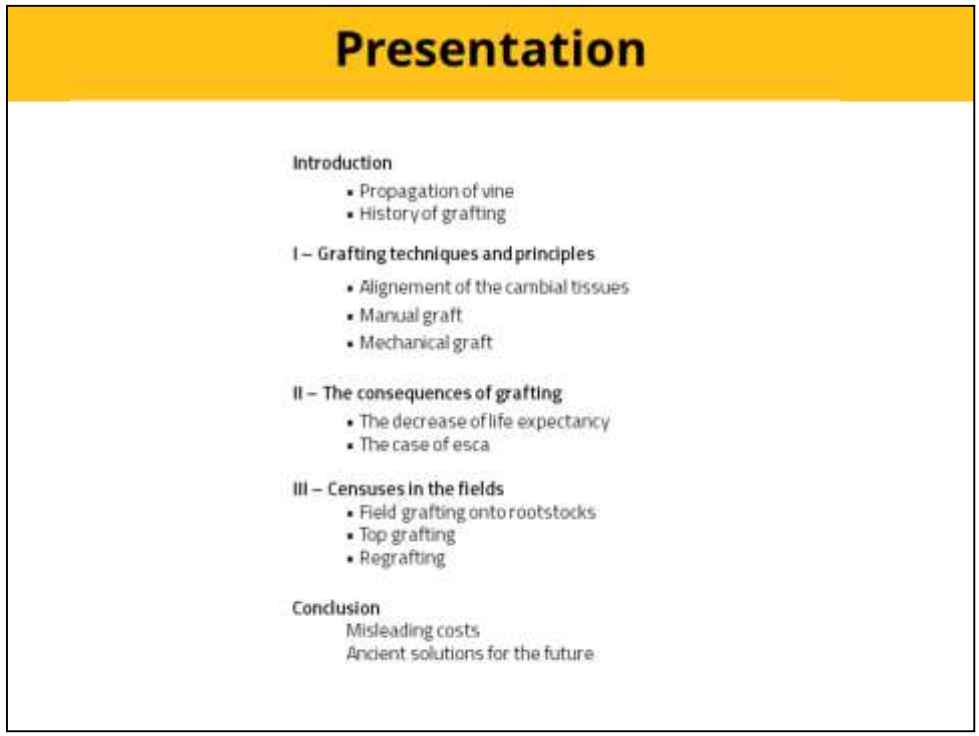
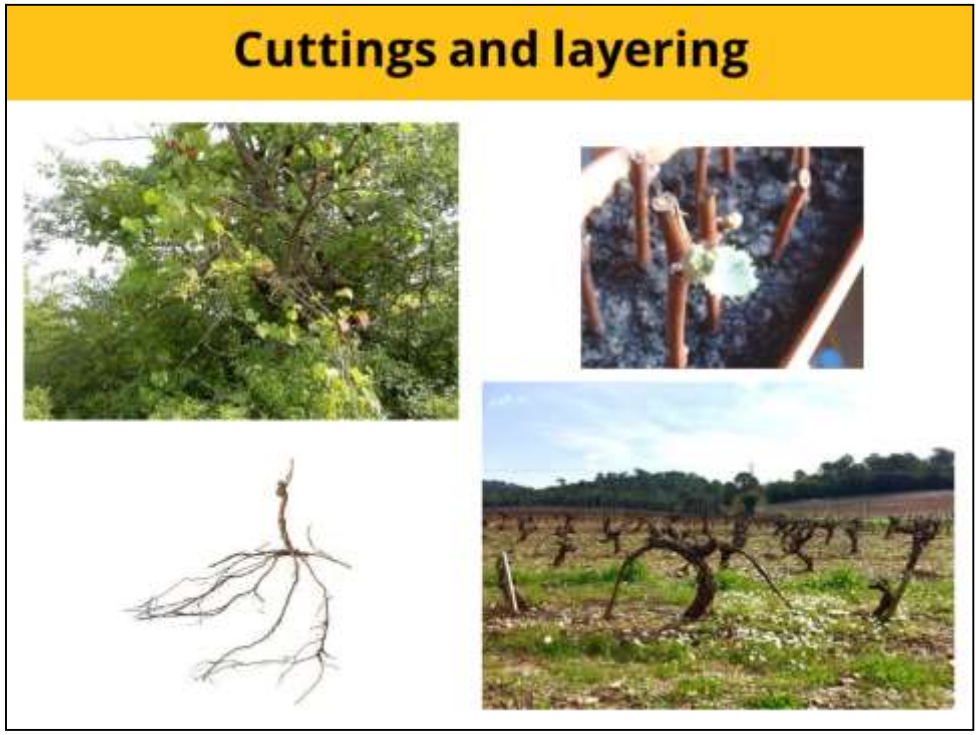
The quality of the graft determines the quality of the vines … and the wine

It is not possible to approach the subject of grafting vine and its immense consequences for the vine and the wine, which are completely neglected by the wine world, without talking about the history of the vegetative propagation (don't worry, it will be quick), which is also sometimes named (sadly) the "vine material".



I will also, quickly, talk about the principles and techniques of grafting, in order to present to you their consequences, and the studies and arguments that demonstrate those.

