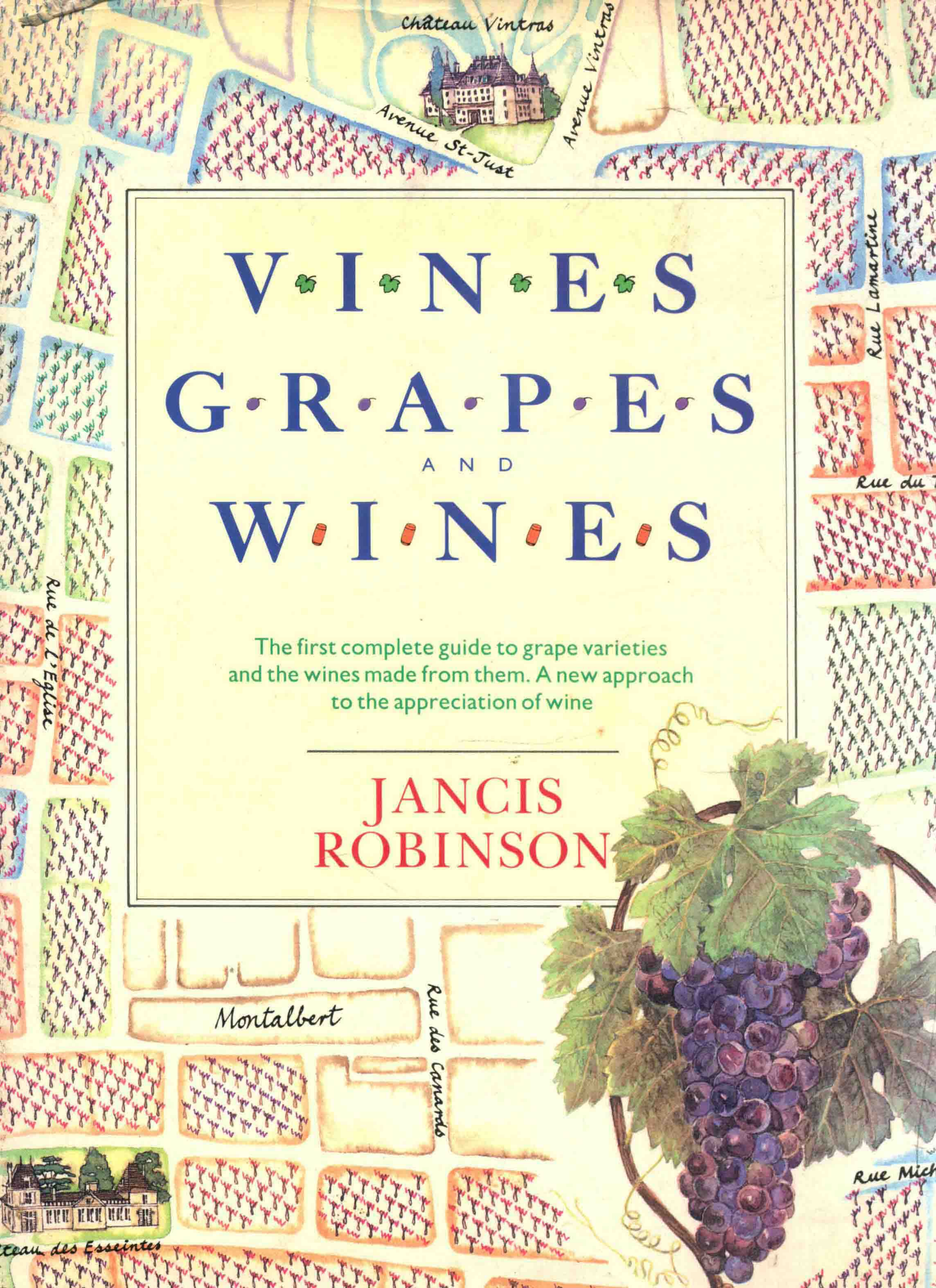

VINES GRAPES AND WINES

The first complete guide to grape varieties and the wines made from them. A new approach to the appreciation of wine

JANCIS ROBINSON

Vines, Grapes and Wines

Jancis Robinson

Alfred A. Knopf New York 1986

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For W.I.L.

