'Vosnes-Romanée'), **village-vineyard** (e.g. 'Volnay-Santenots') which are *Premier Cru* wines, or **vineyard** alone (e.g. 'Romanée-Conti'), which are *Grand Cru* wines: the more specific the geographical area, the higher the quality of the wine and the stricter the rules.

The mandatory inscriptions on French wine labels are the geographical name, the words 'Appellation d'Origine Contrôlée' or 'AOC' if the wine is ranked as such, the name and address of the person responsible, the alcohol content, and the volume of wine in the bottle. Any other writings are unregulated and up to the producer. Note that the vintage year is not mandatory, but almost always given.

In Bordeaux, the AOC rules and the ridiculously complicated classifications (Appendix B) make it hard for the non-expert to navigate through the maze of labels. Champagnes are the only AOC wines which do not have to print 'AOC' on their labels. The 1935 laws have been amended many times, to update the rules and define new AOC regions.

The VDQS (*Vin Delimité de Qualité Supérieure*) appellation was created in 1949, The VDQS wines are in an intermediate category between AOC and the 'vins de pays' (country wines).

Similar geographical delimitations and quality controls are or have since been introduced in other countries.

4. RENAISSANCE TO WORLD WAR II: THE NEW WORLD

Although man is already ninety percent water,
the Prohibitionists are not yet satisfied.

John Kendrick Bangs (1862-1922)

All the European and Middle Eastern varietals belong to a single species, *vitis vinifera*. None of them grew in North America or south of the equator until the Europeans arrived in the 1500s. Fifteen centuries after the Phoenicians, Greeks, and Romans brought viticulture from the shores of the Mediterranean Sea to continental Europe, wines were finally ready to take on the world.

4.1 THE AMERICAS

The first documented visit to America by a European was that of Leif Erickson, a Norse who landed in Newfoundland in 1000. He found wild grapes and named the land *Vineland*. His settlement(s) did not survive long.

The next to come was Columbus, in 1492. He was quickly followed by the Conquistadores, in particular Hernán Cortés and Francisco Pizarro. They were accompanied by Franciscan monks who brought with them cuttings and seeds of *vitis vinifera*: they needed sacramental wine for Mass.

The monks took hardy varietals to maximize their chance of survival in new environments. Their main white grape was probably the muscat of Alexandria.

Nobody knows for sure what their main red was, but the Spanish/Sardinian 'monica' is a plausible candidate. Its wine is not very good, but the vine is resilient. It became known as *negra corriente* (Peru), *pais* (Chile), *criolla chica* (Argentina) or *mission* (California), where a thousand acres of it still grow today, in the south.

Fig. 57: *Spanish Conquistadores, preceded by monks...[39]*

4.1.1 Central and South America

The journey of *vitis vinifera* from Europe to Central and South America began in Mexico, went south to Peru, Bolivia, Chile, Argentina, Uruguay and finally reached Brazil. The first vineyards were planted near missions or churches. The locations were only accidentally adequate and, with very few exceptions, these vineyards did not become commercial enterprises.

Cortés planted the first vines in Mexico in 1522. In 1554, he ordered that any Spaniard with a land grant plant 1,000 vines per year for each Indian slave employed. This ensured a large local production, and the New World soon stopped importing wines from the Old. In order to arrive in South America, European wines had to cross the Atlantic, be hauled overland through Panama, and be reloaded on ships on the Pacific side. It was much simpler to produce the needed wines locally.

Bartolomeu Terrazas established a vineyard near Cuzco (Peru) before 1540, and some vines still grow there today. Pizarro also planted in Peru in 1547, after defeating the Incas. Around 1550, Francesco de Carabantes planted near the coast, south of Lima, where the Tacama vineyards still produce nice wines today.

In the 1560s, Peru had about 100,000 acres of vines, and its wines were exported throughout South America. The first vineyards in Chile's Central Valley were planted in 1554 by Juan Jufré and Diego Garcia de Cárceres. Three years later, Father Pablo Cedron took vines from there across the Andes mountains to Argentina. Finally, Gonzales de Santa Cruz established the mission of Santa Cruz do Sol in 1626, in the southernmost corner of Brazil.

Thus, even though most of the early vineyards were planted by Franciscan monks for religious reasons, wines were soon produced by secular estates. They were sold to European soldiers and settlers.

Within a few years, the vineyards of South America were producing enough wines for all local needs and for export to Spain, to the dismay of the Spanish growers. To avoid competition, the King of Spain ordered restrictions on the wine production in 'New Spain' as early as the end of the 16th century. This order was widely ignored.

The first attempts at commercial winemaking in **Chile** occurred in the 1700s, as Portuguese immigrants brought their own varietals and experimented with the Isabella, a *vinifera x labrusca* hybrid. This industry remained limited. Vineyards were found in many locations, but the technology was primitive and the transportation of barrels of wine difficult. For over a century, the production in each region remained small and the trade localized.

After the successful Revolutionary War of the U.S. Colonies against England, the thought of independence from (Spanish or Portuguese) colonial rule was present in people's minds throughout Central and South America. The first attempt followed Napoleon's invasion of Spain in 1808. It took eleven years until Simon Bolivar ended Spanish rule in areas that are today Colombia, Venezuela, Panama and Ecuador.

General Bernardo O'Higgins with 120 fighters, fighting Spain for Chile's independence, found refuge in the cellars of Santa Rita near Santiago. In memory of this event, several Santa Rita wines have '120' on their label.

On the east coast the liberator was José de San Martin. He defeated the Spanish in Santiago, then allied himself to Bolivar.

The independence of Brazil was obtained without bloodshed. When Napoleon invaded Portugal, King John

VI fled to Rio de Janeiro (1807) and Brazil became a kingdom of equal status with Portugal. When John returned to Portugal in 1821, he left his son Pedro as regent. When cries for independence became louder, Pedro demanded independence from his father (who agreed) and became Emperor Pedro I. He might have been wiser to become Mr. Pedro or just Pedro. But that's another story.

Free from European oversight and taxation, the countries of Central and South America could now benefit from trade. They prospered.

The founding father of the wine industry in Chile was Silvestre Ochagavia Echazarreta. In 1851 he convinced French growers and winemakers to come to Central Chile. He also imported high-quality varietals (cabernet sauvignon, malbec, pinot noir, chardonnay, and others) to replace the pais. At about the same time, immigrants from Italy, Switzerland and Germany found good locations for growing grapes and started commercial vineyards as well.

For unknown reasons, Chile escaped the world-wide devastation brought by powdery mildew and phylloxera at the end of the 19th century. It became the only country in the world with completely healthy vineyards. Parts of Argentina (and Western Australia) were spared as well. The Chilean growers can plant cuttings directly into the ground instead of grafting on American rootstock, which results in substantial savings.

Further, the growing conditions in Chile are remarkably good. A vineyard sometimes produces two crops a year. However, for many years, the reputation of Chilean wines remained one of 'plentiful and cheap'. The production of high-quality wines and global export began in the last decade of the 20th century.

In **Argentina,** the wine production was limited to the criolla until the 1820s. Then, General San Martin freed the country from Spanish colonial rule. Waves of immigrants from Italy, France and Spain arrived and brought with them European varietals as well as knowledge of viticulture.

The founding father of Argentina's wine industry was Don Tiburcio Benegas. He settled in Mendoza in 1865, imported vines from Chile and France, and planted vineyards on his estate in 1883. More importantly, he lobbied hard to extend the national railroad system from Buenos Aires to Mendoza, thus securing a market for local wines. However, the low level of investment slowed the technological progress, and world events reduced the export market to near zero until long after World War II.

The first impact of **Brazil** on the history of wine was… sugar. Until slave labor was brought to Brazil, the world's largest sugar producer was (Portugal's) Madeira, a group of volcanic islands in the Atlantic, some 400 miles off the coast of Marocco. The cheap Brazilian sugar supplanted Madeira's production. To replace this crop, malmsey vines were planted (and later boal, verdelho, and serciel). By 1580 Madeira wines were well-known, although it would take longer before they were appreciated.

As for Brazil, its sugar was successful but its wines were not. The vineyards near Santa Cruz suffered from disease, fungi and rot. It was only in the 1800s that Italian immigrants found appropriate locations for planting *vinifera*, some 60 miles north of Porto Alegre. This is where the Brazilian wine industry is now centered.

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4.1.2 North America

Numerous vines are native to North America. This contrasts with Europe and the Middle East, where all the varietals belong to the single *vitis vinifera* species. But the North American species do not produce as much sugar as *v. vinifera* and cannot produce great wines, although wines have been made with them (some of them successfully).

The precise number of native species is a matter of debate, especially since most of them easily hybridize[40]. The most important wild native species are *v*. *rotundifolia, munsonioana, riparia, labrusca, rupestris*, and *aestivalis*.

***Fig. 58**: v. labrusca (photo SKE).*

One reason for this diversity of species east of the Rocky Mountains is the presence of bugs such as phylloxera, diseases such as Pierce's disease, and fungi such as mildew, all of which are lethal to the European species. The native American vines evolved resistance to local threats.

In the 1560s, a group of French Huguenots arrived in Florida, where Jacksonville now stands. They were the first to make (a rather poor) Muscadine wine from *v. rotundifolia*.

As Europeans arrived in North America, they brought with them seeds and cuttings. But all their attempts at making wine using *v. vinifera* failed. Lord Delaware planted French cuttings in Virginia in 1619. All his plants died, as did those of Lord Baltimore in 1662 and William Penn in 1682. German immigrants tried to grow European vines in Germantown, PA. Colonies of Greeks, Italians, French and Spaniards tried their luck in Florida... All the vines died from phylloxera or fungal diseases.

***Fig. 59**: v. rupestris (photo SKE).*

Thomas Jefferson, Ambassador to France from 1784 to 1789, traveled

extensively through France, Germany and Italy. He visited vineyards and selected wines for George Washington's presidential cellar. Jefferson loved wine and took many cuttings with him back to Virginia. They all died. He tried again, and this time imported barrels of French soil together with the cuttings. The vines died. For nearly 30 years he planted French, Italian and German vines at Monticello. They all died. He gave up in 1809.

Thomas Jefferson believed that wine is a much more civilized beverage than the strong (distilled) liquors widely available in the United States at the time. During his tenure as President (1801-1809), he kept wine taxes low and hoped to make America a wine-drinking country.

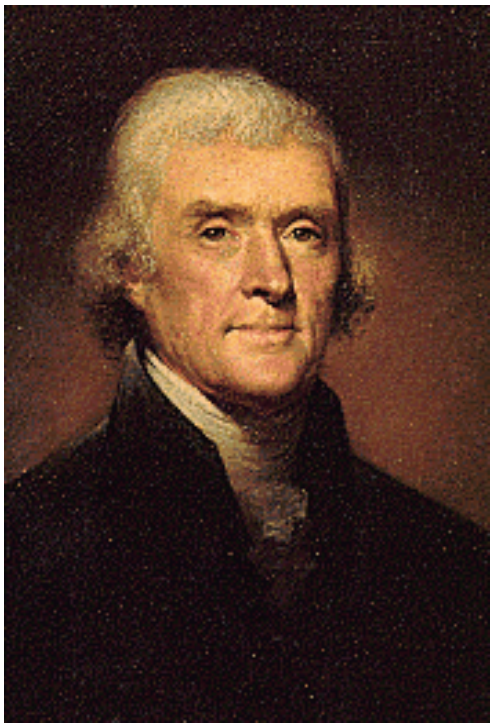

***Fig. 60**: Thomas Jefferson (1743-1826), 3rd President and wine lover.*

The first (accidental) hybrid of *labrusca* and *vinifera*, the alexander, was discovered in 1682 not far from where William Penn had planted his *vinifera*. This varietal resisted pests and disease, and produced a decent wine. It led to the first successful U.S. commercial winery in Indiana, in 1806.

***Fig. 61**: Isabella (photo SKE).*

Other hybrids were soon tried, among which the catawba and isabella (both *labrusca x vinifera*) and the delaware (*labrusca x aestivalis x vinifera*). Other wineries relied on native varietals such as the concord or the clinton, both *labrusca*. The latter should not be confused with the monica. The wine from native varietals or hybrids almost always had a characteristic flavor described as ‘musky’ or ‘foxy’.

In 1811, Johann Schiller started a winery in Cooksville (now Mississinga), Ontario, Canada. In the 1820s, the Pennsylvania Wine Company was established near Philadelphia. It

produced wine from the alexander grape. In 1823, Nicholas Longworth planted 1,200 acres of catawba on the banks the Ohio River, near Cincinnati. He made a sparkling wine, the 'Catawba Champagne', which achieved a rather good reputation. The business collapsed in 1859 when black rot attacked the vines.

The wine industry moved north to the breezier but colder shores of Lake Erie, reducing the problems associated with rot and fungi. The most successful vines there were the cold-resistant 'French hybrids': maréchal foch (*ruparia x rupestris x vinifera*), seyval blanc (a hybrid of hybrids) and other even more complicated crossings and hybrids.

Other centers of viticulture were created around Hermann, Missouri and near the Finger Lakes in New York State. New Hampshire grew the concord, which turns out to make much better jelly than wine. Muscadine wine was made in Carolina and Georgia.

All these wineries ultimately suffered from the low quality of the wines they produced, fungi and diseases, the Civil War, and the Temperance movement. Thus, even though the first U.S. wines were produced on the East Coast, the production of quality wines east of the Rockies started only after Californian wines succeeded.

In the southwest, European vines arrived from Mexico with the Franciscan Friars. The first vineyards were planted in 1682 in Ysleta along the Rio Grande, today part of the city of El Paso.

Although Spanish missionaries were growing vines in Baja California (Mexico) in 1670, it took another century for wines to reach California itself. In 1769, the now 'blessed' Father Junipero Serra (1703-1784) brought the *mission* vine from Mexico to San Diego. He was a tough Friar. He forcibly converted the local Indians to Christianity and used them as slave labor. His idea of happy hour was to whip himself (or others). He established nine of the 21 missions which dot California, from San Diego to Sonoma. The first California wine was drunk in Monterey, at the Mission of San Carlo Borromeo.

In 1823, the Mexican Revolution ended Spanish rule and in 1833, the Mexican Government secularized the missions. After losing the U.S.-Mexican war (1846-1847), Mexico was forced to sell to the United States its territories from the Rio Grande to California.

At that time, mostly mission grapes were grown, and their wine was made in a rather crude manner. Bunches of grapes were packed into cowhides and trampled. The first-run juice was called 'white wine' and a longer pounding produces 'red'.

The first secular winery in California was built near Los Angeles in the 1820s by a Frenchman appropriately named Jean-Louis Vignes. He got his cuttings from South Africa. By 1851, he was producing nearly 1,000 barrels a year, including some premium wines.

In 1849, the Gold Rush resulted in a massive increase in the population of the West Coast. Among the immigrants were the Hungarian Agoston Haraszthy, the Germans Charles Krug and Jacob Beringer, and the Frenchmen Paul Masson and Charles Lefranc. The latter planted the Almadén vineyards in 1857 (with cabernet sauvignon, pinot noir, malbec and sémillion). Krug was the first to make wine in Napa Valley in 1858, near Saint Helena. There were over 400 vineyards in Napa by the late 1800s.

Agoston Haraszthy (1812-1869) became the most colorful character in the history of California. He got involved in politics, horticulture, gold-refining and, of course, winemaking, mostly with the *mission* vine. He built the Buena Vista winery in 1857.

