The Vine

There are thousands of different grape varieties grown in vineyards throughout the world, but they all share much in common. In this chapter we will explore these similarities and the meaning of some of the words used to describe vines and their constituent parts.

4

VINE SPECIES

There are many different species of vine that have evolved throughout the world but grape growers are only concerned with a handful of these species. In modern viticulture the most important species are:

Vitis vinifera – This is the main Eurasian species. It produces nearly all the grapes used in winemaking and has been used to make wine for several thousand years.

American vines – There are three important species of vine native to North America. They are rarely used to produce grapes for winemaking because the wines they produce are widely considered to have unattractive flavours. However, unlike *V. vinifera*, they are resistant to *Phylloxera* (a vine pest that attacks the vine's roots) and so they are widely used to produce rootstocks onto which *V. vinifera* vines are grafted. See section *Phylloxera and Rootstocks* on page 22.

GRAPE VARIETIES

There are thousands of grape varieties belonging to the *V. vinifera* species. For the wine consumer, the principal differences between grape varieties are variations in colour and flavour, both properties coming from the grape itself. Differences between varieties are not just limited to the taste and quality of the fruit, however. When selecting a grape variety the grape grower will also be concerned with other factors such as budding and ripening times, and resistance to certain diseases.

In order to understand what a grape variety is, it is necessary to understand how a variety is grown or propagated. Importantly, this cannot be done using seeds. Instead, in order to preserve the unique qualities of a variety, a grower must use one of two techniques: cutting or layering. A cutting is a section of a vine shoot that is planted and then grows as a new plant. This method is widely used in commercial nurseries that sell vines to growers. Layering takes place in the vineyard. A cane is bent down and a section of it is buried in the ground. The cane tip points upwards out of the ground. The buried section takes root and, once these roots are established, the cane linking the new growth to the original plant is cut. Due to the risk of phylloxera most grape growers now use cuttings instead of layering (see section *Phylloxera and Rootstocks* on page 22). In both these instances the new plant is identical to the original. Therefore, a grape variety is a group of individual plants that can all trace their lineage back through a series of cuttings and/or layerings to a single plant.

Note that the terms 'vine variety' and 'grape variety' can be used interchangeably, and the word 'cultivar' is sometimes used instead of 'variety'.

Clones

Although all the individual vines of a grape variety are genetically identical, it is still possible to observe variations between them. This happens as a result of mutations that sometimes occur when the vines grow. These mutations can sometimes be positive and can result in plants with better quality fruit or better disease resistance. Often, vines with positive mutations are selected for further propagation by cutting or layering, so that the positive characteristics of these vines can be carried forward in new plantings. This is known as clonal selection, and it has led to the development of different clones. In grape growing, each individual vine or group of vines that shows a particular set of unique characteristics is known as a clone. The difference between clones is often small and all of the individual plants that make up a clone would still be considered to be from the same grape variety. When grape growers order new plants from a nursery they will often specify which clone they would like as well as the grape variety.

Some mutations have such a significant effect that the resulting plants are treated as if they are new varieties, even though strictly speaking they are clones of an original plant. For example, the grape varieties Pinot Blanc and Pinot Gris are both mutations of the grape variety Pinot Noir.

CREATING NEW VINE VARIETIES

Researchers are constantly looking for grape varieties that are better able to thrive in certain climates and soil conditions, as well as varieties with improved disease resistance, and those able to deliver a higher quality or quantity of grapes. Therefore, rather than waiting for a random mutation to occur, genuinely new grape varieties can be created in controlled conditions using cross-fertilisation. This is where pollen from the male part of a flower of one vine is transferred to the female part of the flower of another vine and fertilisation occurs. The pollinated flower develops into a grape with seeds.