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Introduction

Over the last 10 years the world's wine drinkers have been rapidly conditioned to what might be called varietal worship: respect for those wines labelled with the name of the principal grape variety from which they were made. No sooner were wine lovers in America and Australia clamouring for domestic Cabernet Sauvignon and Chardonnay, than much of the eastern European vineyard began to supply cheap versions of such grapes, the Italians smartly stepped into the international marketplace with their varietal offerings, and even the French started to slip jargon as novel as Pinot Noir and Chardonnay on to their labels to give them greater appeal to the new, variety-conscious breed of wine consumer.

Yet remarkably little has been done to explain the magical world of vine varieties to the wine drinker.

A wine's varietal make-up is crucial, a far more important influence on its flavour and character than geological wrinkle, accident of climate or craft in the cellar. The grape alone determines perhaps 90 percent of the flavour of a wine, and shapes its character by regulating the intensity, weight, acidity, longevity and potential.

It is extraordinary how little the average wine drinker, even the sophisticated one, has been able to penetrate the jungle of thousands of vine varieties. He and increasingly she may be vaguely familiar with the handful of "international" classics grown and sold from Seattle to the South Island, but that is fewer even than the nine included in this book's Classic Varieties section. The fascinating mesh of interrelationships between them and the Major Varieties that follow is a potentially revealing aspect of connoisseurship which has remained uncharted in all but the most arcane literature. And the intricacies of the distribution and often inspiring characters of the 1,000 or so further varieties described in this volume represent *terra incognita* to most of the world's most enthusiastic wine lovers.

The importance and relevance of this subject matter have been recognized and some noble attempts made to cover it, though rarely with any degree of detail. The most admirably thorough work in recent years has been Professor Pierre Galet's four-tome ampelographical work *Cépages et Vignobles de France*, published in the fifties and sixties. Even Lucie T. Morton's excellent American adaptation leaves it skewered awkwardly on a Franco-American axis with little coverage of such rich vine territories as Italy and Iberia, however.

The last major truly international work on vine varieties was published in French in 1909. Written by another Montpellier-trained viticulturist Pierre Viala (now honoured by an eponymous *Place* in Montpellier) with a colleague, Victor Vermorel, this seven-volume *Traité Général d'Ampélographie* is awe-inspiring in its scope and usefulness even today. *Vines, Grapes and Wines* is an attempt at a concise and updated version of Viala. This is the first time, to the author's knowledge at least, that a comprehensive international survey of vine varieties has been undertaken in English. It is designed specifically not for vine growers but for the wine drinker who wants to understand more about why the wines made today taste the way they do, and who wants to study just how the world's wine production is shaped by some often fairly random events and questionable decisions.

The primary aim of this book is to describe how the wine made by each grape variety tastes, why, where it is grown and how this influences that taste. The secondary aim is to allow the wine drinker to analyse and assess the varietal make-up of the world's vineyards.

THE NEED FOR A VARIETAL APPROACH

This systematic inspection of the vine types grown internationally has thrown up a worryingly high number of varieties capable of producing good-quality wines with real character which have effectively become endangered species. This applies particularly to some of the more traditional varieties of Portugal, Spain and Italy – just a few obvious examples being Arinto, Touriga Nacional, Alvarinho, Aglianico, Barbarossa, Greco – though the phenomenon is apparent in wine regions as dissimilar as Somló in Hungary, the Cape and even the Médoc. Now that the principles of selecting good plant material including, especially, clonal selection are well understood, there is an urgent need for a review and possible revival of many of these varieties before their one or two viticultural inconveniences consign them to extinction.