I will end up proposing options (which are too often ignored), to improve the current situation of our "biodegradable" vineyards,



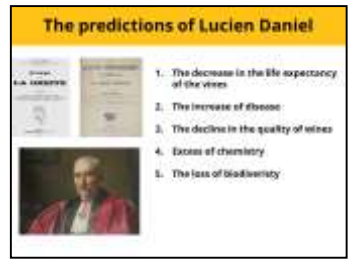
Historically, the vegetative propagation was mainly done by cutting or layering. That is to say that a cane of a vine, or the vine itself, is laid under the ground so that the buried buds sprout roots, while the buds above ground form the aerial vegetative apparatus.

These techniques have been used for millennia. For this reason, voices are heard today to regenerate the vineyard through sexuality. This will allow the plant to adapt to its environment according to the principles of evolution (Darwinian), in which case, the existing grape varieties risk decline through their inability to adapt to changing climates,

The last vegetative propagation technique is grafting. We know that it has been performed in viticulture for at least three thousand years, but it was not used a lot because cuttings were durable, and close resemblance to the mother-stock irreproachable. Therefore grafting was not needed.

Grafting became "indispensable" with the phylloxeric crisis. Indeed, when the small American root-sucking aphid swept over the wine world (as early as 1863 in France and 1874 in Germany), nearly a third of the vines were lost. Almost all the others were restocked by grafting old and fruiting varieties on rootstocks of American origin, naturally immune to the devastating insect.

The systematic implementation of grafting, called "Reconstitution", has been the great Revolution of the wine world. It was believed that decapitating grapevines and grafting them was salutary, whereas it was in fact the beginning of the Terror, and the decline of our vineyards. In the past, vineyards could live for several centuries because they were layered when trunks deteriorated, while the root system, generally preserved from human intervention, was able to last several centuries. But the simple fact of grafting new vine plants drastically reduced their life expectancy, even if it still allowed for octogenarian or centenarians plants. Our old vines serve as evidences; They were grafted by hand on rooted rootstocks by the Winegrowers.



L. Daniel has been wrongly classified in the "sulfurists" category, but we cannot help categorizing people according to existing cleavages, right or left (SPD – CDU), for example in politics.

This “Breton” was a foremost botanist, specialist in horticultural and arboricultural grafting. He was assigned in 1903 by the French Government to evaluate the impact of vine grafting during the “reconstitution”. He finally was dismissed in 1908, more for political and ideological reasons than technical ones.

Like Cassandra, no one listened to this incredible grafter because, he wasn’t, at all, against the grafting of vines on the contrary, but he warned against its disorderly generalization.

He then predicted all the evils of modern viticulture:

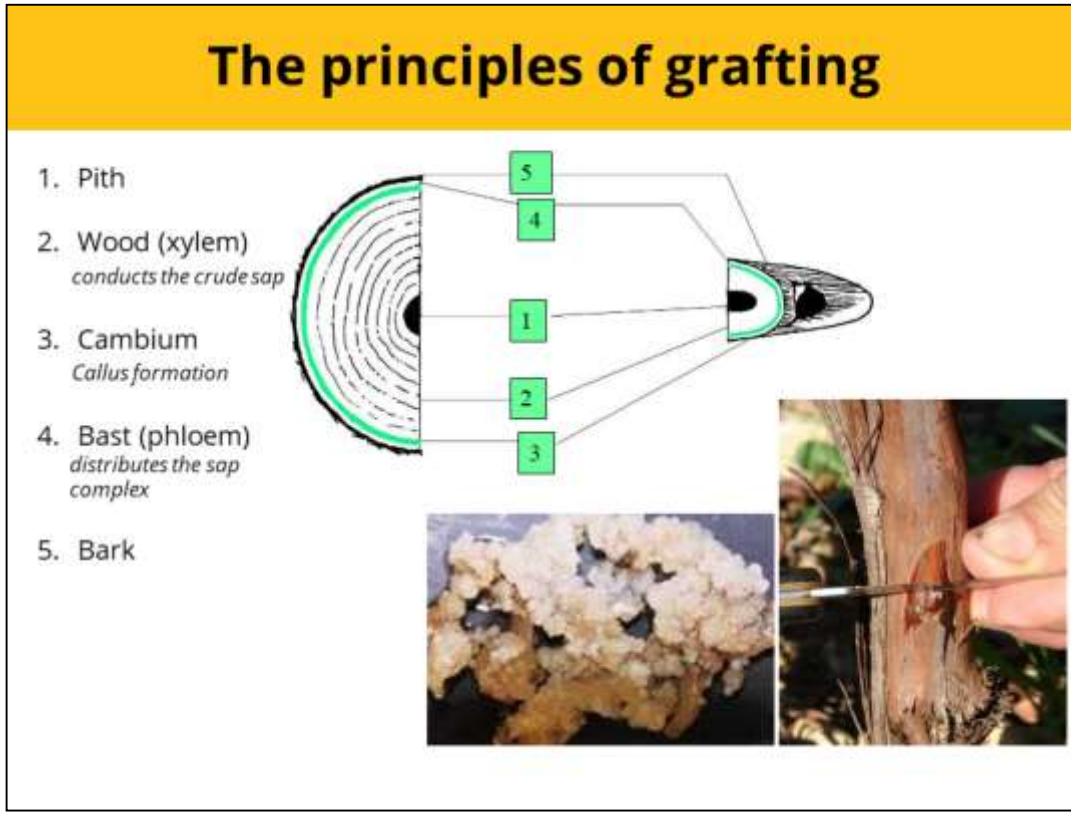
- Shortened life expectancy of the vines.
- Decrease in the quality of the wines.
- Increase of cryptogamic diseases.
- Excessive use of chemical products in vineyards and wines.
- Loss of biodiversity

Yes, we are well aware that grafting is not the only contemporary revolution.