Fig. 62: *Agoston Haraszthy.*

Fig. 63: *Buena Vista (photo SKE).*

Haraszthy's critical contribution to California wine was his trip to Europe in 1861 and the subsequent import of nearly 100,000 vine shoots representing 1,400 European varietals. Among them might have been the *zinfandel*, but this is disputed. In 1834 there already was a varietal called *zinfindal* on the east coast...

The origin of the zinfandel has recently been elucidated by Carol P. Meredith and co-workers[41]. She is a specialist in DNA and the genealogy of grapes. Following several trips to Croatia, she was able to establish that zinfandel is an ancient varietal from the Dalmatian coast, locally named *crljenak kastelanski*. It is a parent of the Italian *primitivo* (which was incorrectly believed to be the ancestor of the zinfandel).

Fig. 64: *Zinfandel.*

Haraszthy never received the promised payment from the Governor for the European trip and the vine shoots, but vines spread throughout California from his nurseries. In 1862, he published an account of his trips and advice on viticulture in '*Grape Culture, Wines, and Wine-Making'.*

There was no mass market for Californian wines until the trans-continental railroad was finished in 1869. Until then, California was just as far from the East Coast as Europe.

The railroad was good for business, but it brought phylloxera with it in the 1870s. The pest destroyed most of the vineyards. The wonderful Carneros district north of San Francisco was particularly hard hit. Grafting *vinifera* shoots on resistant American rootstock

saved the wine industry. Such grafting ultimately had to be done throughout the world. It is still done today, almost everywhere, as it is the only known way to grow *vinifera* in the presence of phylloxera.

In the 1880s, California surpassed Ohio as the leading wine-producing state, and universities become involved in the study of wines and viticulture. This began at the University of California (UC) Berkeley, and then moved to UC Davis. In 1894, the California Wine Association was created. It controlled a large fraction of the production and was able to stabilize prices and costs. At the 1900 World Exhibition in Paris, Californian wines won forty awards, but few people noticed.

The 1906 San Francisco earthquake destroyed or ruined many wineries. Yet, this was nothing compared to the devastation that Prohibition brought to the wine industry.

On January 16, 1920, the Volstead Act (18th Amendment to the US Constitution) becomes the law of the land. With allowances for private use, medical reasons or sacramental purposes, it became illegal to *'manufacture, sell, barter, transport, import, export, furnish or possess intoxicating liquors'*. 'Intoxicating' was defined as exceeding 0.5% alcohol per volume, a mere 1 proof. By the time the 18th Amendment was ratified, 33 of the 48 states were already dry, starting with Maine in 1851.

Although it is unquestionable that hard liquor was abused throughout the country, making virtually all alcohol illegal was a social experiment doomed to fail. It made outlaws of a majority of otherwise law-abiding citizens, promoted contempt for the law, greatly increased organized crime, and generated corruption on a massive scale. Another unintended consequence was the rash of blindness and death from drinking wood alcohol (methanol swells the optic nerve). It is estimated that over 50,000 people died from alcohol poisoning in the first eight years of Prohibition.

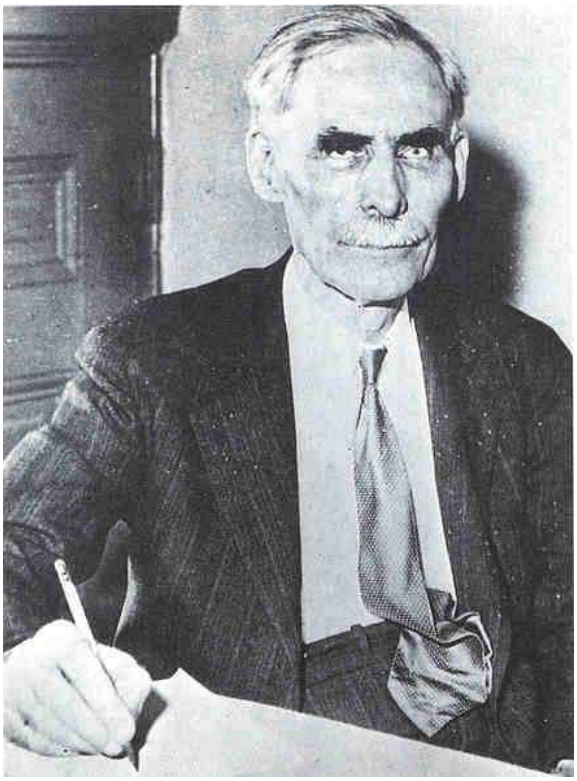

Fig. 65: *Andrew Volstead (1869-1947), congressman of Minnesota, author of the Volstead Act and not particularly good-looking, who feared that someone, somewhere, might be happy.*

By 1921, virtually the entire police force of Cincinnati was on the payroll of the famous bootlegger George Remus. In 1922, there were over 5,000 speakeasies in the U.S., and about 27,000 by 1927. During the Prohibition, the number of homicides sharply increased[42], as did the consumption of alcohol and distilled liquors[43].

Between 1919 and 1925, the number of wineries in California dropped from 700 to a little over 100, and the total

U.S. wine production dropped from 55 to 3.5 million gallons. But the acreage dedicated to table grapes doubled to 600,000 acres. After all, growing fruit was legal. For white grapes, this was *thompson seedless*, a prolific grape unable to produce a decent wine. For red grapes, this was mostly *zinfandel*, which is amazingly productive (unless severely pruned).

Concentrated grape juice in a can ('Vine-Glo') was sold with instructions on how to ferment its contents. Packages of dehydrated grapes with a yeast pill were sold as 'Wine Bricks'. But this was low-quality grape juice. Most premium varietals disappeared from California. Less than 100 acres of cabernet sauvignon survived Prohibition.

The 18th Amendment was repealed by the 21st Amendment, on December 5, 1933. But then, the country was deep in the Depression and wine had become an unfamiliar luxury. Some research was still being done at UC Davis, and the Wine Institute of California was still promoting wines, but the industry had a long way to go. Except for California, the production of wines in other states had mostly disappeared. World War II temporarily stimulated the production as European imports plummeted.

California needed decades to recover. Massive investments were needed to rebuild wineries, replant vineyards with premium varietals, educate the domestic customer, and develop a market for quality wines. By 1940, over 80% of the production consisted of low-quality sweet or fortified wines. A few dry table wines were sold under generic names such as 'Burgundy' or 'Chablis'.

In the mid-1800s, the Frenchman de Candolle had published the first serious study of viticultural climates based on climatic data, which were then becoming available. His ideas were systematically applied in California in 1944 by Amerine and Winkler. They defined five viticultural regions, based on the number of *degrees* above 50°F times the number of *days* above 50°F, over seven months. Region I has fewer than 2,500 degree-days, and is the best region to produce dry table wines. For each of regions II through IV, 500 degree-days are added. Region V (over 4,000 degree-days) is only suited to the production of table or drying grapes.

4.2 SOUTH AFRICA

Vines were first planted in South Africa for commercial, not religious, reasons. The Dutch needed to supply their ships on their way around the Cape. In the 1640s, the Dutch East India Company decided to establish a victualing post at the Cape of Good Hope, and the first settlers arrived in 1652. Jan Van Riebeeck planted the first vines near Cape Town, in 1655. The first South African wine was drunk there in February, 1659.

Simon Van der Stel (1679-1699), Governor of Cape Town, took the first step toward what would become South Africa's most famous wine, the 'Constantia' or 'Vin de Constance'. He was dedicated to excellence in winemaking. In 1685, he planted 100,000 vines and established the Constantia estate (1,850 acres) just south of Cape Town. The land proved to be ideally suited for growing vines. Van der Stel also discovered another excellent wine area, some 30 miles east of Cape Town: Stellenbosch. He also imposed the first regulations and quality standards for making wines.

In 1688, some 200 French Huguenots fleeing religious persecution following the Revocation of the Edict of Nantes

(1685) arrived in South Africa. Many knew how to grow vines and make wine. Their expertise proved most useful.

Fig. 66: *Simon Van der Stel.*

Hendrik Cloete, a German, purchased Constantia in 1778. His goal was to produce the best wine in the country and, why not, in the world. He planted Frontignac (Muscat à Petits Grains), Pontac, red and white Muscadel and some Chenin Blanc (locally known as Steen). These varietals became the ingredients of the 'Constantia'.

This wine maintained a glorious reputation under British rule. It was found at the court of kings, emperors and tsars. Napoleon insisted on having Constantia available during his first exile. Louis XVI kept it (and Champagne) in his cellars. King Louis-Philippe demanded 'considerable quantities' of it. Only the Hungarian Tokaji competed with Constantia.

Fig. 67: *A 1821 'Vin de Constance'.*

Then things got sour. In 1859, powdery mildew appeared at the Cape. Wine production quickly plummeted. In 1861, the Gladstone government removed the Empire's preferential tariffs and profits dropped. In 1885, phylloxera arrived. It devastated vineyards all over South Africa. Constantia was ruined. Some of the vineyards would later be replanted on American rootstock, but the *Vin de Constance* was gone, for over a century.

At the end of World War I, the wine industry in South Africa still had not recovered. The KWV (Cooperative Winegrower's Association) was formed in 1918. It was legally empowered to limit production and set minimum prices. This stabilized the market and pushed the industry into the modern era.

In the 1925, the South African oenologist Abraham Perold created a hybrid of pinot noir and cinsaut. The latter, abundant in South Africa, was also misleadingly called 'Hermitage', in reference to the famous hill in southern Côte du Rhône, where no cinsaut grows. The *Pinot Noir x Hermitage* hybrid, *pinotage*, became the distinct South African varietal. It is capable of

producing very powerful but also very delicate wines, the best of which age beautifully. It is sometimes referred to as the 'South African Zinfandel'. The pinotage remained unique to South Africa until the late 1980s. Some of it now grows in New Zealand as well as (I think) California.

4.3 AUSTRALIA AND NEW ZEALAND

As in South Africa, vines were brought to **Australia** for purely commercial reasons. The first cuttings were planted by Captain Arthur Phillips, who led the first fleet to Australia as Governor of the new penal colony of Botany Bay on the east coast of the continent. He arrived in September, 1788 with cuttings from France, Germany and South Africa. He quickly realized that the region was well-suited to the production of wine. The first two bunches of Australian grapes were picked in his garden in Sydney on January 24, 1791.

The original Sydney vineyards did not survive long because of disease and fungi. But commercially viable crops were planted in New South Wales, then Tasmania, Western Australia, Victoria and finally, South Australia. The first successful winery was that of the explorer Gregory Blaxland. In 1817, he planted a vineyard using cabernet sauvignon cuttings from South Africa. His wines won a silver medal in England in 1822, and a gold one in 1828.

At about the same time, Captain John McArthur established a winery just thirty miles west of Sydney. His wines also won prizes at competitions in England.

James Busby, an immigrant from Edinburgh, expanded the emerging wine industry. In 1831 he traveled throughout Europe and sent back to Australia thousands of cuttings from hundreds of European varietals. He began commercial vineyards in Camden and Hunter Valley.

Busby moved to **New Zealand** in 1833. He was not the first to grow vines there: In 1819, the Rev. Samuel Marsden, a missionary from Australia, had planted vines at Kerikeri, on the north-east coast of North Island. However, there is no evidence that he produced any wine. It is Busby who gets credit for making and selling the first New Zealand wine in 1835, at nearby Waitangi.

Powdery mildew struck in 1876, and phylloxera in 1885. Some winegrowers grafted *vinifera* on American rootstock, others chose to grow the isabella hybrid instead. In any case, New Zealand wines would need nearly a century to emerge on the world market.

The Australian Gold Rush of 1851 brought a huge wave of immigrants. This ultimately resulted in the colonization of all the southern states and the establishment of many new vineyards and wineries. By 1870, the production of Australian wines was substantial, 2.3 million gallons. It consisted mostly of dry table wines from a comprehensive collection of *vinifera* varietals.

Phylloxera was first detected at Phillip Bay in 1877. It soon wiped out most vineyards. Only South Australia remained phylloxera-free. As Australian wines struggled to recover, the (mostly British) market collapsed as World War I was followed by waves of anti-alcohol sentiment and prohibition. By 1938, there were fewer than 200 acres of vines in the entire country. World War II was about to begin...

5. WORLD WAR II TO MODERN WINES

Wine is the most civilized thing in the world.

Ernest Hemingway (1899-1961)

5.1 BACKGROUND

During its tumultuous history, wine survived a lot, but never as much as during the years 1850-1945. Fungi could be controlled, but phylloxera forced vineyards all around the world to be replanted with (selected) *vinifera* varietals, grafted onto American rootstock. Soon after, World War I brought poverty and destruction. Prohibition and the Great Depression dramatically reduced the wine markets all over the world. Finally, World War II spread another wave of destruction.

In 1945, World War II was finally over and reconstruction began. It took time. In Europe, the very ancient wine tradition speeded up the recovery of the wine industry. In California, a complete overhaul was needed, and the attitudes of the customer toward American wine had to be changed. This required money and advertising, but Americans are good at both. As for South America, South Africa, Australia and New Zealand, massive investments were needed to upgrade the technology and develop international markets. Their recovery was much slower.

Today, just over half a century after the end of World War II, technology has evolved dramatically and quality wines are produced in many countries all over the world.

5.2 EUROPE

5.2.1 Bordeaux

After World War II, the wines from Pomerol and St. Emilion in Bordeaux began their rise to prominence. The best wines from Graves were classified in 1953 (reds) and 1959 (whites). In contrast to the 1855 classification (which defined 1st through 5th growths), the Graves were simply ranked as 'Classés' or not. In 1955, with a revision in 1996, the best St. Emilion wines were ranked. The categories are 'Grands Crus Classés A', 'Grands Crus Classés B' and 'Grand Crus Classés'. The wines from Pomerol have yet to be classified, and may never be. Thus *Pétrus*, arguably of the best (certainly the most expensive) Merlot in the world, is not classified. The official classifications are given in Appendix B.

Some Médoc wines, absent from the 1855 Classification, were ranked 'Crus Bourgeois' (in 1996) and 'Crus Artisans' (in 1997). To simplify things even further, one also finds 'Crus Grand Bourgeois' and 'Grands Bourgeois Exceptionnels'.

These classifications have obviously been created by committees of dedicated bureaucrats influenced by politicians and wealthy businessmen. The average wine shopper needs substantial documentation when buying wine, and looks are often deceiving.

Since a lot of money and big egos are involved, it is impossible to update the classifications, something badly needed. An inspection of the 1855 Classification reveals that some chateaux no longer exist, others have substantially improved, others yet deserve to be demoted.