Another factor is probably that the earthily traditional varieties, even the top-quality ones such as Malvasia and Vermentino, tend to be in the hands of those least equipped to transform them into clean, stable, top-quality wine. Perhaps greater familiarity with such varieties on the part of the cosmopolitan wine drinker will help the better examples more firmly to stamp their identity and establish a market and, therefore, long-term future.

The increased awareness of, some might say obsession with, grape varieties in the newer wine regions has had interesting effects on winemakers as well as wine drinkers. The fortunes of the proudly traditional vignerons of Gascony, for instance, have taken a distinct turn for the better since someone drew their attention to the fact that the Californians were doing rather clever things with their brandy variety Colombard, which transformed it into extremely appetizing table wine. The eventual result has been the very toothsome Colombard Vin de Pays de Côtes de Gascogne.

By looking in more detail at the grape varieties available to the modern winemaker, and how they respond to different conditions and treatments throughout the world,

the wine drinker will be able to understand better not only what *is* offered, but also what should and could be offered. Vine growers are extremely conservative, as one might expect of farmers who have to invest in a crop for 30 years at a stretch. (This is one area in which the larger wine companies, able to formulate long-term strategy and take the concomitant risks on a corporate basis, are much better placed than the individual vine farmer.) With greater understanding of the varieties available, it will be seen that the wines currently vaunted on the international market represent a tiny fraction of the exciting possibilities ahead.

HOW THE BOOK WORKS

The map section at the beginning of this book is self-explanatory; the categorization of specific grape varieties that follows is not. It starts with a detailed study of nine Classic vine varieties, chosen for such distinction on the basis of their quantitative as well as qualitative importance. Each of these vine types is fairly widely distributed across the wine world, and is capable of producing truly great wine, even if, as in the case of Chenin Blanc, the great majority of its produce is much more ordinary.

After this come the Major varieties, which include the most important members of the multifarious Muscat family, chosen because they are associated with the best-known names on the international wine market. Viognier is perhaps the most contentious member of this group, but has been included because of the stature of Condrieu and Château-Grillet.

The principal name chosen for any variety in this book traces it back as closely as possible to its origins. Thus references to the Grenache of the Midi and Provence will be found under Garnacha; the Muscadet grape is called Melon de Bourgogne; and the Ugni Blanc now so quantitatively important to the French *vignoble* is doggedly referred to as Trebbiano to underline its provenance. Galet's principal names and spellings have been followed for French varieties and authorities of similar standing have been sought for other countries.

The rest of the vine types are divided into red-wine and white-wine varieties, because this is a guide for wine drinkers rather than grape spotters. This means that dark grape varieties such as Gewürztraminer, Schönburger and some of the Muscats which are habitually used to produce white wine are listed in the "white" section. The red-fleshed Teinturiers are clearly marked as such and rated "dark". Of course, different-hued mutations are known for almost every grape variety. That elusive plant true Pinot is notorious in this respect, as is Veltliner. It is quite possible to find grapes which should technically be classified "light", "dark" and "grey" on the same plant or even, in some cases, on the same bunch.

Where a different coloured mutation has established a discernible identity and considerable influence for itself, such as Garnacha Blanca, Pinot Blanc and Merlot Blanc, separate entries can be found in the appropriate section.

These red and white sections of Other vine types are split into obvious geographical divisions. Each variety is listed under that region or country which currently has the greatest area planted with it. And, within each combination of colour and country or region, the varieties are listed in decreasing order of quantitative importance wherever this is documented. Macabeo, for instance, appears under Spain because Spanish plantings outnumber French hectares planted with it by seven to one, and it is listed second under Spanish white varieties because Airén is the only other white variety to cover a greater area of Spanish vineyard land. All of these statistical decisions are only as good as the statistics on which they are based, of course, and every effort has been made to use the most recent available. This means as long ago as 1979 in the case of most of France, unfortunately, but even the now rather dated official agricultural census is a sterling feat of precision compared to most of the Mediterranean countries and Portugal, which few vineyard statisticians appear to have visited for several decades.