During the 20th Century, we went from extensive to intensive viticulture: The vines migrated to the plains where soil was more fertile and allowed for mechanization. Productive plants have been favored and assisted by chemically nitrogenous fertilizers and watering, and thus, have been kept "under perfusion". You have to over treat them for they have weakening diabolical gear. Chemistry is then considered lifesaving.

Mechanization has also become general: Spraying machines, tractors, grape harvesting machines, pre-pruners, leaf removal machines, ... in short, a run for chemical and mechanical intelligence.

Fields are no longer left fallow. We have forgotten that the environment is alive. Man believed he totally dominated it thanks to science, when in reality he accelerated its deterioration.



It looks like nothing, but it's absolutely fundamental.

When you cut a piece of wood, (rootstock or bud), you will find :

The cambium gives rise to secondary xylem and phloem cells which allow for the welding and vascularization of the graft.

The ideal grafting aims to adjust the cambial tissues of the two elements, over the largest possible area.

All is said ! The grafting must respect these principles.

The full cleft graft

In the field, the most widely practiced graft is “the full cleft graft”, because it is easy to carry out.

It can be qualitative when done with similar diameters, so that the cambial tissues can be adjusted. It's a bit like piping.

Ancient generations performed it with success.

This technique is less reliable, in terms of the take on strong diameters and sadly is not sustainable.

Whip and tongue graft

It's the only modern graft. It was developed in the seventeenth century in England, by Louis Tothnam Higthross.

When the gauges are respected, it is a very qualitative graft, beveled with long contact areas.

A totally mechanized version exists. It’s name is the “the Whip and Tongue graft”. Contact areas are shorter. The grafter is the one who carries out the good graft.

Bud grafts

« ***Bud grafting of vine,***

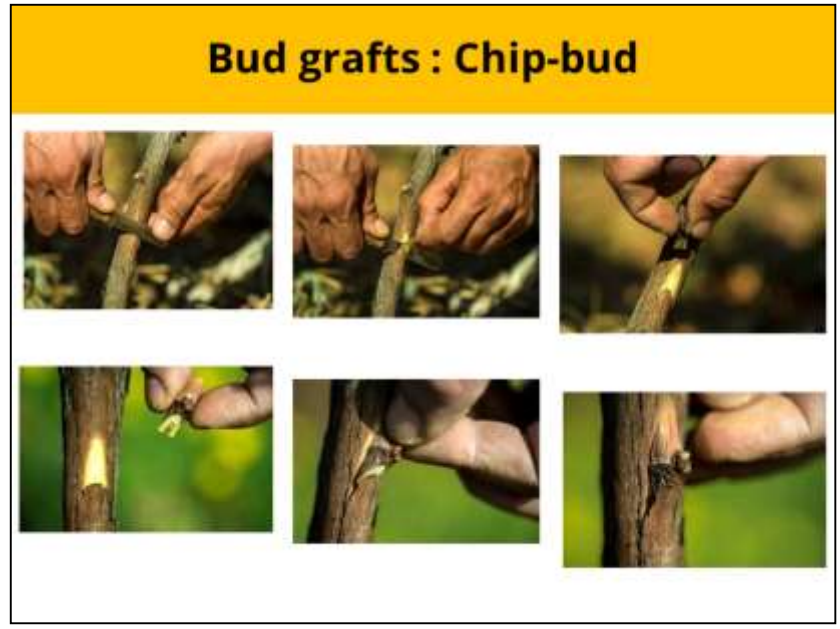
considered to be an impossible or very difficult task, is today, thanks to a more precise knowledge of how to carry it out, a very easy way to graft vines and a technique which gives perfect unions.

It is a highly attractive technique; ***It's only fault is that it arrived too late****. As it is today, fifteen years earlier, it would have supplanted, to a large extent,* ***the whip and tongue and full cleft grafts ».***

« La greffe en écusson de la vigne »
M. Alazard. *Revue de Viticulture. 3e année. Tome VI, n°134. Paris, 11 juillet 1896.*