If a seed is planted and grows, it will be a new variety because its genetic material will be different from that of its parents. A new variety will be produced even if the parent vines are from the same grape variety. The new variety may have some characteristics that are recognisable from the parent vines, but this is not always

THE ANATOMY OF THE VINE

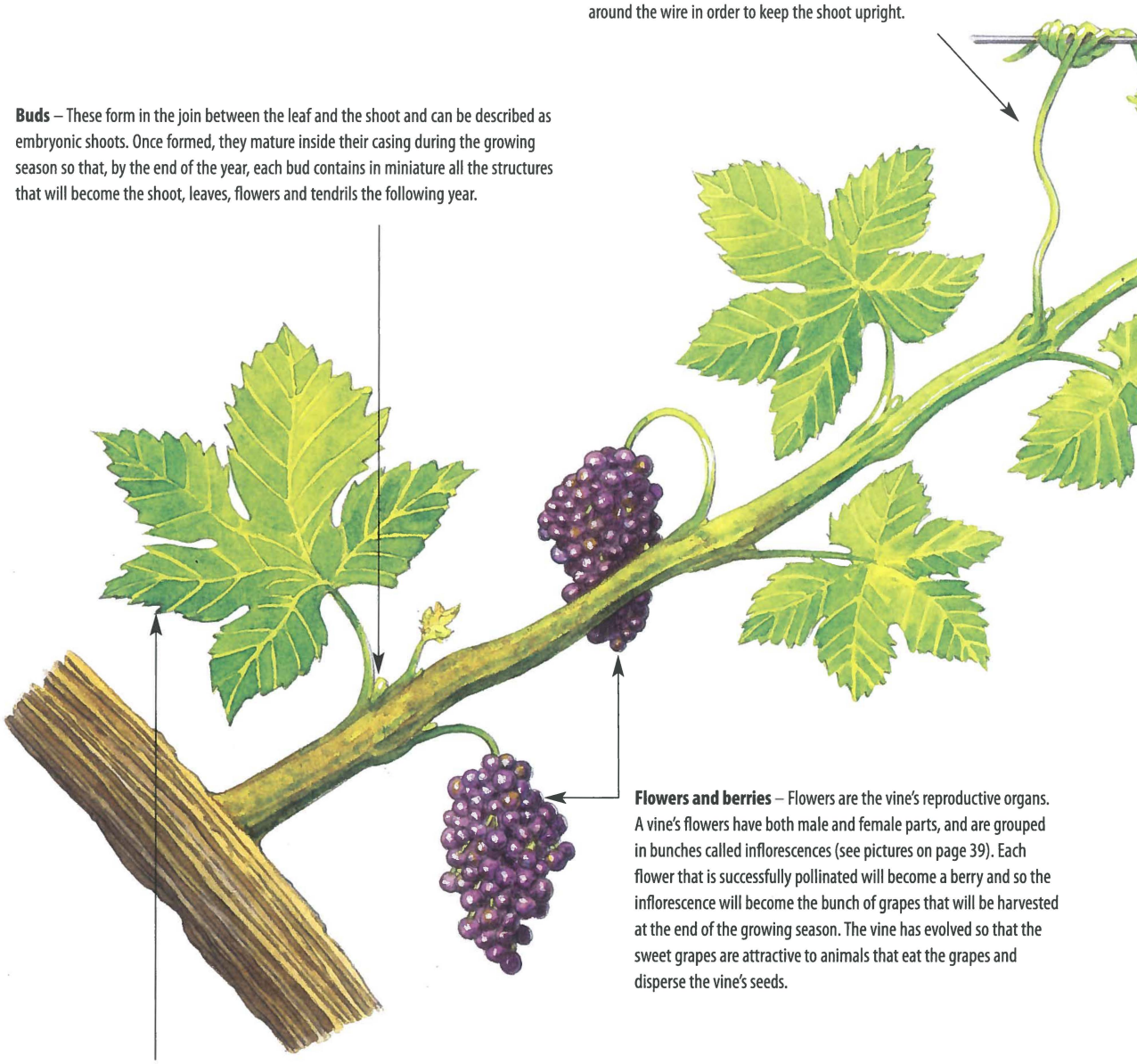
All vines have a similar structure. These can be divided into four sections: the green parts of the vine, one-year-old wood, permanent wood and the roots.

The Green Parts of the Vine

These are the parts of the vine that grow each new year. The principal structure is a shoot, which is illustrated below. Along the length of each shoot there are leaves, buds, tendrils and flowers or berries.

Tendrils – Vines are not able to support themselves, so they use tendrils to grip a supporting structure in order to stay upright. Once a tendril senses that it has touched a structure, such as a trellis wire, it will wind itself tightly around the wire in order to keep the shoot upright.