SOME RELATIONSHIPS – FACTS AND FALLACIES

This lack of familiarity with some of the world's most ramified national groupings of vine varieties has led to widespread acceptance of many an error. Ampelography, the science of vine description, has only recently been refined and codified, notably by Galet, to make identification internationally possible. The leaves and shoots, being that part of the vine available for study for the longest period of the year, either growing or dried in the winter, are chosen as the most useful raw material for a series of very detailed measurements. When taken together with the all-important hairiness of the growing tip, shoot tip and eventual leaf, the systematic description of shoot, cane, buds, flowers, cluster, berries and seeds makes up the equivalent of a fingerprint for each vine variety.

Thus an experienced ampelographer can tell when a "Cabernet Franc" is really a Merlot, as is often the case in California; when Western Australia's "Sémillon" and a Victorian plantation of "Chardonnay" are in fact Chenin Blanc, as the invited French ampelographer Paul Truel found in 1976; and when two grape varieties popularly held to be related, as Chardonnay and Pinot Noir were for so long, are not.

Portugal and Spain are perhaps richest in disproved hypotheses of vine relationships, many of them backed up by very pretty historical fable. Contrary to accepted folklore, no ampelographical connection can be found between Riesling and Sercial (Cerceal), Arinto or Pedro Ximénez, for instance. There are no Pinot Noir genes in any known Douro variety, and the German red Portugieser appears unrelated to any Portuguese vine, though a tiny parcel of Portugieser cuttings is now cultivated in the Douro for observation purposes.

Another obvious example of common misapprehension is the supposition that the Limberger of Austria, often known as Blaufränkisch in German-speaking countries, Kékfrankos in Hungary and other Slav variations on that

"blue French" theme in eastern Europe, is related to or identical with Gamay. The Beaujolais grape is, in fact, very unusual among those associated with internationally famous wines in that it is hardly found outside its native region – and not at all outside its native country, despite the California habit of using its name so liberally for a pair of quite unrelated (though admittedly French) varieties.

The value clearly attached to certain vine names in some areas has exacerbated initial confusion. Pinot is an obvious example, its name being applied liberally not only to the Pinots Blanc and Gris related to Pinot Noir, but also erroneously to Chardonnay and the likes of Pineau d'Aunis, Pineau de la Loire (Chenin Blanc) and Pinot de Romans (Durif). The same is true in Italy of Malvasia, often used in synonyms of varieties quite unrelated to the great Greek original. In France, too, there are several Malvoisies with genealogical connections closer to, for example, Pinot Gris than Malvasia. Auxerrois meanwhile is the name of the Alsace partner of Pinot Blanc as well as the Cahors synonym for Malbec and therefore just as confusing, though compared with Italy, France's vine nomenclature looks a model of clarity.

All sorts of fascinating facts, interesting anomalies and intriguing mysteries are spotlit when the vine world rather than the wine world is studied. Few of the world's wine drinkers, for instance, would guess that the vine variety covering the largest vineyard area by far is the white Airén of La Mancha. Nor would many realize that the robust Bastardo of Portugal, the Trousseau of the Jura and California's Gray Riesling are so closely related.

Examination of the viticultural characteristics of each variety raises further questions about their geographical distribution. The late-ripening Chenin Blanc seems a perverse choice for a region as northerly as the Loire, while the astringent Carignan, particularly the poor clones of Carignan so commonly planted throughout the Midi, seems with hindsight to have been a questionable variety to promulgate in a region which can only afford to make early-maturing wines. In Italy, Verdicchio is extraordinarily well entrenched on the east coast, covering perhaps three times the area of France's total plantings of Cabernet Sauvignon; yet it yields so grudgingly that the objective observer is forced to wonder at its popularity.