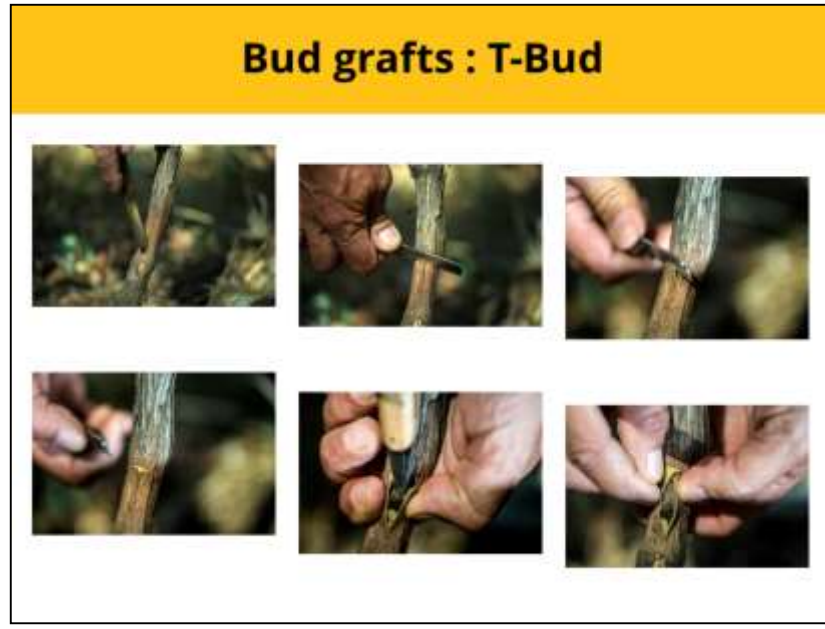
« Nil novi sub sol »!

Those are ancestral arboriculture techniques. Theophrastus (4th century -BC) with Emplastratio, then Virgile (1th Century BC) with Innoculatio, apparently already described those 2 methods, called Chip-bud and T-Bud. They have never really been practiced in viticulture because they require dexterity. I will leave you to think about this comment from a practitioner, which demonstrates that this graft has been severely under-recognized.



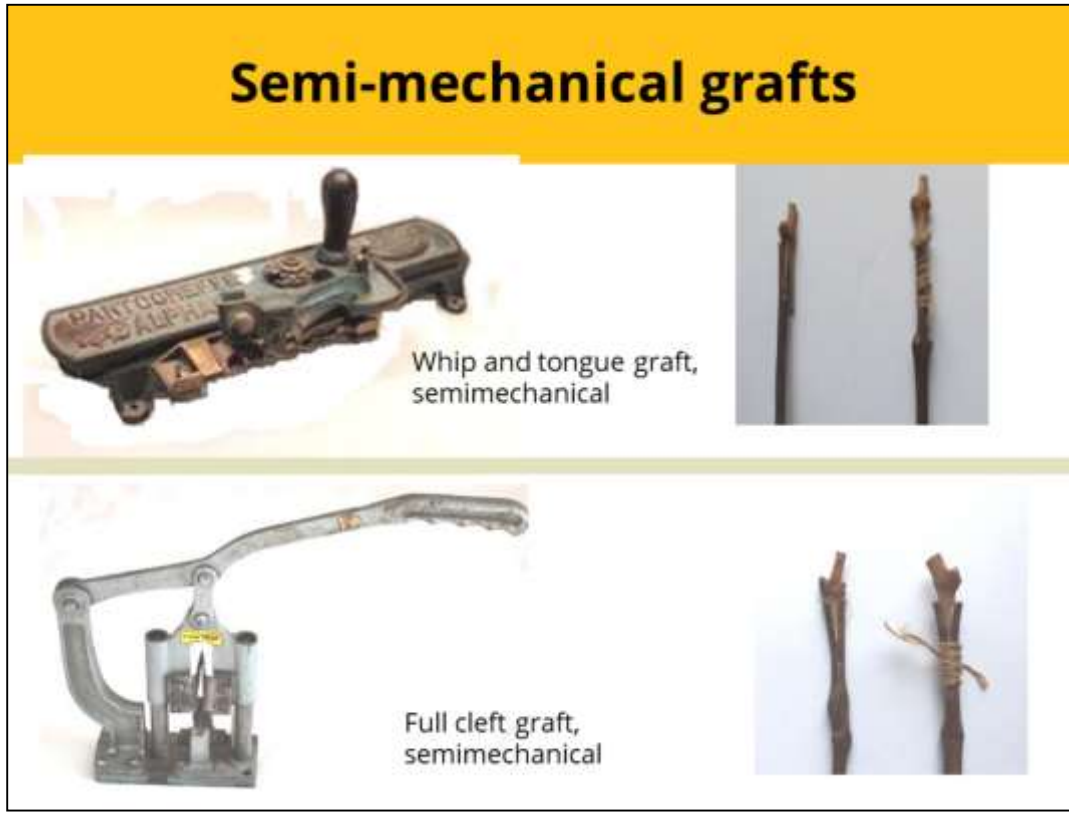
The Chip Bud graft involves cutting a small slice on the trunk and replace it by a scion with a bud of the exact same shape.

This graft is well adapted to small vines or young rootstocks.