Buds – These form in the join between the leaf and the shoot and can be described as embryonic shoots. Once formed, they mature inside their casing during the growing season so that, by the end of the year, each bud contains in miniature all the structures that will become the shoot, leaves, flowers and tendrils the following year.



Flowers and berries – Flowers are the vine's reproductive organs. A vine's flowers have both male and female parts, and are grouped in bunches called inflorescences (see pictures on page 39). Each flower that is successfully pollinated will become a berry and so the inflorescence will become the bunch of grapes that will be harvested at the end of the growing season. The vine has evolved so that the sweet grapes are attractive to animals that eat the grapes and disperse the vine's seeds.

Leaves – These are the plant's engine. They are principally responsible for photosynthesis, which is the process by which plants use sunlight to convert water and carbon dioxide into glucose and oxygen. Glucose is a sugar that is used to support vine growth and make ripe grapes taste sweet.

One-year-old Wood

Shoots turn woody during the winter after they have grown. The following spring, they become one-year-old wood, and the buds that formed on them the previous year burst and grow into shoots. Managing the one-year-old wood is vital for the grape grower because vines will normally only produce fruit on shoots that grow from buds that developed the previous year. Every winter the vine is pruned and the one-year-old wood will either be called a cane or a spur depending on how many buds it is left with. A cane is long, with eight to 20 buds, whereas a spur is short and has only two to three buds. This is discussed further in the section *Vine Pruning* in Chapter 6.

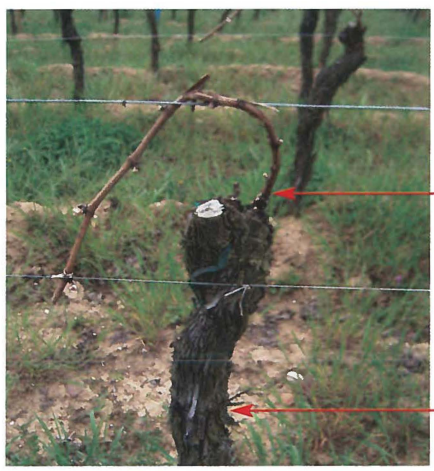
Permanent Wood

This is wood that is more than one year old. In the vineyard the amount of permanent wood is restricted by pruning. The permanent wood is made up of the trunk and, where present, the arms of the vine. Not every vine has the same configuration of permanent wood. This is discussed further in the section *Vine Training* in Chapter 6.

The Roots

Their function is to absorb water and nutrients from the soil, anchor the vine and store carbohydrates to allow the vine to survive the winter. In modern vineyards most *V. vinifera* are grafted onto root systems from other species because they cannot resist *Phylloxera*. See section *Phylloxera and Rootstocks* on page 22.

A spur-pruned vine in Spain.
One-year-old wood:
spur
Permanent wood:
arm
trunk



A cane-pruned vine in Alsace, France.
One-year-old wood:
cane
Permanent wood:
trunk

A spur-pruned vine in Australia.
One-year-old wood:
spur
Permanent wood:
arm (cordon)
trunk

the case. There is no way of knowing what qualities a new variety will have.

Creating a new grape variety for commercial use is therefore a very costly and time-consuming process, because hundreds of seeds are required. Many seedlings fail in the first year and the producer must wait at least two or three years before those that survive flower and produce grapes. It takes even longer to demonstrate the long-term value of the variety and whether it should be grown and sold commercially. These difficulties explain why only a small number of new grape varieties bred in the last 150 years have found a successful niche in the vineyards of the world.

Crossings

When a new variety is produced from two parents of the same species it is called a crossing. This term is most commonly used when talking about *V. vinifera*, although crossings of American vines exist too. Technically every grape variety used today is a crossing. For example, modern DNA techniques have shown that Cabernet Sauvignon is a crossing of Cabernet Franc and Sauvignon Blanc. However, this term is more normally reserved for new varieties that were bred by researchers. Müller Thurgau (Riesling × Madeleine Royale) and Pinotage (Pinot Noir × Cinsault) are well-known examples.

Hybrids

For grape growers, a hybrid is a vine whose parents come from two different vine species. Typically hybrids will have at least one American vine as a parent.

As mentioned earlier, the grapes from American vines are rarely used in winemaking. This is true of their hybrids too, although there are some notable exceptions such as Vidal which is grown in Canada. Nevertheless, hybrids and American vine crossings have a crucial role in modern grape growing: they are used throughout the world as rootstocks.