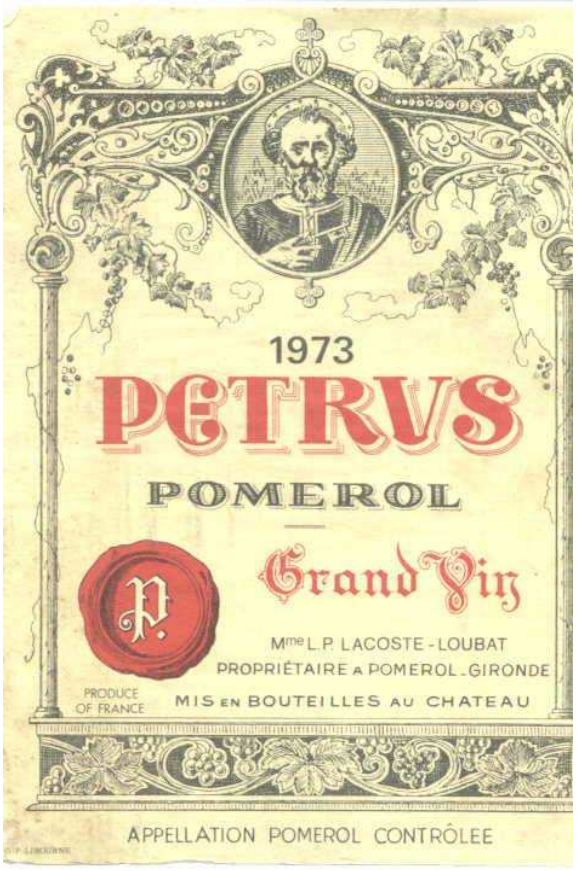

Fig. 68: *The famously expensive Pétrus.*

Since 1997, a new and impartial ranking of wines from Bordeaux (as well as other wine regions) has been provided by Orley Ashenfelter[44]. His ranking (Appendix C) is based on the prices fetched by the wines at auctions throughout the world.

Thanks in part to the efforts of Baron Philippe de Rothschild, chateau bottling in Bordeaux became compulsory for classified growths in 1972.

5.2.2 Burgundy

Nicolas Rolin's hospital became the 'Hospices de Beaune', famous today for its wines and wine auctions. The auctions date back to the late 1700s and have been held almost continuously ever since. In 2003, 560 wine casks (and 13 liquor casks) were sold, at prices per cask ranging from 1,700 Euros (for the red Pernand-Vergelesses *Rameau-Lamarosse*) to 40,000 Euros (for the white Batard-Montrachet *Dames de Flandres*).

Fig. 69: *The Hospices de Beaune of former times (Beaune Chamber of Commerce) look very much as they do today (SKE).*

VINS FINS

De 1794 & 1795,

A VENDRE.

LES commissaires chargés de l'administration du principal hospice de l'humanité de Beaune font savoir que le 18 brumaire prétert mois, il sera procédé au bureau dudit hospice, à la vente par encheres des vins ci-après; 1°. fix pieces deux feuillettes de vin de Beaune, cuvée Collenot de 1794; 2°. deux pieces une feuillette de vin de Savigny, cuvée de Chouard, année 1794; 3°. et une cuvée de Savigny de 1795, dudit cit. Chouard pour la portion de propriétaire. *Nota.* On payera comptant.

BEAUNE, DE L'IMPRIMERIE DE BERNARD.

Fig. 70: *Cover page of the 1795 Hospices de Beaune auctions.*

Over the years, the Hospices received and purchased many quality vineyards. Today, they own some 150 acres of *Grand Cru* and *Premier Cru* vineyards. These wines are sold at auction, by the barrel, on the third Sunday of November. The proceeds of the sale go to the hospital and are invested to fund its work.

The Hospices de Beaune wine is sold in casks. The buyer must use traditional Burgundy bottles with special labels issued by the Hospices. The label must include the appellation, the '*cuvée'* (name of the benefactor: Appendix A), vintage year, name and address of the buyer. Since donations of vineyards still occur today, this list may already be incomplete.

The festive period surrounding the auction includes the general meeting of the *Chevaliers de Tastevin*, a brotherhood created in 1934 and headquartered in the Clos De Vougeot.

In addition to the wines from the Hospices, Burgundy produces many distinguished red (Pinot Noir) and white (Chardonnay) wines. The quality increases with the specificity of the geographical name: region (*Bourgogne*), sub-region (*Côtes de Nuits*), village (*Beaune*), village-vineyard (*Volnay-Santenots*), or vineyard (*LaTâche).*

5.2.3 Other French regions

To the north of Burgundy, ***Chablis*** produces memorable (and bone-dry) chardonnay, many of which age beautifully. Further north is Champagne. To the south is ***Beaujolais***, where the Gamay grape grows.

Alsace, on the border with Germany, benefits from a dry climate, a hilly geography, and a varied geology (granite, limestone, gneiss, schist and sandstone). In contrast to all other AOC wines, the Alsatian label their wines by the varietal: Sylvaner, Riesling, Pinot Blanc, Pinot Noir, Gewurztraminer, Muscat, and Tokay (nothing to do with the Hungarian Tokaji wine region). Traditionally, the Alsatian wines tended to be dry and powerful, in contrast to their sweet German counterparts. This is no longer entirely true.

Côtes du Rhône is divided into north (between Vienne and Valence) and south (north of Avignon) regions. Some twenty varietals are allowed, among which the wonderful Syrah, Grenache, Viognier, or Marsanne. The most famous wine is the Hermitage (or Ermitage), a hill first planted by the Phoenicians and famous ever since (not to be confused with Crozes-Hermitages, a much larger region). A number of world-class wines are produced in Côtes du Rhône.

There are many other smaller or lesser-known wine regions in France, and some of the wines they produce are excellent. ***Jura*** is famous for its 'vins jaunes' (yellow wines, the Chateau Chalon), ***Anjou*** produces whites and rosés, the ***Loire*** has many well-known white wines (Pouilly-Fumé, Vouvray, Muscadet), ***Cahors*** is famous for its 'black' wines, ***Corbières*** for its caves, and the list goes on.

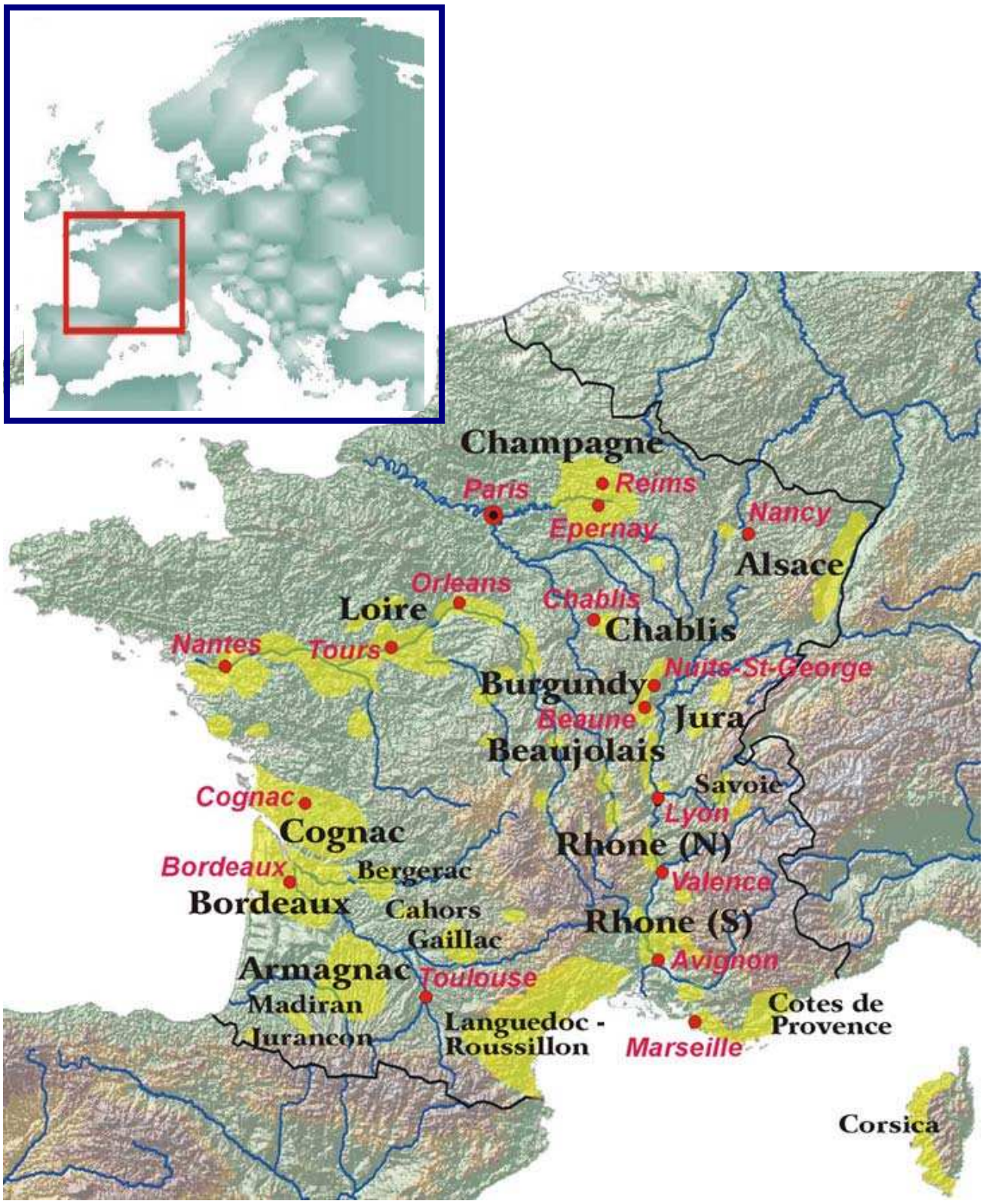

Fig. 71: *Wine regions of France (map: Kristin Reid).*

5.2.4 Germany

Germany has 13 wine regions, some of which have sub-region: Ahr, Mittlerhein, Mosel-Saar-Ruwer, Nahe, Rheingau, Rheinessen, Rheinpfaltz, Baden, Franken, Württemberg, and Baden are in the former 'West' Germany, roughly along the river Rhein. While the nearby Alsatian wines tend to be dry (little or no residual sugar) and emphasize strength, the German ones have some (or a lot of) sweetness. In former 'East' Germany are Saale-Unstrut and Sachsen[45].

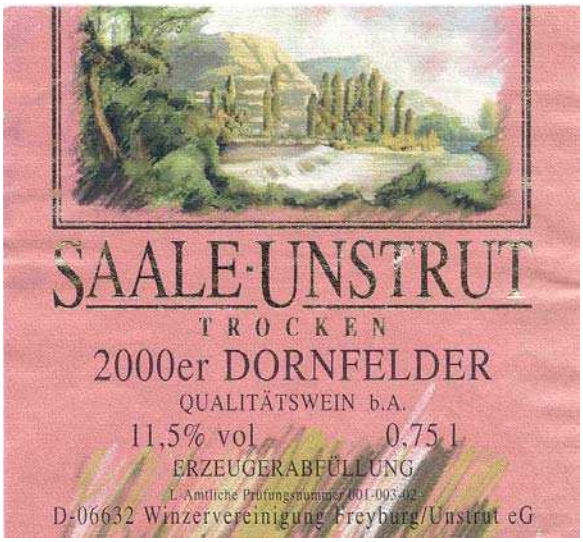

Fig. 72: *A wine from the former 'East'.*

The most common grapes are the riesling, pinot blanc (*Weissburgunder*), pinot noir (*Spätburgunder*), silvaner, and *Müller-Thurgau*. Smaller areas are planted with *Gewürztraminer*, and varietals, such as the *Gutedel* or *Kerner*.

The quality of a German wine is often linked to their sugar (and alcohol) content. 'QbA' stands for *Qualitäswein bestimmter Anbaugebiete* and 'QmP' for *Qualitäswein mit Prädikat.* The QbA wines have a low alcohol content (5.9-9.4%). The QmP category includes the best German wines. In order of increased sugar and alcohol content (and therefore price), are the *Kabinett*, *Spätlase*, *Auslese*, *Beerenauslese*, *Eiswein*, and 'TBA', which stands for *Trockenbeerensaulese*. The latter wines often involve some degree of noble rot.

While exceptional vineyards are recognized in most countries, the German wine laws (especially those of 1971 and 1994) encourage the blending of wines from the best vineyards with lesser wines. This strange idea results from extending regions within a given appellation. For example, in the early 1900s', the *Wehlener Sonnenuhr* came only from a 25 acre region. The appellation was extended to 86 acres in 1953, then 143 acres, and is now down to some 116[46].

Fig. 73: *A 1975 Wehlener Sonnenuhr from my wine cellar.*

As a result, a prestigious name on the label does not guarantee that the wine in the bottle actually comes from the vineyard one might think the label refers to. It is best to know the producer and/or the wine merchant. The indication *Einzellagen* (estate-bottled) provides some reassurance.

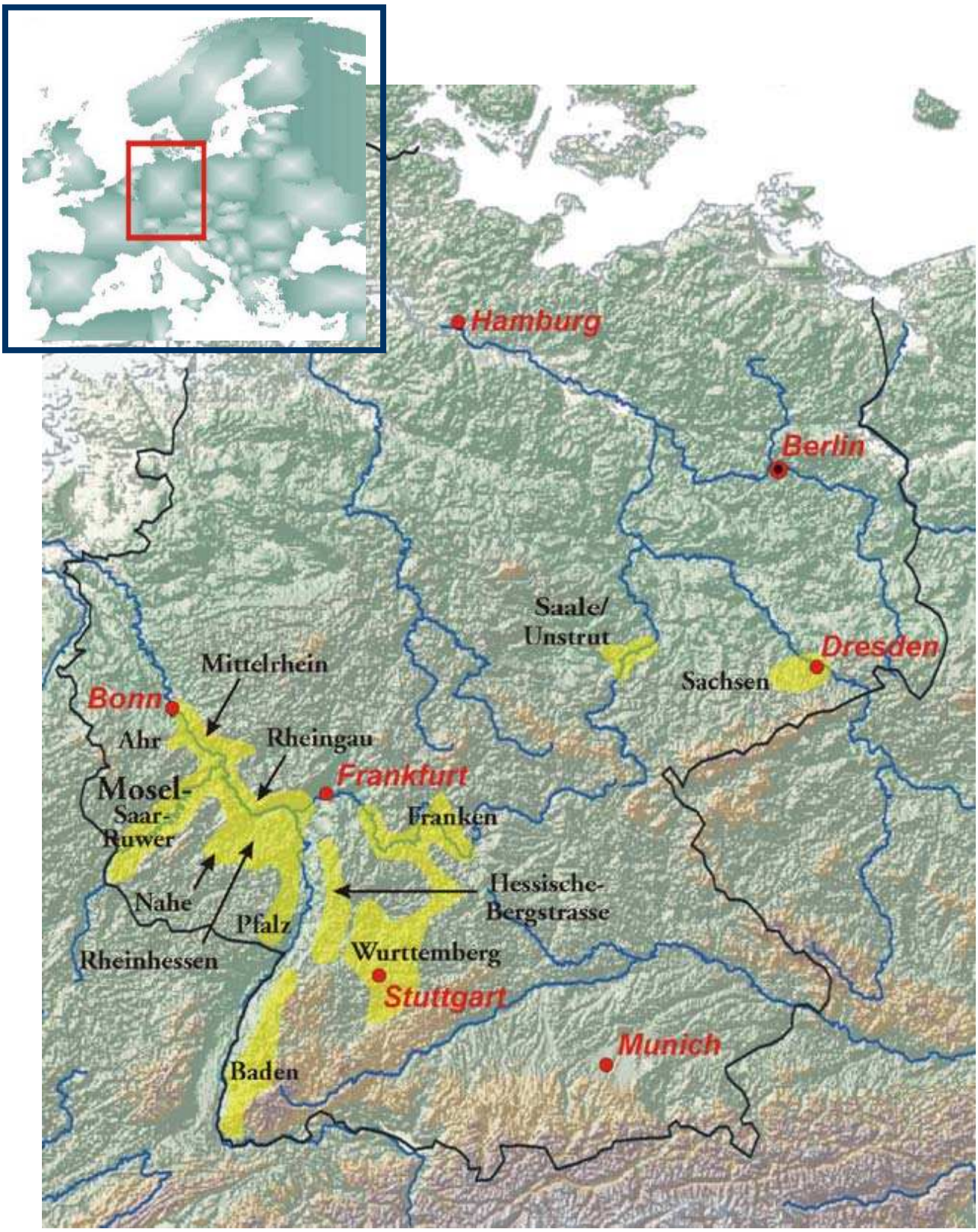

Fig. 74: *Some of the wine regions of Germany (map: Kristin Reid).*

5.2.5 Italy

Hard work and government supervision have increased the stature of Italian wines, some which now rank with the best in the world. In 1963, the Italian government introduced the *Denominazione di Origine Controllata* (DOC) then DOCG ('G' stands for *e Garantia* but means a lot more paperwork). In addition, the government has introduced the lesser *Vini Tipici* (vin de pays) and *Vino di Tavola* (table wines) categories. The 'Classico' label on some Chianti bottles means that the grapes come from the original production region, delimited by the Duke of Tuscany in 1716. 'Riserva' means that a wine has aged three or four years longer in wood barrels than usual wines.