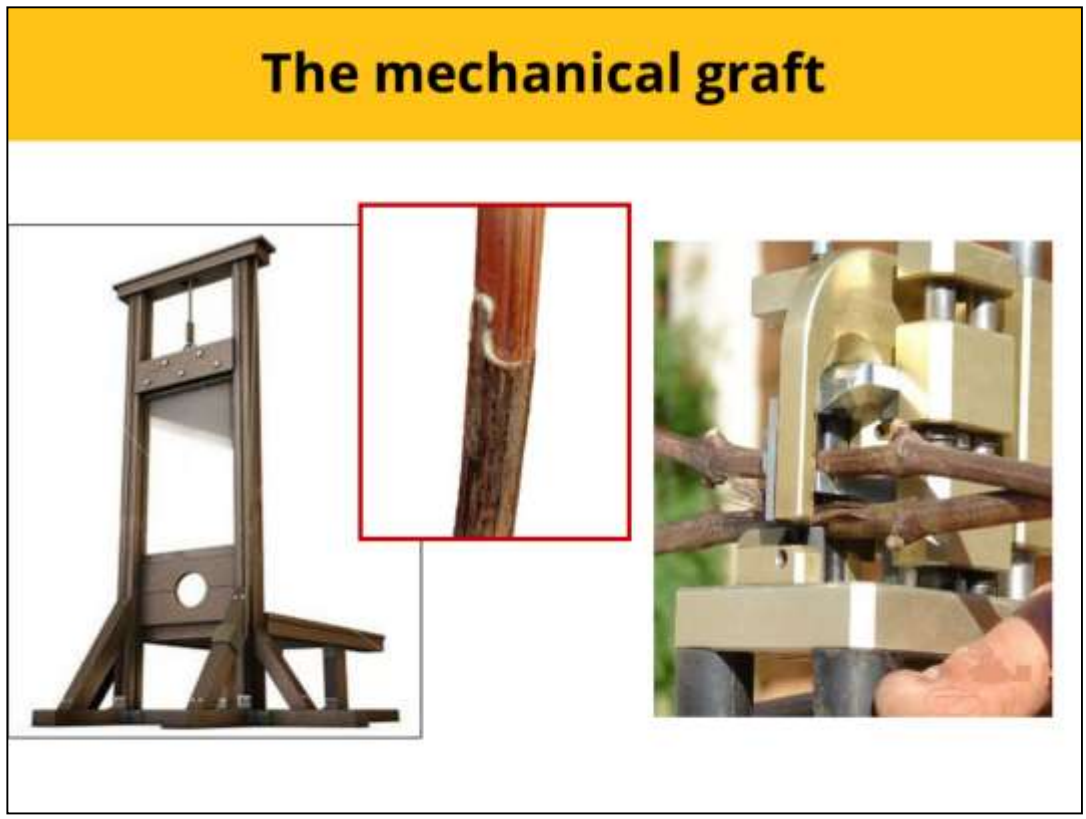


This graft involves cutting the bark of the plant in a T-shape, in order to insert under the bark a scion with a bud.

In our opinion, the graft is almost perfect, because the wound is superficial, and it doesn’t cause necrosis of the wood tissues.



These were the most used techniques in northern regions and our old vines, which went through mechanization, chemistry and brutal pruning… are still there to testify. But the revolution was not over at that point. And as it often does, it led to terror.



History is often cyclic. Like in many revolutions, the wine ended up in a blood bath, with an emblematical tool which limited any resistance. The graft has been totally mechanized, thanks to a real guillotine which decapitates the plant material. It is the omega grafting machine, patented in Germany in 1975. The machine turned out to be so outstanding in terms of productivity, that in a decade, nearly all nurseries adopted this new technique.

Consequences are sometimes serious. We will talk about that a little later. But we have to go through wood diseases first, specifically esca.

Wood diseases: ancient roots

Collumelle

Piertro de Crescenzi

Latin authors like Columelle (1St Century) were using the term “sideratio” to describe the vegetation accidents happening at the end of heatwaves, and caused by the stars.

Palladius (5th Century) writes in “De Re Rustica” about “Vines which suddenly drie out as if they were hit by lighting (it means stroked down).

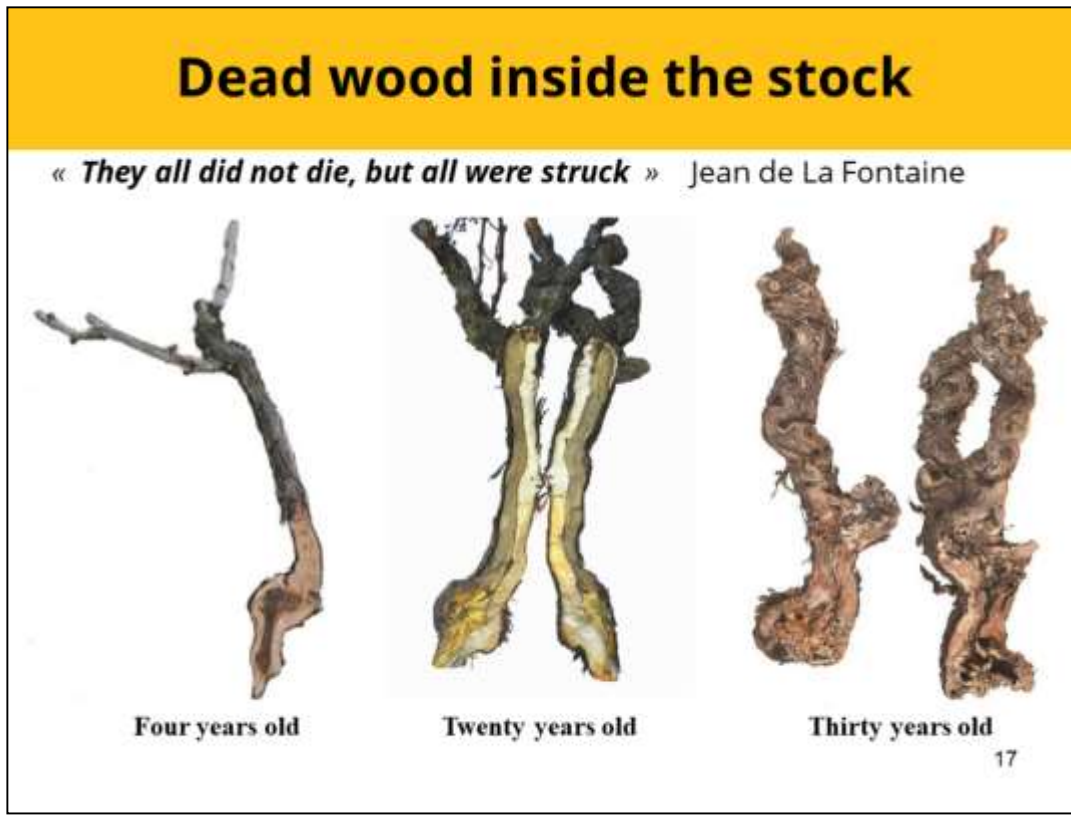
Pierre de Crescenzi also noticed it (see his writing : Rustican in 1300).