By now most possible genealogical links between the world's known vine varieties have been established, but there remain some enigmatic areas, notably around the ampelographically uncharted eastern Mediterranean. It is well known that many Italian varieties, indeed many of the better Italian varieties, are Greek in origin. It could be extremely useful to Greek vineyards, which have an uncertain future, to establish, for instance, which of the vines they currently nurture are Aglianico and Grechetto. And absolute proof is needed for the attractive and just about convincing theory that the Ribolla of Friuli is the Rebula of Yugoslavia is the Robola of the Greek island of Cephalonia. Could Portugal's Rabo de Ovelho be Hungary's Juhfark? The names have the same literal translation; the vines and resultant wines seem very similar; there are cultural links between the two countries. Could Viognier, the mystery vine of the northern Rhône, be related to the eponymous vine of the Dalmatian island of Vugava? Why did the South Americans latch so enthusiastically on to the Torrontes of Galicia from among the thousands of Spanish vine types available to them? Perhaps this book will promote an interest and exchange of information so that a future edition could answer all these questions.

THE VINE FAMILY

Only the *Vitis* genus of plants, belonging to the *Ampelidaceae* family, is of relevance to wine drinkers, even though four of the other nine genera of *Ampelidaceae* yield grapes of a sort. This table shows how the best-known of the different species of the *Vitis* genus, or vine family, are classified.

SUB-GENUS *EUVITES*

American Species

Temperate Regions: Eastern zone	
Vitis labrusca	*Vitis aestivalis*
Vitis lincecunici	*Vitis bicolor*
Temperate Regions: Central zone	
Vitis riparia	*Vitis rupestris*
Vitis rubra	*Vitis monticola*
Vitis berlandieri	*Vitis cordifolia*
Vitis candicans	*Vitis cinerea*
Temperate Regions: Western zone	
Vitis Californica	*Vitis Arizonica*
Torrid Regions: Florida and the Bahamas	
Vitis coriacea	*Vitis gigas*
Torrid Regions: Tropical and Equatorial zones	
Vitis Bourgoeana	*Vitis Caribaea*

Eastern Asian Species (incomplete)

Temperate Regions	
Vitis amurensis	(Japan, Mongolia, Sakhalin Is.)
Vitis coignetiae	(Japan, Sakhalin Is., Korea)
Vitis Thunbergii	(Japan, Korea, Formosa, Southwest China)
Vitis flexuosa	(Korea, Japan, India, Nepal, Cochin-China)
Vitis Romaneti	(China)
Vitis Piasezkii	(China)
Vitis armata	(China)
Vitis Wilsonae	(China)
Vitis rutilans	(China)
Vitis Pagnucii	(China)
Vitis pentagona	(China)
Vitis Romanetia	(China)
Vitis Davidii	(China)
Sub-Tropical Regions	
Vitis Retordi	(Tonkin)
Vitis Balansaeana	(Tonkin)
Vitis lanata	(India, Nepal, Dekkan, Southern China, Burma)
Vitis pedicellata	(Himalayan Mountains)

European and East and Central Asian Species

Vitis vinifera

SUB-GENUS *MUSCADINIAE*

North American Species

Vitis rotundifolia
Vitis Munsoniana
Vitis Popenoei

Furthermore, remarkably few of the 40-odd species of that *Vitis* genus, divided by botanists into the *Euvites* and *Muscadiniae* subgenera, yield grapes worth turning into wine. Indeed, one species alone, *Vitis vinifera*, the only one native to Europe and Central Asia, is responsible for 99.998 percent of the world's wine production.

There are other species of some relevance to the wine drinker, either as rootstocks, progenitors of hybrids or as direct producers of wine in their own right:

Vitis amurensis Named after the Amur river which forms the Sino-Siberian frontier, this species is notable for its resistance to cold, as one might expect. The Russians and now the Germans are experimenting with hybrids of *amurensis* and *vinifera*. Although officially barred from using them for quality wine production in Germany, Professor Helmut Becker of Geisenheim is delighted with their performance in trials, and they could be of great use in England and New Zealand.