Many noble varietals are typically Italian. Some grow very successfully in California: sangiovese, nebbiolo, dolcetto, or barbera. Others are found only in Italy: ruche, frezia, grignolino, vermentino, fiano,… Italy has many fascinating wines, and the best ones should be aged. Trips to Italy are very enjoyable indeed!

Italian wine regions cover the entire country. In the north, *valle d'Aosta* produces wines from the Chardonnay and Pinot Noir. In *Trentino-Alto Adige*, one finds again pinot noir and sabernet sauvignon, but also lagrein and schiava.

The *Piedmont* is famous for the powerful Barolo and Barbaresco wines, both of which are made from the nebbiolo grape. Close seconds are the Barbera and Dolcetto. For happy hour, I recommend a fresh Moscato d'Asti, although this fruity and delightfully sparkling wine is drunk there for dessert.

Lombardy is famous for its sparkling wines, *Veneto* for the Valpolicella, the (dry) sparkling Prosecco, and the powerful amarone, and *Fruili-Venezia Giulia* for its dry white wines (e.g., pinot grigio). Dry white wines, but from the Pigato and Vermentino grapes, are typical of *Ligura*, the coastal region around Genova. *Emilia-Romagna* is home to the Lambrusco, a light sparkling red wine.

Fig. 75: *A fantastic Barolo, from my cellar.*

Tuscany, with Florence at its center, is best known for Chianti. The main grape is the Sangiovese, but different varietals grow, are harvested, and pressed together. The famous Brunello di Montalcino and Vino Nobile di Montepulciano wines are Tuscan.

Central and Southern Italy have many wine regions, but their production is mostly local. Their names (and examples of better-known wines or grapes) are *Umbria* (Sagrantino di Montefalco), *Marche* (Verdicchio), *Latium* around Rome (Frascati), *Abruzzi* and *Molise* (Montepulciano), *Campania* around Naples (Aglianico), *Apulia* (Primitivo), *Basilicata* (Aglianico del Vulture), Calabria (Greco).

Sardinia produces interesting wines from the Vermentino (white) and Monica (red) grapes. Sicily, often associated with bulk production of strong but otherwise common wines, is now producing very interesting wines from numerous local grapes (Nero d'Avola, Nerello Mascalese, Zibibbo, and others) but also some Chardonnay…

Fig. 76: *Main wine regions of Italy (map: Kristin Reid).*

5.2.6 Spain

In 1944, the mayor of the city of Rota, Don Zoilo Ruiz-Mateos y Camacho bought a small sherry stockholder. Some ten years later, his son Jose Maria secured a 99-years contract to supply sherry to Harveys of Bristol. He bought bodegas and made numerous investments. Money flowed. It was said that he purchased three banks in a single day... He founded a company called RuMaSA which evolved into a huge business. In the early 1980s, it controlled one-third of the sherry industry.

The company was privatized by the government. After reorganization, RuMaSA was much smaller, but still controlled some 32,000 acres of vineyards.

The Spanish government established the 'DO' system similar to the French AOC. The appellations proliferated in the 1960s, but the investment in the technological infrastructure remained insufficient. The reputation of most Spanish wines was low. Only the wines from Rioja (and Sherry) had notoriety.

In 1975, Generalissimo Franco finally died (he is still dead). In Barcelona and other cities, the police confiscated the champagne to prevent people from celebrating. But Spain was breathing again. Franco's dictatorship was replaced by a modern multi-party democracy. The wine industry began a continuous climb. It is now reaching spectacular levels.

Today, many of Spain's wine regions produce modern and world-class wines, some of which fetch exorbitant prices. The most extreme example is the *Vega Sicilia* from the Ribera del Duero region, which retails for nearly $300 a bottle for a recent vintage year. Many of the wines produced in Ribera del Duero sell for higher prices than the traditional wines from Rioja, and deservedly so.

Fig. 77: *The (very) expensive Vega Sicilia.*

In addition to Rioja and Ribera del Duero, other wine districts produce high-quality and distinct wines: Navarra, Priorato, Penedes, just to name a few.

The traditional Spanish red wines are macerated (with stems) in open vats, then aged in large, old, wooden barrels. A 'Crianza' spent at least 12 months in oak, a 'Riserva' three years (one of which in wood), and a 'Gran Riserva' five years (two of which in wood). A range of varietals are used (including Cabernet Sauvignon and Grenache), but the most typical Spanish varietal is the *tempranillo*, sometimes referred to as the Spanish cabernet, even though it is rounder and softer.

A recent development is the use of stainless steel tanks for fermentation, and new French oak barrels for aging.

***Fig. 78**: Main wine regions of Spain: Kristin Reid).*

5.2.7 Portugal

Portugal has a rich wine history and produces many excellent and underpriced wines, from deep, powerful and long-aging reds to light and crisp *vinhos verdes*. Many noble varietals are typically Portuguese: the exquisite *touriga nacional*, the softer *castelão*, or the powerful *alfracheiro*.

Portugal has many wine regions, the best known of which is Dão. In recent years, some of the best vineyards in the Douro have been used to produce dry table wines rather than Port. These are among the very best in Portugal. Other wine regions north east and north of Lisbon (Estremadura and Ribatejo) and south of the country (Alentejo) have modernized since Portugal joined the European Union in 1986, and their wines could be the next hot thing.

Traditional red wines were pressed in open stone vats (*lagares*), fermented with stalks and aged for years in old vats. Few wines are made this way today. Since the late 1980s, de-stemming, pneumatic presses, stainless steel vats, dried yeast and other technological advances have been introduced.

Port wines come from demarcated regions in the upper Douro, a contraction of *Rio do Ouro* ('river of gold'). The terraced vineyards, on spectacular steep and rocky hills, stretch for some 70 miles up to the Spanish border. Early in the fall, the grapes are harvested, pressed, and the juice macerated. When the alcohol concentration reaches about 6%, the must is run off into casks containing *aguardente*, a grape brandy at 77% (the aguardente-to-must ratio is 1:4). The alcohol kills the yeast, which stops the fermentation and preserves natural sugar: A typical port has 20% alcohol and 10% residual sugar.

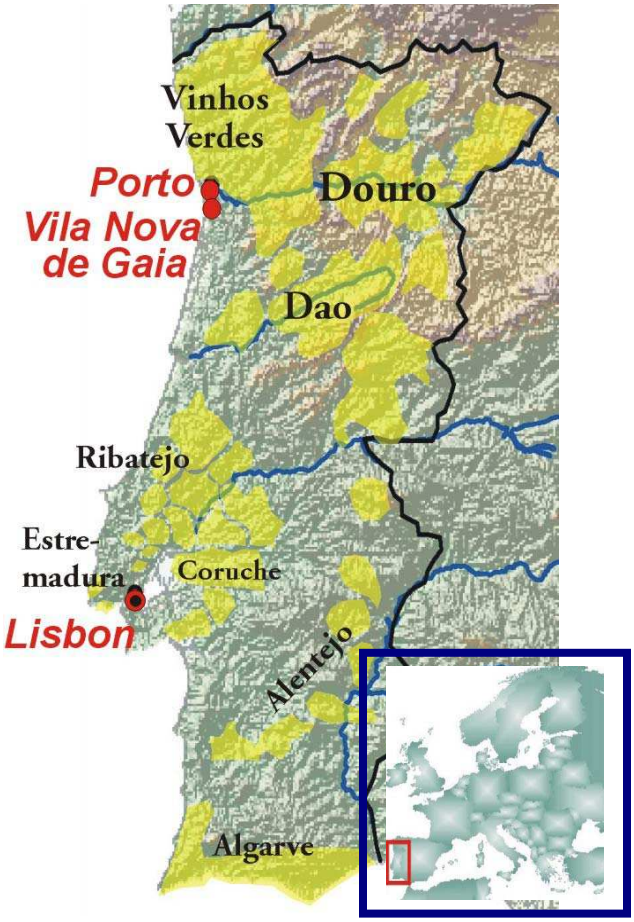

Fig. 79: *Some wine regions of Portugal.*

In the spring following the harvest, the new wine is transported to Vila Nova de Gaia, on the south bank of the Douro, across Porto. It spends 2 years in wooden casks, then its fate is decided. The two broad categories are *Tawny* (mahogany color, soft, delicate) and *Ruby* (brilliant red, more intense and powerful). The latter never spends more than 6 years in wood. Starting with the best, the categories are as follows.

Tawnies: *Colheita* (which means 'harvest' or 'crop') is a tawny from a single vintage, aged at least 7 years in wood, often longer. *Aged tawnies* are blends of many (dozens) wines. The label shows the average age of the blend: '10', '20', '30', or 'over 40' years. Wood-aging, with periodic racking and blending, allows more contact with air

than bottle-aging, which softens the wine. There are also many common tawnies. Their quality varies. The best ones are aged over 7 years in wood, the cheapest ones are blended with white port to produce the tawny color.

Rubies: *Vintage* requires a 'declaration of vintage' by a government agency, the Instituto do Vinho do Porto. Shippers request a declaration only in the best vintage years, and then only 1 to 2% of the best port becomes Vintage. The wine is bottled between its 2nd and 3rd year and ages in bottles. *Single-Quinta Vintage* is from a specific vintage and estate (e.g., Dow's *Quinta do Bomfim* or Warre's *Quinta da Cavadinha*). The wine spends 2–4 years in wood and ages in bottles. *Vintage Character* is a blend of several vintage years but bottled late, often just as the tawny color begins to show. *Late-Bottled Vintage* (LBV) is from a single vintage and spends 4–6 years in wood. Most LBVs are bottled ready to drink, some lack distinction. The best ones, labeled 'traditional', are not filtered and continue to age in bottles. There are many common rubies. Their quality varies.

The rare and expensive ***Garrafeira*** is a port from a single vintage, aged 2 years in wood then 20–40 years in 5- or 10-liter glass demijohns. It has deep fruit and color, but is soft and silky.

5.2.8 Hungary and Eastern Europe

Wine has been produced in Eastern Europe since Roman times, or even much earlier as in (Russian) Georgia for example. However, no industry ever thrived under communism and the wines were destined for the (poor) internal market. Following the fall of the Berlin Wall in 1989, opportunities opened up. However, there are now a lot of wines from many regions on the world market, which makes it more difficult for Eastern European wines to succeed. Only a few of them (and not necessarily the best) are available in wine shops.

Fig. 80: *A wine from Georgia*

Yet, some wines from Romania, Bulgaria and other countries in the East are quite nice. What is needed is investment, infrastructure, regulations, and marketing.

Fig. 81: *A famous Cabernet from Romania.*

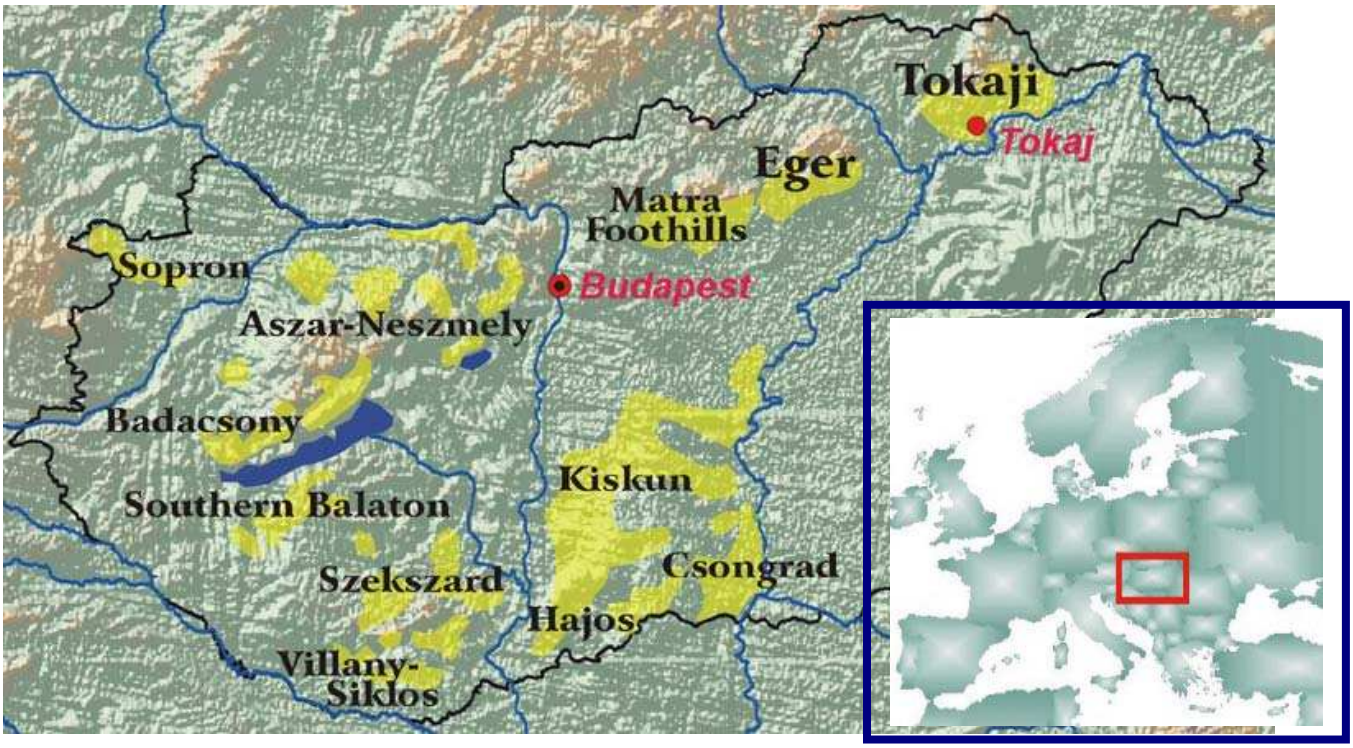

Fig. 82: *Hungary: Tokaji is in the north-east (map: Kristin Reid).*

Like other countries in Eastern Europe, Hungary produces table wines. However, it is best known for the *Tokaji Aszú*. Note that *Tokaj* (the city) and *Tokaji* or *Tokay* (the wine or wine region) have nothing to do with the Alsatian 'tokay', which is just another name for the pinot gris.