People spoke of vegetation accidents rather than disease, and abiotic factors were blamed instead of parasites.

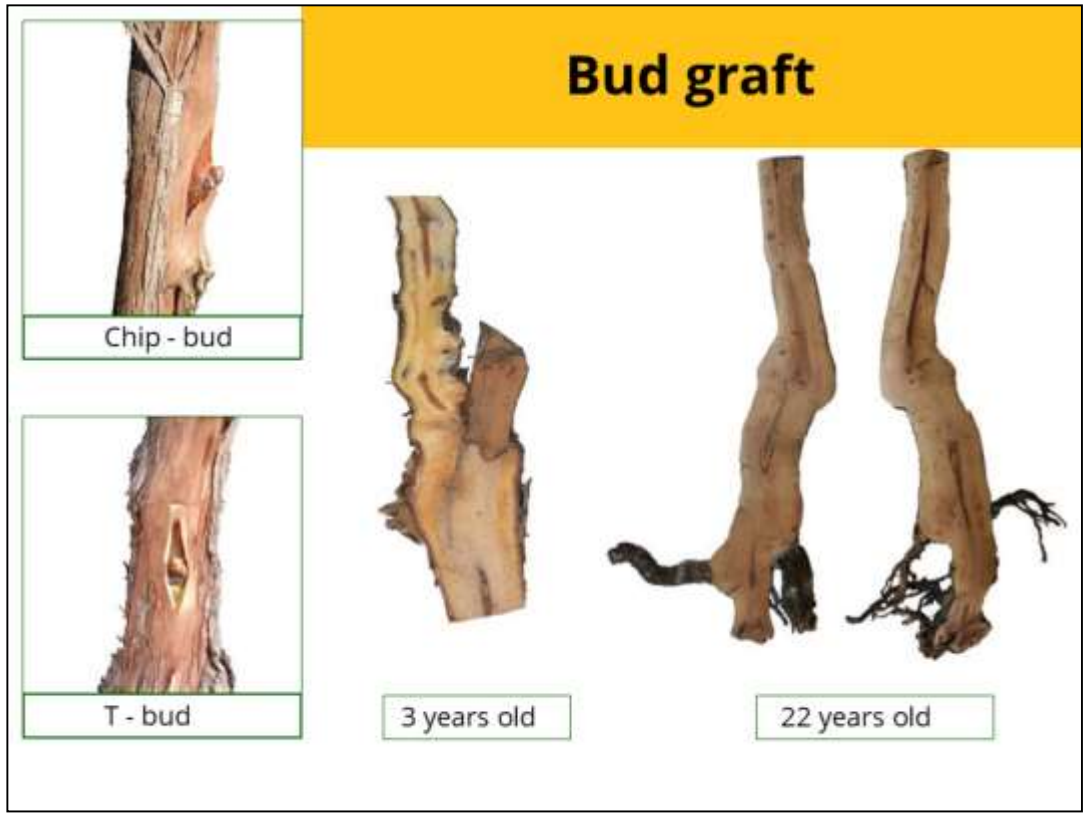
All of this is to say that this disease is very old, but always has been considered as secondary and even anecdotal. Only its amplitude is modern.Today, it is estimated that ¾ of vineyards are impacted by this plague in France, and nearly 15% of vines are consequently unproductive.

Let’s go back now to our Omega Guillotine.

Take a plant sample from your recent deliveries victim of sudden infant death (=Young plant which died from a “stroke”). Instead of doing a cross section, which is most commonly done, perform a vertical one and observe the inside of the plant. The immediate and general finding is that there are necrotic tissue on at least 50% of the internal surface.It is impossible to do otherwise, the technique requires it, even if the graft can be well done with sorted gauges.