PHYLLOXERA AND ROOTSTOCKS

Phylloxera

Phylloxera is an insect that is native to North America and *V. vinifera* is unable to defend itself against this pest. Consequently it was able to cause the wholesale destruction to the vineyards of Europe when it was accidentally introduced in the nineteenth century. *Phylloxera* has a very complex life cycle, taking different forms throughout the year. During one phase it lives underground and feeds on the roots of the vine. Infections enter through the feeding wounds and over the course of a few years the vine is weakened and ultimately dies. American vines, which evolved with *Phylloxera*, are able to inhibit the underground louse by clogging its mouth with a sticky sap. They also form protective layers behind the feeding wound preventing secondary infections. *Phylloxera* is now a problem in nearly every vineyard area of the world. There are some exceptions such as Chile, some parts of Argentina and South Australia. Strict quarantine procedures are the only protection against infection.

Rootstocks

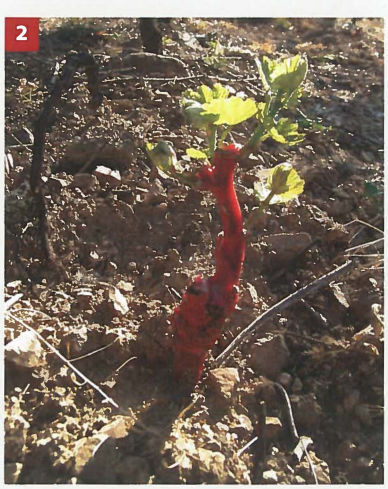
Phylloxera cannot be controlled with chemicals and when it struck Europe in the late nineteenth century the only certain way of dealing with it was to plant American species or hybrids. By the end of the nineteenth century a better, if more expensive, solution was found. *V. vinifera* could be grafted onto the rootstock of an American vine or hybrid. This offered the protection of the American vine and the flavour of the European vine.

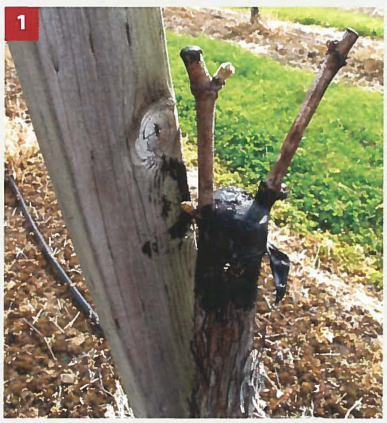
Since this initial discovery, it has been found that rootstocks can provide many other advantages besides resistance to *Phylloxera*, and a large number of hybrids have been bred accordingly. For example, specific rootstocks can be used to protect against nematodes (see section *Managing Vineyard Pests and Diseases* in Chapter 6) and provide better resistance to drought conditions. Consequently, rootstocks are often used in

BENCH GRAFTING

1. A new graft. The section at the top is *V. vinifera*, and the bud that will form the new plant is clearly visible.

2. A newly planted bench-grafted vine. The red wax is used to protect the join between the two sections of cane.





HEAD GRAFTING

1. A head-grafted vine in the spring after the grafting. The two canes are held secure with tape, which, in this instance, has been covered with pruning paint to protect the wound.

2. A well-established head graft.

parts of the world where *Phylloxera* is not a problem, despite the extra cost involved in buying grafted vines.

Grafting

Grafting is the technique used to join a rootstock to a *V. vinifera* variety. The most popular modern technique is bench grafting; an automated process that is carried out by specialist plant nurseries. Short sections of cane from both the *V. vinifera* variety and the rootstock variety are joined together by machine and stored in a warm environment in order to encourage the two parts to fuse together. Once this happens the vine can be planted.

There is another form of grafting called head grafting, which is used if a grape grower with an established vineyard decides to switch to a different grape variety between seasons. The existing vine is cut back to its trunk and a bud or cutting of the new variety is grafted onto the trunk. If the graft is successful the vine will produce the fruit of the new variety at the next vintage. It takes a newly planted vine a minimum of three years to be able to produce a commercial crop, but this technique can allow the grower to adjust quickly to changes in market demand. It is also considerably cheaper than replanting the whole vineyard and the new variety starts life with an established root system.