Tokaji Aszú is a noble-rot wine from the *furmint, hárslevelü, muscat lunel*, and *orémus* varietals, grown on volcanic hills in the *Tokaj-Hegyalja* wine region of Hungary. The word 'Aszú' refers to the dry, rotting grapes. Tokaji Aszú wines have a unique and long-lasting flavor, quite distinct from that of other noble-rot wines (Sauternes or Beerenauslese).

Most Tokaji Aszú wines are labeled with ***Puttonyos***. Traditionally, one Puttonyo is one bucket (20 liters) of Aszú paste, poured into a 140-liter barrel of (normal, not noble-rot) Tokaji wine. Today, the number of Puttonyos relates to the residual sugar in the wine: 3 Puttonyos (the minimum) is 6-9%, 4 Puttonyos is 9-12%, 5 Puttonyos is 12-15%, and 6 Puttonyos is 15-18%. ***Tokaji Aszú Eszencia*** has more than 18% residual sugar.

The rarest of all, ***Tokaji Eszencia***, is pure Botrytis wine, or rather syrup. It is made from the drops that slowly ooze from the noble-rotting grapes under their own weight. The sugar content is so high (40-70%) that the fermentation may take years. Achieving a concentration of 4% alcohol is pretty high. This wine has always been exceedingly rare: Kings and Emperors would drink it in their deathbeds, in an attempt to regain youth or strength. It is so rare, that until 2003, I had never even seen a bottle of Eszencia.

In contrast to all the other noble-rot wines, Tokaji Aszú has a considerable amount of residual acid, which makes it remarkably fresh. It is sold in 0.5l clear-glass bottles. The older, the better.

Fig. 81: *The rarest of the rare: Eszencia… (photo SKE)*

5.3 UNITED STATES

Following Prohibition, the U.S. wine industry slowly recovered. Most of the California vineyards had to be replanted with noble varietals, and major investment was needed to rebuild the infrastructure. The first boost occurred in the early 1950s with waves of post-World War II European immigrants.

Refrigerated stainless steel tanks with rotary compressors appeared in the 1950s. From then on, three materials were involved in winemaking: stainless steel for temperature-controlled fermentation, wood for tannins and maturation, glass bottles for aging.

This was a quiet yet important revolution: the only material involved in making, transporting, and aging wine was clay (amphorae) for over 5,500 years, then wood for about 1,200. The combination wood+glass appeared in the mid 1600's, and lasted until the 1950's, when stainless steel replaced wood barrels for the fermentation of most wines.

Varietal labeling was introduced by Frank Schoomaker in the 1960s. At that time, much of the U.S. wine production still consisted of (low quality) sweet and/or fortified wines. In 1968, the production of dry table wines labeled 'Bourgogne' (meaning red) or 'Chablis', (meaning white) overtook that of fortified wines. However, such labels provide zero useful information about the content of the bottle, as winemakers simply borrowed (controlled) French appellations and used them without much regard for ethics. As a result, the reputation of U.S. wines in general was poor, and no European restaurant would have American wines on their wine lists. In the 1970's, California produced only a few high-quality wines.

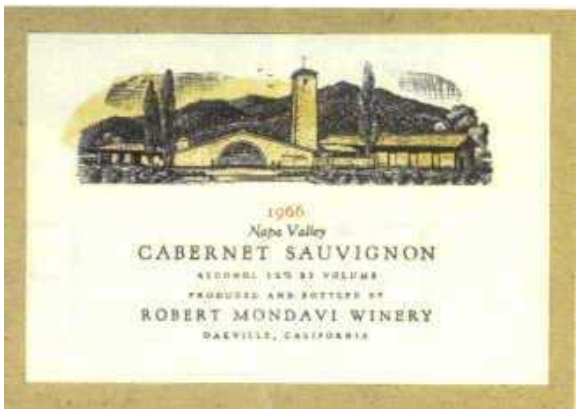

Fig. 82: *Robert Mondavi's first cabernet sauvignon, the 1966.*

This changed in May 1976, when the Englishman Stephen Spurrier, co-founder of *L'Académie du Vin*, organized a blind tasting at the Paris Intercontinental Hotel. The nine judges were French and the tasting included ten Cabernet Sauvignon wines (four from Bordeaux, six from California) and ten Chardonnay wines (four from Burgundy, six from California).

Fig. 83: *At the 1976 Paris wine tasting.*

To everyone's surprise, the 1973 Stag's Leap Cabernet Sauvignon form Napa Valley ranked first among the reds. It defeated the French 1970 Montrose (2nd), 1970 Mouton Rothschild (3rd), 1970 Haut Brion (4th) and 1971 Leoville-Las-Case (7th). Among the whites, the 1973 Chateau Montelena (Napa Valley) won, beating the French 1973 Meursault-Charmes, among others. Solid competition…

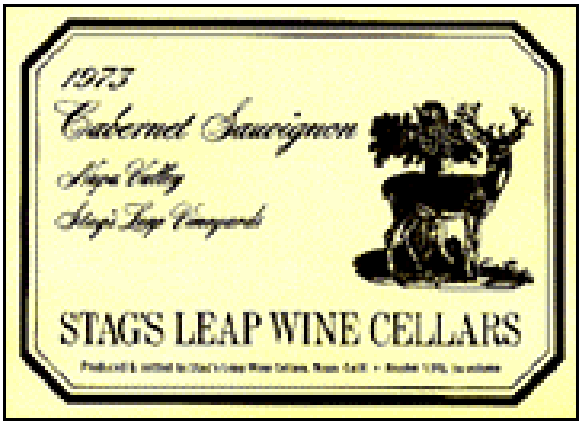

Fig. 84: *The two winners in Paris.*

The world suddenly realized that America produces world-class wines. A burst of investment swept through California and the rest of the U.S. New vineyards were planted in Illinois, Georgia, Maryland, Texas (Lubbock

comes to mind), Washington, Oregon,... Abandoned vineyards were restarted in Virginia, Ohio and New York.

Researchers at UC Davis designed varietals suited to particular climatic conditions and produced detailed maps showing which varietal was most likely to perform best in each region. The vines were grafted on phylloxera-resistant rootstock.

Different rootstocks offer varying degrees of protection and productivity. They have romantic names such as 161-49, 41B, 110 Richter, or AXR1. The latter, a *vinifera x rupestris* hybrid, was the most widely used during the boom of the 1970s. It is productive but not very tough. Phylloxera has been feeding on it in recent years and a lot of replanting had to be done.

Today, quality wines are produced in many states (and Canada). The production includes the very well-known Cabernet, Pinot Noir, and Chardonnay. They often sell for unreasonable prices and are bottled 'ready-to-drink'. There are also more exciting wines (I think) from lesser-known grapes such as the sangiovese, tempranillo, grenache, or viognier. They are often made in a more traditional style and age nicely.

Fig. 85: *Main wine regions of California (map: Kristin Reid).*

5.4 SOUTH AMERICA

Most countries of Central and South America produce wine. However, almost all of it is consumed locally. The two exceptions are Chile and, more recently, Argentina, which is the largest wine producer of South America, followed by Brazil and Chile.

Chile: The dictatorship of Augusto Pinochet in the 1970's and 1980's proved hazardous to life, liberty, the pursuit of happiness, and free enterprise. The domestic demand for wine dropped under his rule and nearly half the vineyards were abandoned.

The return to democracy in the late 1980's reversed this trend. Some 25,000 new acres of noble varietals were planted between 1987 and 1993. The technology improved, maximum yields were imposed, and quality factors such as the use of small oak barrels implemented. The export of high-quality Chilean wines began. In the 1990s, investors from California (Mondavi, Kendall-Jackson,…) and France (Eric de Rothschild) established wineries.

Fig. 86: *A Chilean Cabernet Sauvignon*

Chile benefits from an ideal climate for growing grapes, the land and manpower are inexpensive, and there is no phylloxera. The wine regions extend from north of Santiago to the south in a series of valleys perpendicular to the Pacific: Aconcagua, Casablanca, Maipo, Rapel, Colchagua, Curico, and Maule valleys. The dominant varietals are cabernet sauvignon, merlot, chardonnay and sauvignon blanc.

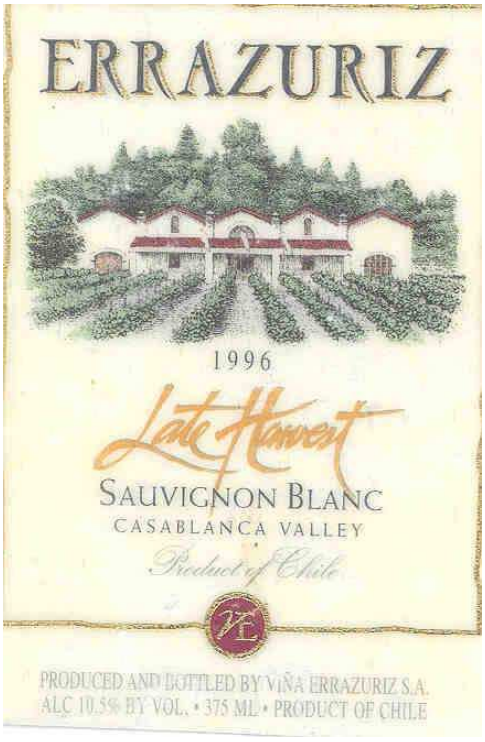

Fig. 87: *This late-harvest sauvignon blanc was remarkable.The winery is close to Santiago.*

Argentina: Since the 1990s, Argentine wines are increasingly visible on the world market. However, political problems in the country slow down the needed investment. Wines include traditional cabernet sauvignon, malbec, merlot, and chardonnay, but also some nice shiraz as well as Italian and Spanish varietals such as barbera, bonarda, sangiovese, and tempranillo.

Argentina is has excellent climate and growing conditions, few problems with phylloxera, and is emerging fast.

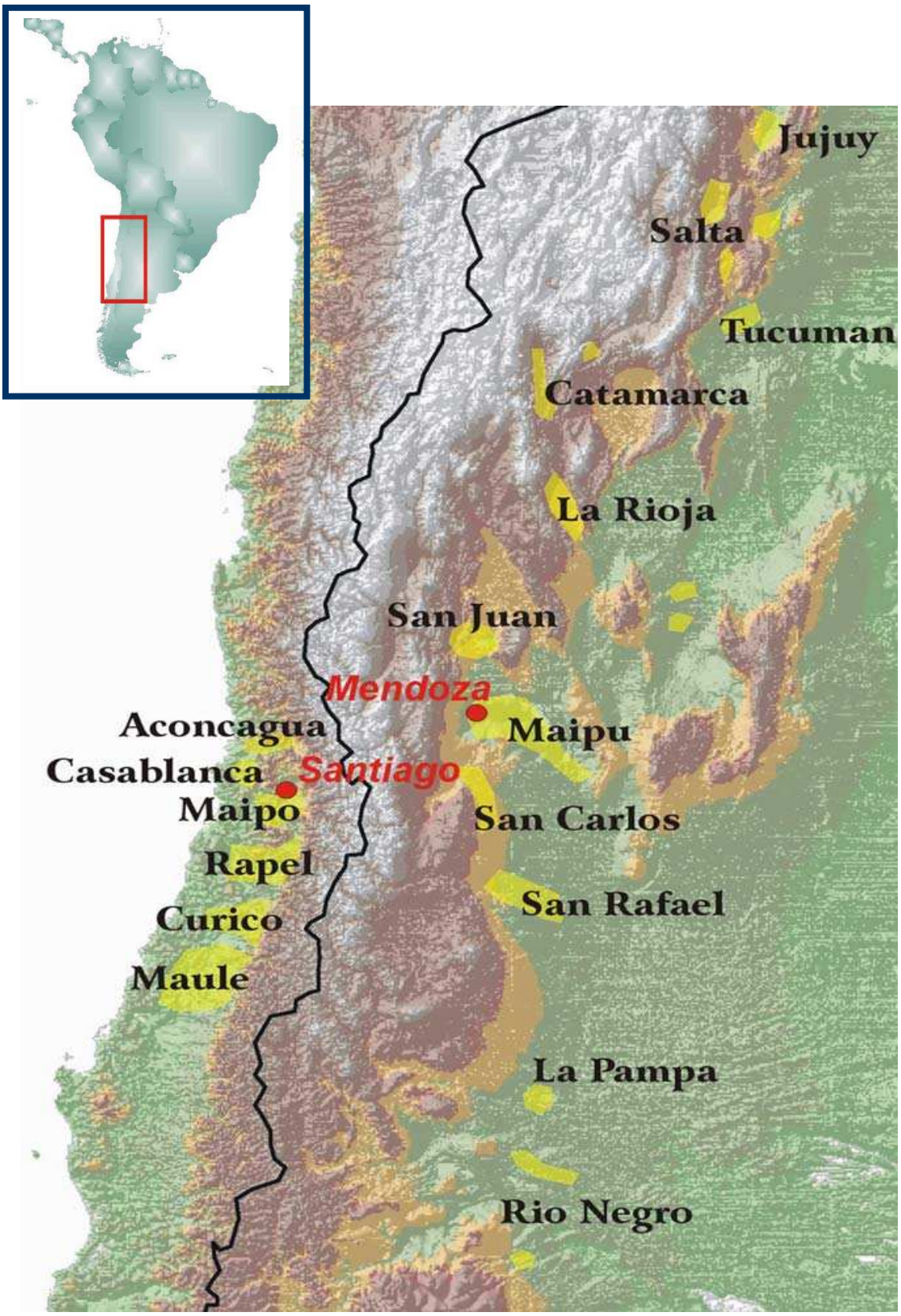

Fig. 86: *Wine regions of Chile and Argentina (map: Kristin Reid).*

5.5 SOUTH AFRICA

For a variety of financial and political reasons, the South African wine industry emerged internationally only in the mid 1970s. A 1972 law delimited 16 'Areas of Origin', and over 50 individual 'Estates' are now registered. Since 1980, it is easier to obtain import permits for improved vine cuttings.

The soil and growing conditions are excellent, and South Africa produces a number of world-class wines (as well as many more common wines). Its wines had a fantastic reputation during much of the 18th and 19th centuries, and were ruined by phylloxera and other imported problems, starting in the late 1800's.

The laws and regulations in place are much weaker than those in European countries. There is no control over yield, planting density, irrigation, use of fertilizers or pest control. Blending wines from varietals different from the one mentioned on the label is allowed: up to 15% for exports, more for the local market. Other loopholes favoring producers rather than customers are common.

South Africa produces some spectacular wines from varietals (locally called *cultivar*) such as the cabernet sauvignon, pinotage, merlot, shiraz, chardonnay and steen (chenin blanc). There are also many blended and fortified wines. The latter are often labeled 'port' or 'sherry', which is unfortunate: they are excellent but quite distinct from true Ports and Sherries. Why invite a comparison when none is needed? As South Africa increases its commercial ties with Europe, the labeling is bound to change.

The entire wine-producing area lies within 100 miles of Cape Town. Constantia, Stellenbosch and Paarl are wine regions of particular interest. The Constantia region is divided into three estates, all of which produce world-class wines: Buitenverwachting, Groot Constantia and Klein Constantia. The latter now produces again the original 'Constantia', in bottles shaped to resemble the old ones. Each of the three Constantia estates includes one or more restaurants, and they count among the best in South Africa. If you travel there, make reservations!

Fig. 87: *This Shiraz from Groot Constantia was one of the best I can remember…*

South African wines still represent one of the best price/quality ratios on the market today. Many of these wines benefit from aging. The largest wine shop in South Africa is Vaughan Johnson in Cape Town. They will ship wines, unless of course you live in a dry county, in which case U.S. customs will be delighted to destroy the wine for your own safety. Isn't it nice to know that so many people care about you?