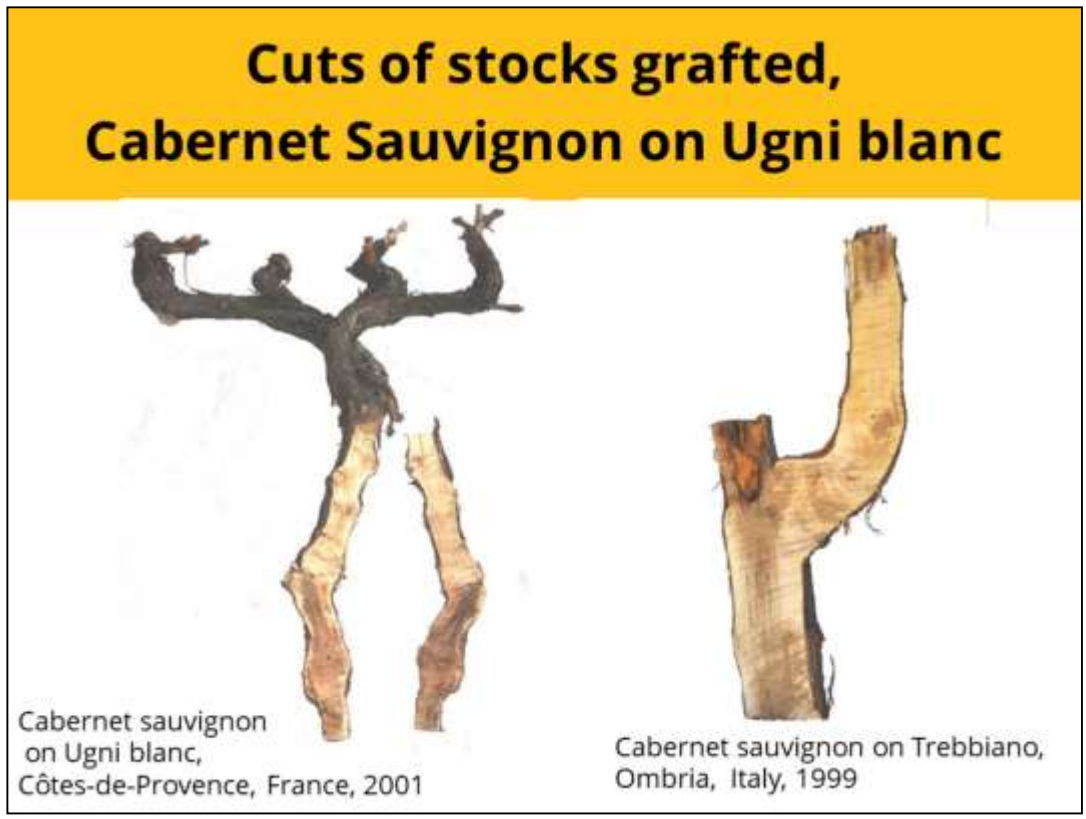
Now, the original small wound remains somewhat the same for years and generally gets worse with other mechanical damage and pruning.The harmful fungi are saprophytes, that is to say they feed themselves with dead raw materials, to then transform into new vital resources.They do not attack the green parts of the plant. They cause strokes indirectly only, hence the impact of abiotic factors, most likely by the emission of toxins. Nevertheless, Man is the direct culprit of this plants' deterioration.



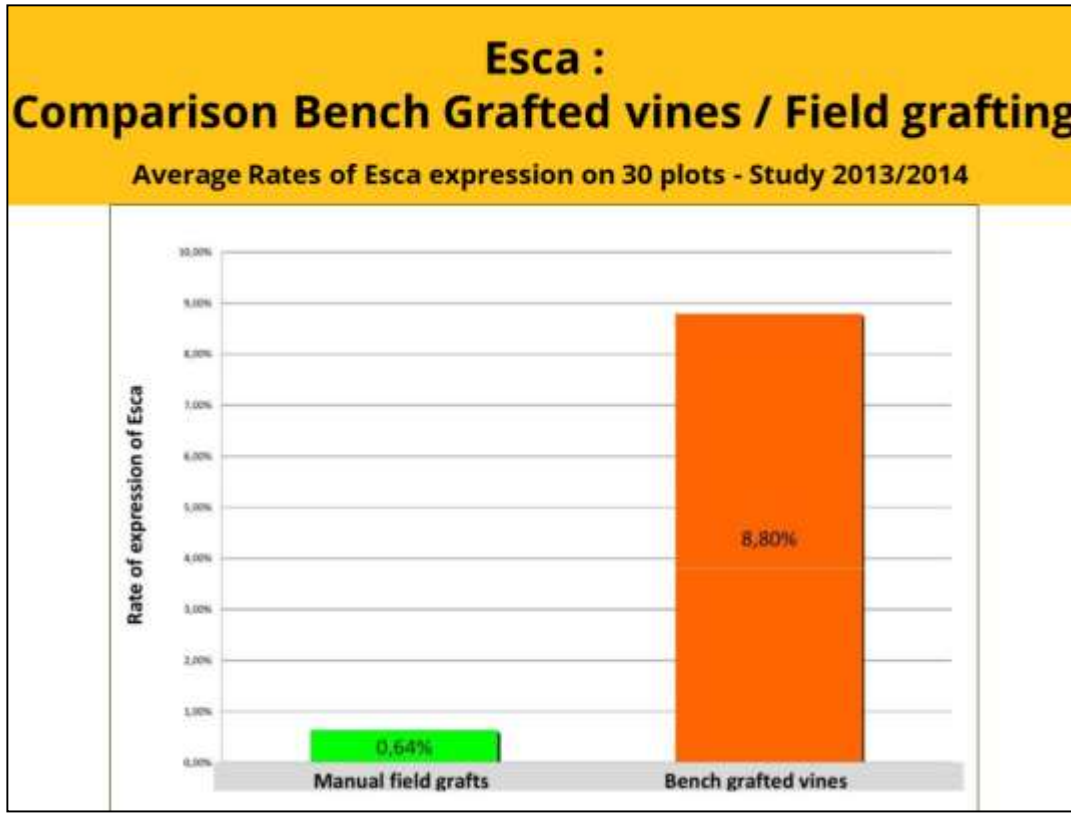
On another note, here is the evolution of bud grafting techniques, from 3 to 22 years old. If there is no dead wood, then the fungi don't settle.