Vitis labrusca Edward Hyams postulates that this native of New England and Canada was the vine spotted in his "Vinland" by Leif Ericsson in 1001. It was certainly the first American vine to be identified, in 1763, and has the dubious privilege of being suspected of bringing phylloxera to Europe in the nineteenth century. In fact, its phylloxera resistance is not reckoned high enough to make it useful as a rootstock in Europe and it is known to wine drinkers chiefly in all-*labrusca* varieties such as the Concord of New York State and Isabella of the USSR and Madeira, or as a parent of hybrids such as Baco Blanc, Catawba and Delaware. The wines it and most of its hybrids produce are notorious for their overpowering "foxy" flavour.

Vitis riparia The "river bank" species is another American vine but notable for its resistance to phylloxera and, therefore, much used for breeding phylloxera-resistant rootstocks. It and its hybrid descendants such as Baco Noir ripen extremely early so are useful in cold climates.

Vitis rupestris This is one of the few species whose name appears in a varietal name, Rupestris St George or Rupestris du Lot, its most famous incarnation, for it is of importance almost solely as a rootstock.

Vitis berlandieri This American vine has good resistance to both phylloxera and lime chlorosis and only its difficulties in rooting have stopped it directly playing a role as *vinifera* rootstock. It has to be hybridized instead.

Vitis aestivalis Quite a number of hybrids, with *labrusca* and *rupestris* chiefly, have been successful, mainly because of the good disease resistance and high yield of *aestivalis*. It is not sufficiently resistant to phylloxera to yield good rootstock material on its own.

Vitis cinerea This native of the American Midwest and southern states is encountered as progenitor of Black Spanish and Herbemont (now eliminated from French vineyards), bred from *aestivalis-cinerea-vinifera*.

Vitis rotundifolia is the species to which Scuppernong belongs; it is one of the few Muscadine vines, all of them native to the Gulf of Mexico, which is grown commercially.

Others occasionally involved, however obliquely, with winemaking are *Vitis candicans* and *Vitis monticola*.

THE SPREAD OF VITIS VINIFERA

Vitis vinifera is distinguished by having in general much smaller berries, thicker shoots and more deeply indented leaves, usually orbicular, than the American wild vines, most of whose varieties are capable of producing only dark berries.

This European wine-producing species of vine evolved from the primitive *labrusca*-like wild vines long before even man evolved from less sophisticated mammals. It is still possible to find wild vines that are at different points between these two stages in evolution. The Leningrad botanist A. M. Negrul was able to deduce from his observations of such plants around the Black Sea in the thirties that *Vitis vinifera* evolved from the vines of eastern Asia and that, therefore, all *vinifera* varieties have some eastern genes lurking in their make-up.

Like man, the vine – and *Vitis vinifera* in particular – has a remarkable ability to adapt itself to the conditions in which it finds itself. More than most other sorts of fruit, *vinifera* vines are very heterozygous, which means that their genes, already numerous, can be dealt and recombined as easily as if they were a pack of cards.

Unlike wild vines which would naturally be a mixture of fruitless males and irregularly fecund females, *Vitis vinifera* has evolved as a reliably fruitful hermaphrodite. This means that it can propagate itself vegetatively rather than sexually, and bud mutation, resulting in new clones and new varieties, is very common. In addition, some varieties such as Pinot are particularly easily mutable. The number of genes, together with the ease with which they can be permutated and the wide variety of different conditions in which the *vinifera* vine has been asked to thrive, help to explain why there are quite so many different varieties of *vinifera* and why wine is so fascinatingly varied.

Varieties as such had already been identified by the ancient Greeks. The Romans were able to distinguish and name several, some of which we can still enjoy today in one of our most direct links with the past. In support of Negrul's work, some of the varieties known to the Romans were specifically Asian, and are still grown in China. See pages 20–21 for more on the evolution and distribution of wine grape varieties in the last two millennia.