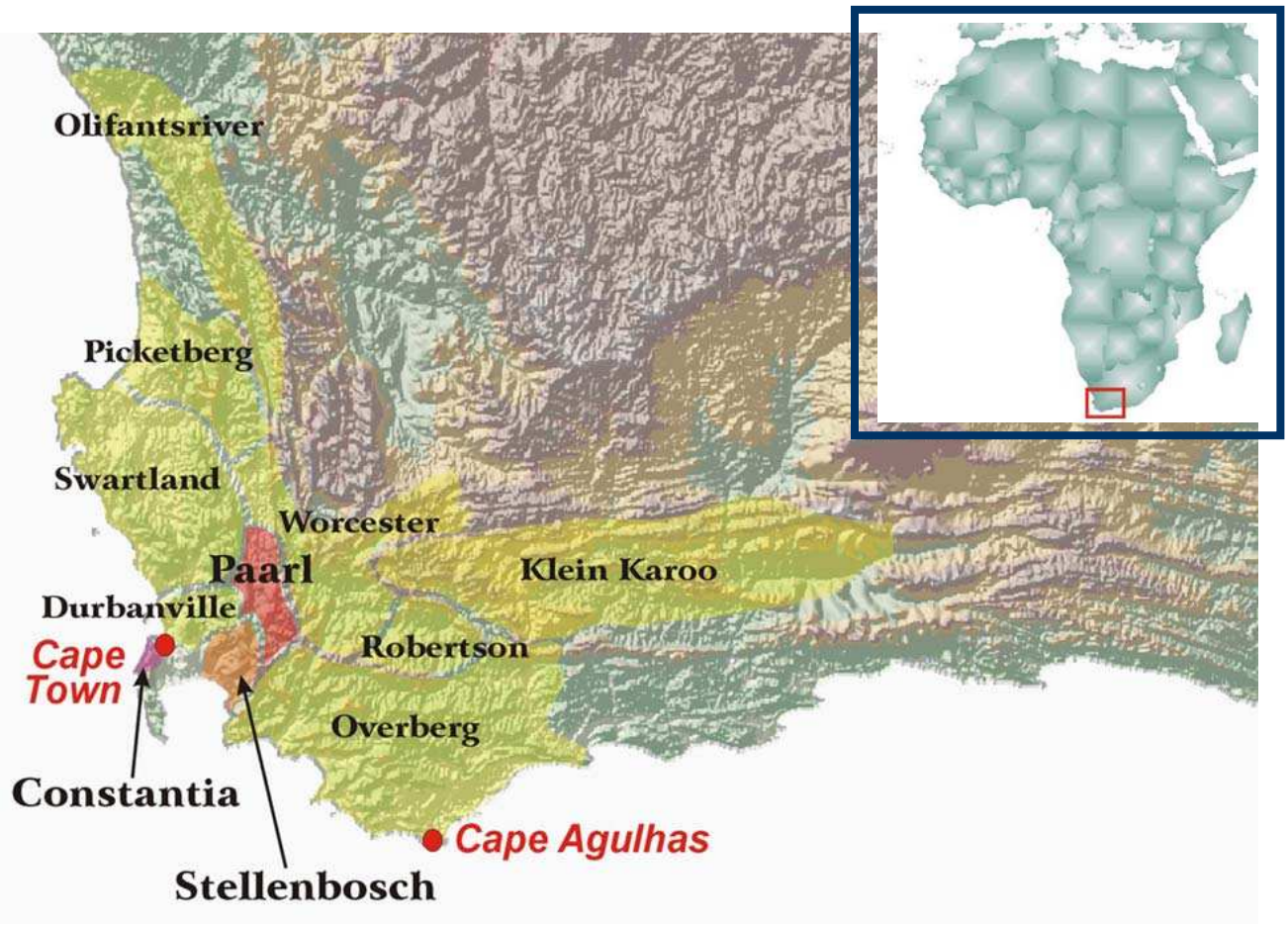

Fig. 88: *The wine regions of South Africa are clustered around Cape Town (map: Kristin Reid).*

5.6 AUSTRALIA AND NEW ZEALAND

5.61 Australia

The Australian wine industry began the road to recovery shortly after World War II. For a couple of decades, volume mattered more than quality. Until 1970 most Australian wines were fortified (and improperly labeled 'sherries' and 'ports'). It is in the late 1970s and early 1980s that the production of dry table wines increased substantially.

At first, the best wines were kept for the local market and only the lesser wines were exported (this has since changed). New vineyards were planted with high-quality varietals in selected locations. Cabernet sauvignon, shiraz, and chardonnay are widespread. State-of-the-art technology, first imported then locally developed, is now omnipresent and impressive.

There are 29 wine regions: eight in Victoria, around Melbourne, six in New South Wales along the south-east coast, one in Queensland, just south of Brisbane, eight in South Australia, four in Western Australia, clustered around Adelaide, and two in Tasmania.

Australia produces about 65 million gallons of wine a year and some wines, such as *Grange Hermitage* or *St. Henri*, are said to be remarkable, although a bit steep for my bank account.

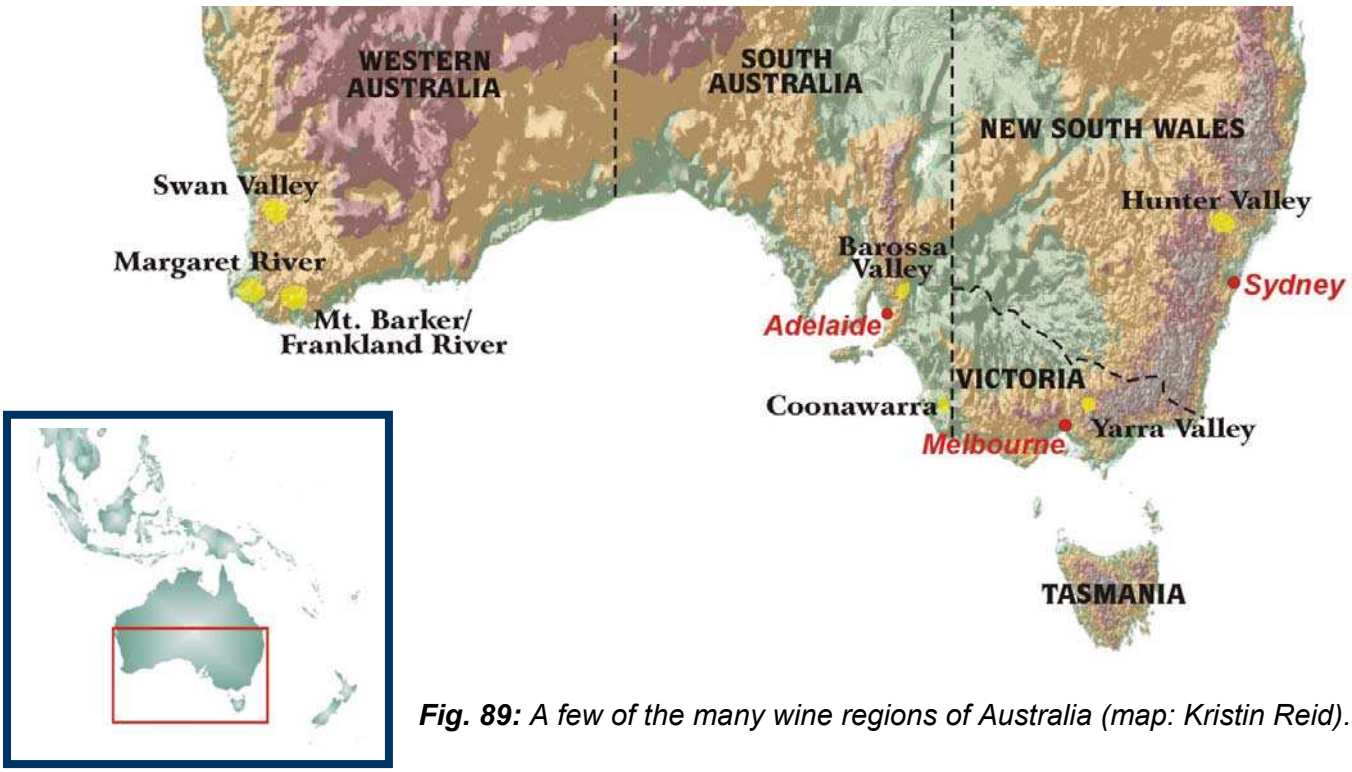

Fig. 89: *A few of the many wine regions of Australia (map: Kristin Reid).*

5.6.2 New Zealand

New Zealand is still struggling with the issue of prohibition. In 1919, it was narrowly voted in, but the soldiers returning from World War I tipped the balance toward reason. But strict liquor laws are still in place. Since 1990, supermarkets are allowed to sell local and imported wines, but neither beer nor spirits. The situation is evolving.

The first wine in the well-known Marlborough region was produced in 1973. The Wine Institute of New Zealand was created in 1975, and wine dilution has been illegal since 1980.

The excess production of 1983 compelled the government to organize a vine-pulling scheme. By 1986 almost one-quarter of New Zealand vines were uprooted. Since then, the trend has reversed and exports increased. Over 130 wineries exported about 1 million gallons of wine in 1991. In 2000, there were 334 wineries and over 4 million gallons.

Much of the wine production of New Zealand consists of dry white wines, in particular from the sauvignon blanc, but chardonnay, pinot noir, dry riesling, cabernet sauvignon and merlot are also produced, as well as some champagne-style sparkling wines.

Although the country has so far been a lesser player on the international wine market, the New Zealand wines are disctinct and the quality is increasing. Were it not for the current world overproduction, they would be even better known.

Fig. 90: *The wine regions of New Zealand (map: Kristin Reid).*

6. CONCLUSIONS

I drink wine when there is an occasion,
and sometimes when there is no occasion.

Miguel de Cervantes (1547-1616)

Wine has been important if not critical to our lives since the dawn of mankind. Its history follows that of western civilization and the two are often intertwined. Abrupt changes in scientific understanding and technology, or market forces, have occurred through the ages and profoundly affected the making, storing, and drinking of wine. There is no reason to believe that we have now reached any kind of steady state. In fact, it is safe to predict that more changes, hopefully beneficial, will take place.

We will never know the taste of the great wines of the past, such as the Roman *Falernum* or Sam Pepys' *Ho Bryen*. But one thing is certain: the quality of today's average wine is much higher than in the past. Much of this can be traced to scientific understanding and technological progress.

Over 400 chemicals in wine have so far been identified and their role studied[47]. Beyond water, the most important ones are *acids* (tartaric, malic, lactic, acetic,...), *sugars* (mostly glucose and fructose), *alcohols* and *esters, sulfur dioxide* and *glycerin*. However, the chemical changes that occur during the aging of wine (especially for a long time), are not really known.

Our understanding of viticulture, fermentation, yeast selection, wine chemistry, maturation, and aging has improved enormously. Yesterday's educated guess is today's quantitative science.

Weather forecasting has also improved. With timely rainfall and sunshine, a skilled winemaker can produce wine that is either ready to drink (the current trend) or able to age and improve with years. It is becoming difficult - but not impossible - to find truly bad wines.

Wines that improve with age are made from 'noble varietals'. The better-known ones are for example the chardonnay, sauvignon blanc, or viognier (in white), and the cabernet sauvignon, merlot or pinot noir (in red). But there are many others[49]. From the still widely known nebbiolo, sangiovese, or tempranillo, to the more obscure ruche or xinamavro. There is a universe waiting to be discovered.

The age of the vine is important as well. Past the age of 30 or so, a vine begins to produce clusters with smaller grains and thicker skin: less juice, more concentration, more tannins. It is common to find century-old vines in Bordeaux and other French regions. Elsewhere in the world, vines over 30 years of age are often replaced by younger ones which produce more fruit and therefore more volume. French regulations strictly limit the volume of wine that can be produced per acre. Any excess cannot be sold, even for distillation. This places the emphasis on producing the highest possible quality.

The young wines contain tannins from the skin and pips of the grapes. These tannins make the young wine

taste harsh, but with age, they evolve into flavors and aromas, the alcohols form longer chains, and other reactions take place. The wine becomes softer, more complex, lasts much longer in the mouth.

How much tannin is present in the fruit depends a lot on the varietal used and the age of the vine. To extract tannins, the winemaker macerates the juice with the skins and pips, sometimes as long as several days. Rapid juice extraction prevents the tannins from dissolving in the must.

Not all wines are capable of aging, but those who are properly made with noble varietals (and older vines), then are bottled without filtering out the tannins, benefit enormously. The color of the wines changes with time. The reds lose some pigments and the whites get darker because of oxygenation.

Fig. 91: *Recent and old vintages of Chateau d'Yquem, illustrate how much this type of wine darkens with age[48].*

Very different tannins come from oak. They are softer than the grape's natural tannins. The oak flavor is often compared to 'vanilla', 'butter', or even 'coconut', depending on the type of oak. Exposure to oak softens the wine, just like sugar hides the bitterness of an strong expresso. How much is too much? To some degree, this is a matter of taste. But adding chips of fresh oak (it is illegal in France) to a tank of strong and tannic cabernet sauvignon allows it to be drunk young, especially if the natural tannins are filtered out. This imparts a softer, semi-sweet taste to the wine. Some experts like this and talk about 'big fruit'. I don't believe that such wines age and mature properly. My strong preference is for more grape tannins and less wood, because the wine matures and ages better. When I crave for vanilla-butter-coconut, I look for a bakery, not a chardonnay. But this is my taste.

In the mid-1980s the prices of rare and collector wines skyrocketed. In 1986, a 1784 bottle of Chateau d'Yquem with the initials 'Th.J.' sold for $56,628. In 1985, a 1787 Chateau Lafite went for $156,450. But then, seven Methuselah of 1985 *Romanée Conti* sold at Sotheby's for $225,000, which is about $800 per 1.5dl glass. And this was a very young wine.

Note about large wine bottles: The capacity of a standard wine bottle is 0.75 liters (0.198 gallons). The **Magnum** is 1.5l (2 bottles), the **Jeroboam** is 3.0l (4 bottles) in champagne and 4.5l (6 bottles) in bordeaux; the **Rehoboam** is 4.5l (6 bottles) in champagne; the **Methuselah** (champagne) or **Imperial** are 6.0 l (8 bottles); the **Salmanazar** is 9l (12 bottles); the **Balthazar** is 12l (16 bottles); the **Nebuchadnezzar** is 15l (20 standard bottles).

In the 1980's, the prices of top-name wines, then those of lesser-name wines, increased. Vineyard appellations from Chablis that were selling for fifteen dollars in the early 1980s went up to eighty by the end of the decade. Today's 'top' brand-name wines are reserved to a very wealthy clientele indeed.

But there are many wonderful wines from lesser-known countries or varietals that are fantastic wines and great buys. The more you know, the better off you are. There are great wines to discover from Portugal, Spain, Central and Eastern Europe, South Africa, Australia, or even Greece or Lebanon (Chateau Musar is the best-known, but not the only winery in the Bekaa Valley). Such wines are much easier to find today than ten years ago.