Saproxylic species are our friends.

Once again, it can be seen, that Man is the enemy when he turns the vine into a bonzaï.



In other cases, here are top-grafts of nearly 20 years old.These 2 varieties are very sensitive to esca: Cabernet Sauvignon and Trebbiano (or Ugni Blanc).In the photo on the left, you can see that necrotic tissue are extremely localized around the original mechanical graft.In the photo on the right, close-up on the bud graft. We can see that the fungus, although present in the stump of the old trunk, does not have the opportunity to develop into a well-done graft, that is to say, without injuries.To demonstrate these different statements, we carried out censuses.

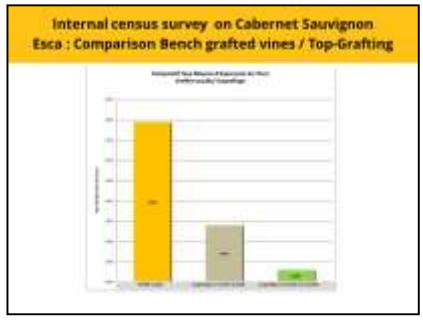


First of all in 2013 and 2014, we carried out a study about field grafting with a technology transfer agency directly linked to Sup Agro Bordeaux University.It was designed to count the average rate of esca expression (in its weak or “stroky” form) with very Esca-sensitive varieties (Cabernet Sauvignon or Mourvedre) according to the grafting method, that is to say, hand grafted vines directly into the fields or nursery bench grafted vines.

Esca : Comparison Bench grafted vines / Manual grafts

Results were presented as early as 2015 in Bordeaux, to the international working group, COST. The study has since been published in a scientific journal (OenoOne- Austria, July 2017).

It should have come as a real media explosion, but it remains ignored. Perhaps it disturbs the "system", or is it because it does not come from officially patented research authorities?Regardless, the vines of our parents and grandparents discuss this also. They also experienced the same physical abuse (intensive production, all-chemical, brutal pruning, mechanization ...) and they are often still there, alive, while contemporary vines must almost all be uprooted before they turn thirty.



When discussing top-grafting (that is to say a graft done on the aerial part of the trunk) two situations have to be distinguished

Either the top-graft is performed on a variety which is non-sensitive to Esca, for example, Merlot. In this case, the average rate of esca expression is 0.60 %

Or the top-graft is performed on a variety which is sensitive to Esca. In this case, the average rate of esca expression is then 2.81 %.

The reason for this result is because the ‘breakage” of the bench grafted vine, with its necrosis and its high propensity for stroke.

At last, in this study, when counting the omega bench grafted vines, the summer average rate of Esca expression was 7.89 %.

One would think that the wine regulations, which subsidize and favor certified vines released from mechanical bench grafting, would still be economically more advantageous than sustainable manual field grafting. However, this is extremely false.

Let us take the case of a vineyard with an 25 years average life expectancy, as that is usually the case with certified plants.

If the winegrower carries out his own field grafts, it will immediately be less expensive than bench grafted plants.

It would cost him roughly pretty much the same over a period of 25 years, then if the grafting were done by an external service provider. if you compare it with the bench grafted vines and take into account the early death, the painful replacement of dead vines, the crop loss etc. But the huge difference is that the plot planted with bench grafted vines are worth being uprooted when 25-30 years old, whereas the other only starts its mature life for another 2 to 3 generations.

Finally, we take into consideration intangible elements such as the wine quality, since we can’t disagree with the fact that the wine produced by an old vine is superior to a wine made from a young wine. Moreover, manual field grafts with a better established, deeper and more sustainable rooting are also more qualitative.

It is not a diatribe against the nursery, but against society as a whole. The winegrower is just as responsible for the evolution of the situation. If he is pressing for low prices, he will receive his money. Nurseries are in a competitive market, and the mirror of the all society. You can get out of this.

I was talking about a real phylloxeric revolution which, unlike the other revolutions, has been exploited by the bourgeoisie. Today, its beneficiaries are the large industrial, chemical groups, sometimes nurserymen (of an impressive concentration for a few years). But It also has been seized by some professional, scientific and political governing bodies, which marvelously work out the existing system, in collaboration with the phylloxeric Occupant (cf: the aforementioned regulations).I had a dream, that one day we would begin to search for biological warfare against phylloxera, because it is difficult to understand that a single insect still has maintained such a significant impact on viticulture for the past 150 years. We should develop more biological means of fighting today. And as long as we will have to graft, we will have to carry out qualitative grafts.

I would like winegrowers to source old vines, learn the ancestral gesture of grafting again, and reconsider the plant with respect. And if they relearn to graft, they can also, at a lower cost, top graft and improve their vine population in a sustainable way.

They can allow them sustainable, economical and ecological plants.