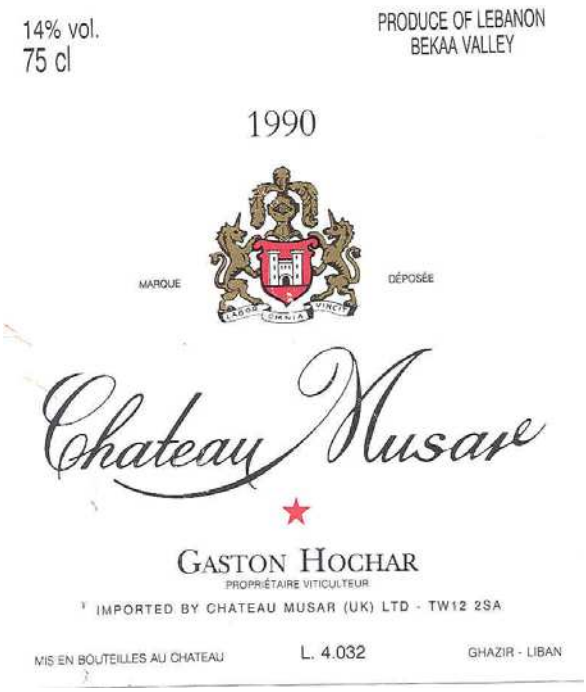

Fig. 92: *The unpredictable but often wonderful Chateau Musar.*

Fig. 93: *The Chateau Ksara winery in the Bekaa valley (photo: Lisa Rezzonico).*

Until the mid-1990s the largest wine-producing countries in the world were Italy, France, Spain, Germany and the United States. Today the wines from the southern hemisphere have arrived on the world market, with a vengeance. Among the top six exporters are Australia, Chile, Argentina and South Africa. Not far behind is New Zealand. Brazil may follow.

The planted acreage in 'old world' countries remains rather constant, but the acreage in 'new world' countries is increasing rapidly. In India for example, the annual consumption per capita was about one teaspoon. The growth potential is fantastic. Today, wineries such as Sula Vinyeards east of Bombay cannot keep up with the demand. The wine production in China has also been increasing dramatically.

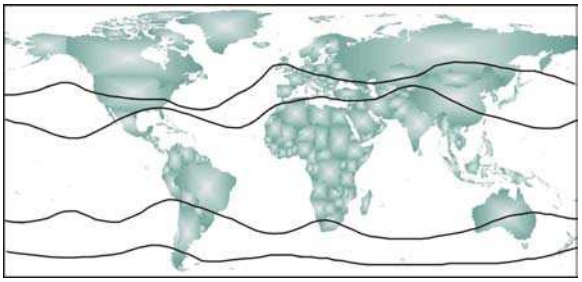

Fig. 94: *Most of today's wine regions lie between the 10°C and 20°C isotherms (map: Kristin Reid).*

Another major change in the world of wines is globalization. One of the earliest joint ventures was *Opus One*, the famous 1979 collaboration between Baron Philippe de Rothschild and Robert Mondavi in Napa Valley. Since then, many French-Californian ventures have been successful, some involving French champagne houses. Today a number of moderately-priced California champagnes rival much more expensive French ones. They even age nicely.

Lafite-Rothschild has substantial holdings in Chile (Los Vascos) and Portugal, while Antinori purchased vineyards in South Africa. The list goes on and on.

A welcome development is that California and other wine regions of the new world are producing wines using a wide range of varietals from Italy, Spain, Portugal, and elsewhere. For a while, it seemed like the entire Universe would be covered with chardonnay, cabernet sauvignon, and merlot. Today, at least forty different varietals are grown in California alone, from the alicante bouschet to the barbera, cabernet franc, dolcetto, … all the way to the zinfandel.

One important issue is the lack of government supervision in much of the world. On one side, we have the traditional European countries such as France, Italy, Spain or Portugal, where the government controls are very strict. The geographical locations, varietals, yields, pruning methods, vinification techniques,… everything is controlled in order to provide guarantees of origin and quality. The bureaucracy of the European Union will make things even worse, as the EU administrators love to micromanage everything.

But government regulations are very lose in South Africa, Australia, and California. In the USA, the bureau of Alcohol, Tabacco, and Firearms defines 'American Viticultural Areas', avoiding the word 'control', Hardly any regulations at all exist in other countries.

According to the *Office International de la Vigne et du Vin*, the top twelve wine-producing countries in 2001 were France (1,591 million gallons), Italy (1,534), Spain (863), U.S.A. (534), Argentina (420), Germany (325), Autralia (225), South Africa (211), Portugal (206), Romania (172), China (137), and Chile (127).

Today, a war is being fought about corks. The best corks (from Portugal) are expensive, and the demand exceeds the production. Further, corks sometimes give a bad taste to the wine. The chemical responsible for most of the problem is '246-TCA' (*2,4,6-tricloroanisole* for clarity). A cork can of course also be affected by a parasite or fungus.

Some writers claim that nearly 10% of wine bottles have a problem. This is not my experience. I have never witnessed 10% of the customers in a restaurant rejecting their wine, and wine store managers confirm that it is rare to run into corky wines. It happened to me three times, which is considerably less than even 1% of the wines I have consumed in my life. However, I try to pick my wines carefully.

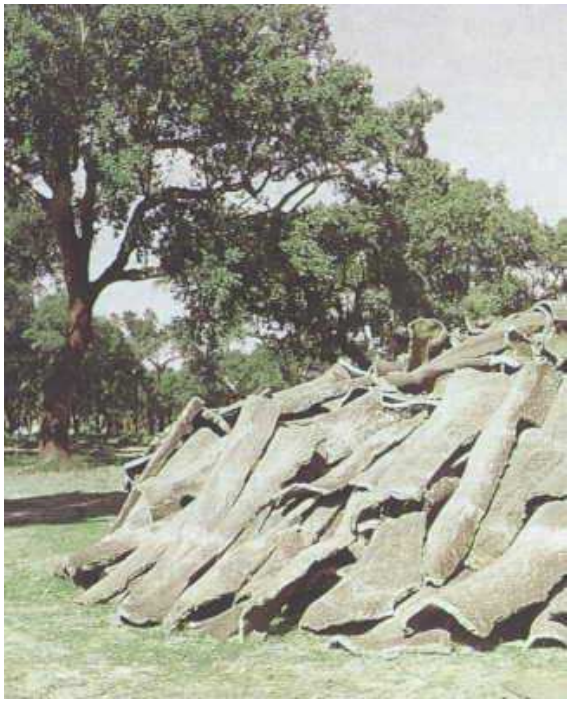

Fig. 95: *Barks from the cork oak waiting to be processed in Portugal.*

Some winemakers have begun to look for alternatives. The very expensive

PlumpJack cabernet sauvignon now comes with a twist-off cap. Synthetic corks are being tested by many wineries, and several lawsuits have resulted from thousands of corks stuck in bottles. Replacing natural corks is still an imperfect technology. And how will the wine age?

Ah! bouteille, ma mie,
pourquoi vous videz-vous?
Molière (1622-1673)

ACKNOWLEDGEMENTS

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Claudius Ptolemy
(87-150)

When Ptolemy, now long ago,
Believed the Earth stood still,
He never would have blundered so
Had he but drunk his fill.
He'd then have felt it circulate
And would have learnt to say:
The true way to investigate
Is to drink a bottle a day.

author unknown

reported in Augustus de Morgan's
***Budget of Paradoxes* (1866)**

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APPENDIX A: Cuvées des Hospices de Beaune

AUXEY-DURESSES - cuvée BOILLOT
In 1898, Antoinette BOILLOT donated her vineyards in Auxey-Duresses, Meursault and Volnay.

BATARD MONTRACHET - cuvée DAMES DE FLANDRES
The Hospices purchased in 1989 a fraction of this Grand Cru vineyard and named it 'Dames de Flandres' as the Sisters of the Hôtel-Dieu were known.

BEAUNE - cuvée NICOLAS ROLIN
Nicolas Rolin was the chancellor of Philippe le Good and the founder of the Hôtel-Dieu. The amount of wine sold as 'Nicolas Rolin' increased in 1963 with a donation from the widow Maurice PALLAGOIX, in memory of her husband.

BEAUNE - cuvée GUIGONE DE SALINS
Named after the wife of Nicolas Rolin who was very dedicated to the Hôtel-Dieu.

BEAUNE - cuvée ROUSSEAU DESLANDES
Named after the husband and wife who founded the Hospice de la Charité in Beaune three centuries ago.

BEAUNE - cuvée DES DAMES HOSPITALIÈRES
For over 500 years, the Sisters 'Dames Hospitalières' have dedicated their lives to the poor and the sick.

BEAUNE - cuvée BETAULT
Hugues BETAULT (adviser, secretary of the king) and his brother established the infirmary and the care room (salle Saint-Louis) in 1615.

BEAUNE - cuvée BRUNET
Five members of the family Brunet who made donations to the benefit of the sick.

BEAUNE - cuvée Maurice DROUHIN
Maurice DROUHIN, administrator then vice-president of the Hospices de Beaune from 1941 to 1955, donated an important vineyard within the Beaune appellation.

BEAUNE - cuvée CYROT CHAUDRON
In 1979, CYROT CHAUDRON and his wife donated vineyards in Beaune and Pommard

BEAUNE - cuvée CLOS DES AVAUX
This appellation consists of vineyards that belonged to the Hospice de la Charité before the French Revolution (1789).

CLOS DE LA ROCHE - cuvée Georges KRITTER
The Hospices de BEAUNE purchased in 1991 a fragment of this Grand Cru vineyard located in Morey-St-Denis using a donation from Mrs. Georges KRITTER.

CLOS DE LA ROCHE - cuvée CYROT CHAUDRON
In 1991, Mr. and Mrs. CYROT CHAUDRON made a donation which allowed the Hospices de Beaune to increase the part of the vineyard obtained from Mrs. Georges KRITTER.

CORTON - cuvée Charlotte DUMAY
Donated part of a vineyard in Aloxe-Corton in 1584.

CORTON - cuvée Docteur PESTE
The Baronne du Bay gave her vineyards in Aloxe-Corton. In 1965, the property was enlarged with a gift from Marcel FOURNIER in memory of her husband, and her uncle and aunt, THEVENOT-BUSSIERE.

CORTON CHARLEMAGNE - cuvée François de SALINS
In 1745, François de SALINS left a legacy of his vineyard in Aloxe-Corton and Savigny.

CORTON VERGENNES - cuvée Paul CHANSON
Part of a vineyard donated by Paul Chanson in 1974.

MAZIS CHAMBERTIN - cuvée Madeleine COLLIGNON
In memory of Mr. and Mrs. Marcel THOMAS-COLLIGNON.

MEURSAULT - cuvée Jehan HUMBLOT
This notary from Beaune gave his property of Laborde-au-Bureau in 1600.

MEURSAULT - cuvée LOPPIN
Several members of this family donated money, buildings and other gifts.

MEURSAULT - cuvée GOUREAU
Miss GOUREAU donated properties in Masse, Corcelles, Mimande, Chaudenay, Ebaty, Demigny.

MEURSAULT CHARMES - cuvée Louis de BAHEZRE de LANLAY
This former inspector of telegraphs donated his entire fortune to the Hospices.

MEURSAULT CHARMES - cuvée Albert GRIVAULT
Mr. and Mrs. GRIVAULT donated a vineyard in 1914.

MEURSAULT GENEVRIÈRES - cuvée BAUDOT
The scientist and antiquarian of Burgundy (and his family) donated a large collection of antiquities and works of art in 1880 (the collection was later sold).

MEURSAULT GENEVRIERES - cuvée Philippe le BON
Named after the duke of Burgundy who allowed (and helped) his chancellor create the Hospices.

MONTHELIE - cuvée Jacques LEBELIN
Mr. and Mrs. LEBELIN donated a large sum to the Hospices.

PERNAND VERGELESSES - cuvée RAMEAU LAMAROSSE
She was the last descendent of an old Burgundy family. She donated her house and vineyards.

POMMARD - cuvée DES DAMES DE LA CHARITÉ
The Sisters of Charity dedicated their lives to the care of the elderly and orphans. Many Sisters donated personal belongings.

POMMARD - cuvée BILLARDET
Drs. Billardet organized the surgical ward. Their daughters and grand-daughters also contributed.

POMMARD - cuvée Raymond CYROT et cuvée Suzanne CHAUDRON
In 1979, Mr. and Mrs. CYROT CHAUDRON donated fine vineyards in Beaune and Pommard.

POUILLY FUISSÉ - cuvée Françoise POISARD
After his death in 1994, Françoise POISARD left a legacy of two houses as well as land and vineyards, of which ten acres in Pouilly Fuissé.

SAVIGNY Les BEAUNE - cuvée Arthur GIRARD
This benefactor donated a part of his estate to the Hospices in 1936.

SAVIGNY Les BEAUNE - cuvée FORNERET
A noted family from Beaune, who donated a property in Savigny et Pernand.

SAVIGNY Les BEAUNE - cuvée FOUQUERAND
Denis Antoine FOUQUERAND made a donation in 1844 and his wife, Charlotte-Claudine BONNARD, already had written a will benefiting the Hospices in 1832.

VOLNAY - cuvée BLONDEAU
François BLONDEAU donated properties in Volnay, Pommard, Monthélie, Bligny, Beaune.

VOLNAY - cuvée Général MUTEAU
Donated the property of Laborde au Château.

VOLNAY SANTENOTS - cuvée Jehan de Massol

This Counsillor of the King at the Parliament in Beaune left all his belongings to the Hospices, including vineyards in Meursault, Demigny and Travoisy.

VOLNAY SANTENOTS - cuvée GAUVAIN

In 1804, Bernard GAUVAIN donated all his estate. His widow donated her hotel in Beaune and her land in Chivres and Laborde au Bureau.

APPENDIX B: French classifications of Bordeaux wines

The earliest (1855) classification of the best Bordeaux wines was carried out by the Bordeaux Syndicate of Wine Brokers. The prices fetched by the wines of various Chateaux were used as the sole basis for the ranking. The approach was later used for other classifications.

The classification of 1855

The name of each château is followed by its district (*commune*). The first growths are listed in the official order. The other wines are listed in alphabetical order. The number in parenthesis associated with each wine refers to the order of the ranking in the original document.

Red wines (Haut Médoc, Médoc)

PREMIERS CRUS

Lafite-Rothschild (Pauillac)
Latour (Pauillac)
Margaux (Margaux)
Mouton-Rothschild (Pauillac)
Haut-Brion (Pessac, Graves)

DEUXIEMES CRUS

Brane-Cantenac (Cantenac) (9)
Cos d'Estournel (Saint-Estèphe) (13)
Ducru-Beaucaillou (Saint-Julien) (12)
Durfort-Vivens (Margaux) (6)
Gruaud-Larose (Saint-Julien) (7)
Lascombes (Margaux) (8)
Léoville-Barton (Saint-Julien) (5)
Léoville-Las-Cases (Saint-Julien) (3)
Léoville-Poyferré (Saint-Julien) (4)
Montrose (Saint-Estèphe) (14)
Pichon-Longueville (Baron) (Pauillac) (10)
Pichon-Longueville (Comtesse-de-Lalande) (Pauillac) (11)
Rausan-Ségla (Margaux) (1)
Rauzan-Gassies (Margaux) (2)

TROISIEMES CRUS

Boyd-Cantenac (Cantenac) (8)
Calon-Ségur (Saint-Estèphe) (12)
Cantenac-Brown (Cantenac) (7)
*Desmirail** (Cantenac) (11)
*Ferrière*** (Margaux) (13)
Giscours (Labarde) (5)
Issan (Cantenac) (2)
Kirwan (Cantenac) (1)
Lagrange (Saint-Julien) (3)
La Lagune (Ludon) (10)
Langoa-Barton (Saint-Julien) (4)
Malescot-Saint-Exupéry (Margaux) (6)
Marquis-d'Alesme-Becker (Margaux) (14)
Palmer (Cantenac) (9)

* château *Desmirail* disappeared early in the 20th century, but is again available since 1981.

** château *Ferrière* is no longer on the market.

QUATRIEMES CRUS

Beychevelle (Saint-Julien) (8)
Branaire-Ducru (Saint-Julien) (3)
Duhart-Milon-Rothschild (Pauillac) (4)
Lafont-Rochet (Saint-Estèphe) (7)
La Tour-Carnet (Saint-Laurent) (6)
*Marquis-de-Terme (*Margaux) (10)
Pouget (Cantenac) (5)
Prieuré-Lichine (Cantenac) (9)
Saint-Pierre (Saint-Julien) (1)
Talbot (Saint-Julien) (2)

CINQUIEMES CRUS

Batailley (Pauillac) (2)
Belgrave (Saint-Laurent) (13)
Camensac (Saint-Laurent) (14)
Cantemerle (Macau) (18)
Clerc-Milon (Pauillac) (16)
Cos Labory (Saint-Estèphe)} (15)
Croizet-Bages (Pauillac) (17)
Dauzac (Labarde) (8)
Du Tertre (Arsac) (10)
Grand-Puy-Ducasse (Pauillac) (5)
Grand-Puy-Lacoste (Pauillac) (4)
Haut-Bages-Libéral (Pauillac) (11)
Haut-Batailley (Pauillac) (3)
Lynch-Bages (Pauillac) (6)
Lynch-Moussas (Pauillac) (7)
*Mouton-Baronne-Philippe** (Pauillac) (9)
Pédesclaux (Pauillac) (12)
Pontet-Canet (Pauillac) (1)

**Mouton-d'Armailhacq* prior to 1956, and *Mouton-Baron-Philippe* prior to the death in 1975 of Baron Philippe's second wife, Pauline.

White wines (Sauternais)

GRAND PREMIER CRU

d'Yquem (Sauternes)

PREMIERS CRUS

Climens (Barsac) (7)
Clos Haut-Peyraguey (Bommes) (3)
Coutet (Barsac) (6)
Guiraud (Sauternes) (8)
Lafaurie-Peyraguey (Bommes) (2)
La Tour Blanche (Bommes) (1)
Rabaud-Promis (Bommes) (10)
Rayne-Vigneau (Bommes) (4)
Rieussec (Fargues) (9)
Sigalas-Rabaud (Bommes) (11)
Suduiraut (Preignac) (5)

DEUXIEMES CRUS

Broustet (Barsac) (6)
Caillou (Barsac) (8)
d'Arche (Sauternes) (4)
de Malle (Preignac) (10)
Doisy-Daëne, -Dubroca (Barsac) (2)
Doisy-Védrines (Barsac) (3)
Filhot (Sauternes) (5)
Lamothe (Despujols, Guignard) (Sauternes) (12)
Myrat (Barsac) (1)
Nairac (Barsac) (7)
Romer-du-Hayot (Bommes) (11)
Suau (Barsac) (9)

The classification of 1953: Red Graves

Haut-Brion (Pessac): classified in 1855
Bouscaut (Cadaujac)
Carbonnieux (Léognan)
Domaine de Chevalier (Léognan)
Fieuzal (Léognan)
Haut-Bailly (Léognan)
La Mission-Haut-Brion (Pessac)
Latour-Haut-Brion (Pessac)
La Tour-Martillac (Léognan)
Malartic-Lagravière (Léognan)
Olivier (Léognan)
Pape-Clément (Pessac)
Smith-Haut-Lafite (Léognan)

The classification of 1959: White Graves

Bouscaut (Cadaujac)
Carbonnieux (Léognan)
Couhins-Lurton (Léognan)
Domaine de Chevalier (Léognan)
La Tour Martillac (Léognan)
Laville-Haut-Brion (Pessac)
Malartic-Lagravière (Léognan)
Olivier (Léognan)

The classification of 1955: Saint Emilion

(Revised: May 23, 1986)

PREMIERS GRAND CRUS CLASSES A

Ausone
Cheval-Blanc

PREMIERS GRAND CRUS CLASSES B

Beauséjour (Duffau-Lagarosse)
Belair
Canon
Clos Fourtet
Figeac
La Gaffelière
Magdelaine
Pavie
Trottevieille

GRANDS CRUS CLASSES

Balestard La Tonelle
Beauséjour
Bellevue
Bergat
Berliquet
Cadet-Piola
Canon-La-Gaffelière
Cap de Mourlin
Chauvin
Clos de l'Oratoire
Clos des Jacobins
Clos la Madeleine
Clos Saint-Martin
Corbin
Corbin-Michotte
Coutet
Couvent des Jacobins
Croque Michotte
CuréBon La Madeleine
Dassault
Faurie de Souchard
Fonplegade
Fonroque
Franc-Mayne
Grand-Barrail-Lamarzelle-Figeac
Grand Corbin
Grand Corbin-Despagne
Grand Mayne
Grand Pontet
Guadet Saint-Julien
Haut Corbin
Haut Sarpe
La Clotte
La Clusière
La Dominique
Lamarzelle
L'Angélus
Laniote
Larcis-Ducasse
Larmande
Laroze
L'Arrosée
La Serre
La Tour du Pin Figeac
La Tour-Figeac
Le Châtelet
Le Prieuré
Matras
Mauvezin
Moulin du Cadet
Pavie-Decesse
Pavie-Macquin
Pavillon-Cadet
Petit-Faurie-de-Soutard
Ripeau
Sansonnet
Saint-Georges Côte Pavie
Soutard
Tertre Daugay
Trimoulet
Troplong-Mondot
Villemaurine
Yon-Fig

APPENDIX C: Modern classifications

The 1855 classification was based purely on the price customers were willing to pay for a given wine. Some records dated back as much as a century. This approach has been extended by Orley Ashenfelter. He developed new and objective rankings using records from wine auctions held throughout the world. The classification below was published in Liquid Assets (Dec. 1997, reproduced with permission). It was based on over 10,000 transactions in London for the period May 1994 to December 1996, and excluded the wines less than 10 years old when purchased. The reference wine is Ch. Lafite-Rothschild, the price of which was normalized to 100. Not surprisingly, major differences exist between this new classification and the old ones.

The same approach was used to rank the California Cabernet Sauvignons in 1996. The basis was the price fetched at auctions from 1968 to 1985. The price fetched by the Beaulieu Vineyards Private Reserve was normalized to 100. This classification follows that of the Bordeaux reds.

Note that these classifications should be updated on a regular basis to reflect that present (perceived) value of the wines.

The classification of 1997: Red Bordeaux

708%	Le Pin (*Pomerol*)	46%	Figeac (*St. Emilion*)
369%	Pétrus (*Pomerol*)	44%	Le Tertre-Roteboeuf (*St. Emilion*)
160%	Lafleur (*Pomerol*)	44%	Cos d'Estournel (*St. Estèphe*)
129%	Mouton-Rothschild (*Pauillac*)	44%	La Tour Haut Brion (*Graves*)
121%	Cheval Blanc (*St. Emilion*)	43%	Vieux Chateau Certan (*Pomerol*)
113%	Latour (*Pauillac*)	42%	Ducru Beaucaillou (*St. Julien*)
105%	Margaux (*Margaux*)	40%	Domaine de Chevalier (*Léognan*)
100%	**Lafite-Rothschild (*Pauillac*)**	40%	L'Eglise-Clinet (*Pomerol*)
85%	Mission-Haut-Brion (*Graves*)	37%	Gruaud Larose (*St. Julien*)
78%	Haut Brion (*Graves*)	36%	Canon (*S. Emilion*)
75%	Ausone (*St. Emilion*)	34%	Giscours (*Margaux*)
71%	Trotanoy (*Pomerol*)	32%	Petit Village (*Pomerol*)
66%	L'Evangile (*Pomerol*)	32%	Talbot (*St. Julien*)
59%	Pichon-Longueville (*Pauillac*)	32%	Pavillon Rouge (*Margaux*)
56%	Certan de May (*Pomerol*)	31%	Montrose (*St. Estèphe*)
55%	Palmer (*Margaux*)	31%	Pavie (*St. Emilion*)
52%	Leoville-Las-Cases (*St. Julien*)	31%	Magdelaine (*St. Emilion*)
50%	La Fleur Pétrus (*Pomerol*)	31%	Beychevelle (*St. Julien*)
50%	Lynch Bages (*Pauillac*)	30%	Léoville Barton (*St. Julien*)
47%	Les Forts de Latour (*Pauillac*)	30%	Grand Puy Lacoste (*Pauillac*)
47%	La Conseillante (*Pomerol*)	30%	La Lagune (*Ludon*)
47%	Latour a Pomerol (*Pomerol*)	29%	Moulin de Carruades (*Pauillac*)

29% Bon Pasteur (*Pomerol*)
28% Clinet (*Pomerol*)
28% L'Arrosée (*St. Emilion*)
27% Grave-Trigant-de-Boisset (*Pomerol*)
25% Haut Marbuzet (*St. Estèphe*)
24% Rausan Ségla (*Margaux*)
24% Haut Bailly (*Graves*)
24% Chasse Spleen (*Moulis*)
24% Baron Pichon Longueville (*Pauillac*)
24% Leoville Poyferré (*St. Julien*)
24% Saint Pierre (*St. Julien*)
23% Branaire Ducru (*St. Julien*)
23% Le Gay (*Pomerol*)
23% Langoa Barton (*St. Julien*)
23% La Dominique (*St. Emilion*)
23% Calon Ségur (*St. Estèphe*)
23% La Gaffeliere (*St. Emilion*)
23% Haut Batailley (*Pauillac*)
23% Mouton Baronne Philippe (*Pauillac*)
22% Gloria (*St. Julien*)
22% Lascombe (*Margaux*)
22% Larmande (*St. Emilion*)
22% Sociando Mallet (*Médoc*)
22% Pape Clement (*Graves*)
22% D'Issan (*Margaux*)
22% Cantenac Brown (*Margaux*)
22% Cantemerle (*Macau*)
21% Belair (*St. Emilion*)
21% Duhart-Milon-Rothschild (*Pauillac*)
21% Brane-Cantenac (*Margaux*)
21% Batailley (*Pauillac*)
21% Clos du Marquis (*St. Julien*)
21% Certan-Giraud (*Pomerol*)
21% De Sales (*Pomerol*)
20% Fieuzal (*Graves*)
20% Clerc-Milon (*Pauillac*)
20% Labergorce-Zede (*Margaux*)
20% L'Angelus (*St. Emilion*)
20% Haut-Bages-Liberal (*Pauillac*)
20% Meyney (*St. Estèphe*)
20% Prieuré-Lichine (*Margaux*)
20% Gazin (*Pomerol*)
20% Poujeaux (*Moulis*)
19% La-Croix-de-Gay (*Pomerol*)
19% L'Enclos (*Pomerol*)
19% D'Angludet (*Margaux*)
19% De Pez (*St. Estèphe*)
19% Lagrange (*St. Julien*)
19% Canon La Gaffeliere (*St. Emilion*)
19% Haut-Bages-Averous (*Pauillac*)
19% Pavie-Decesse (*St. Emilion*)
19% Dufort-Vivens (*Margaux*)
18% Grand-Puy-Ducasse (*Pauillac*)
18% Les Ormes de Pez (*St. Estèphe*)
18% Rauzan Gassies (*Margaux*)
18% Boyd-Cantenac (*Margaux*)
18% Larrivet-Haut-Brion (*Graves*)
18% Malescot-St-Exupéry (*Margaux*)
18% Croizet-Bages (*Pauillac*)
18% Pontet Canet (*Pauillac*)
18% Smith-Haut-Lafite (*Graves*)
17% Potensac (*Médoc*)
17% Nenin (*Pomerol*)
17% Siran (*Margaux*)
17% Clos Rene (*Pomerol*)
17% Cissac (*Cissac*)
17% Soutard (*St. Emilion*)
17% La Louvière Rouge (*Leognan*)
17% Marquis-de-Terme (*Margaux*)
16% La Pointe (*Pomerol*)
16% Gressier-Grand-Poujeaux (*Moulis*)
16% Camensac (*St. Laurent*)
16% Marquis d'Alesme-Becker (*Margaux*)
16% Du Tertre (*Margaux*)
15% Domaine de L'Eglise (*Pomerol*)
15% Clos du Clocher (*Pomerol*)
15% Trottevieille (*St. Emilion*)
15% La Tour de Mons (*Margaux*)
15% La Tour Figeac (*St. Emilion*)
15% Coufran (*Haut Médoc*)
15% Lafont-Rochet (*St. Estèphe*)

15% La Tour-St-Bonnet (*Médoc*)
15% Malartic-Lagraviere (*Leognan*)
14% Kirwan (*Margaux*)
14% La Tour-de-By (*Médoc*)
14% Beauregard (*Pomerol*)
14% Carbonnieux (*Graves*)
14% Cure Bon La Madeleine (*St. Emilion*)
14% Fombrauge (*St. Emilion*)
13% Phelan Ségur (*St. Estèphe*)
13% Lalande-Borie (*St. Julien*)
13% Beaumolnt (*Médoc*)
13% Lynch-Moussas (*Pauillac*)
12% Grand Mayne (*St. Emilion*)
12% Patache d'Aux (*Médoc*)
12% Larozé (*St. Emilion*)
12% Cos-Labory (*St. Estephe*)
11% Liversan (*Haut Médoc*)

The classification of 1996: California Cabernet Sauvignon

366% Caymus Special Selection (*Napa*)
242% Opus I (*Napa*)
239% Stag's Leap Wine Cellars Cask 23 (*Napa*)
215% Dunn Howell Mountain (*Napa*)
206% Heitz Martha's Vineyard (*Napa*)
172% Spottswoode (*Napa*)
155% Ridge Monte Bello (*Cupertino, SF*)
150% Silver Oak (*Napa*)
142% Dunn (*Napa*)
141% Beringer Reserve (*Napa*)
139% Chateau Montelena (*Napa*)
129% Dominus (*Napa*)
119% Silver Oak (*Alexander Valley*)
114% Joseph Phelps Insignia (*Napa*)
114% Forman (*Napa*)
112% Robert Mondavi Reserve (*Napa*)
101% Heitz Bella Oaks (*Napa*)
100% Beaulieu Vineyards Private Reserve (*Napa*)
99% Duckhorn (*Napa*)
95% Caymus Estate (*Napa*)
95% Groth (*Napa*)
94% Mayacamas (*Napa/Sonoma*)
94% Stag's Leap Wine Cellars SLV (*Napa*)
92% Jordan (*Sonoma*)
69% Sterling Reserve (*Napa*)
65% Clos du Val (*Napa*)
63% Freemark Abbey Bosch (*Napa*)
61% William Hill Reserve (*Napa*)
56% Inglenook Reserve Cask (*Madera*)
56% Carmenet (*Sonoma*)
54% Heitz (*Napa*)
53% Chapelet (*Napa*)
48% Ridge York Creek (*Napa*)
47% Joseph Phelps (*Napa*)
41% Sterling (*Napa*)
41% Robert Mondavi (*Napa*)
33% Charles Krug Vintage Select (*Napa*)