The botanical jumble of early history was gradually transformed into an ordered selection of vine types, usually suited to their particular environment. If, like everything else, grape varieties are the product of natural evolution, they still fail to take on relevant identity until we take notice of them and give them a name. Our forefathers did not suddenly discover Pinot Noir. It slowly developed a recognizable identity and that identity was eventually recognized and distinguished with a name.

The authors of *General Viticulture*, the most recent bible on the subject and a product of the University of California at Davis, suggest that as many as 8,000 different grape varieties may have been named and described at some point, although this includes wild varieties as well as all those ever used for table grape and raisin production. They

qualify this daunting number by pointing out that only "about 20 percent of them may be growing somewhere in vineyards, gardens, and variety collections". The 1,000 vine varieties described in this book are believed to constitute all those relevant to the wine drinker today.

It is quite clear that, while some varieties have evolved by adaptation and mutation, others have been lost forever by a combination of natural selection and man's insouciance. And it is probably true, too, that a certain proportion of the world's vine growers simply do not know exactly which grape varieties, often bizarrely assorted, are growing in their vineyards.

PHYLLOXERA VASTATRIX – THE SECOND COMING?

Even before a vine can metaphorically set down its roots in this brief introduction, the great vine blight of the last century must be considered. Like any other plant, the vine is prey to all sorts of insects. There is the grape berry moth, the grape leaf hopper, the grape rust mite, grape mealy bug, grape blossom midge, and that couple who sound straight out of a tragic opera, cochylis and eudemis. But far worse than any of these is phylloxera, which has been more far-reaching and long term in its effects than any other agricultural disaster.

Following closely on the heels of the eclipsing oidium, the fungus disease that ravaged the vineyards of Europe in the mid-nineteenth century, the phylloxera insect reached France in 1860. Until then phylloxera had been confined to the eastern United States, and *vinifera* vines, unlike American vines which had presumably been exposed to it for centuries, had developed no resistance to it whatsoever. (This probably explains the failure of those such as Thomas Jefferson who had tried to plant ungrafted *vinifera* vines in the eastern United States.) Phylloxera, like oidium, was first observed in Britain, almost certainly borne to Hammersmith and to Europe's vineyards via botanical specimens. The Victorians were avid collectors and classifiers of nature and there was much international traffic in plant material, blithely unhindered by quarantine requirements.

Phylloxera had a wonderful European *grande bouffe*, munching its way through *vinifera* roots and injecting a poisonous saliva into them. Whole vineyard areas were gradually destroyed and, thanks to the international trade in *vinifera* vine cuttings, phylloxera eventually blighted wine production all over Europe, in South Africa, Australia, New Zealand and even California – by then planted with *vinifera* – by the turn of the century.

To this day, the only known effective control of phylloxera's fatal predations on vine roots (although there are treatments suitable for leaf galls) is to graft cuttings of *vinifera* on to phylloxera-resistant rootstocks. This is common practice in all of Europe except where the soil is protected by sand, a medium apparently impenetrable by phylloxera. In many of the newer wine regions, however, grafting is far from *de rigueur*, being much more expensive than just taking a chance, and this sort of vineyard Russian roulette has had perhaps predictably worrying results.

Infestations of phylloxera have recently been identified, so far on a limited scale only, in California, New Zealand and even England. And Australian vineyards, worryingly, are still 90 percent ungrafted. Phylloxera spreads not only through the soil but also on vineyard tools and machinery (mechanical harvesters posing a new threat), by foot and, in the winged stage of its complex 18-stage life cycle, by flying through the air. Dangerous indeed for the wine industry's future.

Since some rootstocks condemned in one part of the world as being insufficiently resistant perform perfectly well in another, it is possible that there are different biotypes of phylloxera. This seems even more depressing, although some *vinifera* vines appear to have a certain natural resistance. Perfectly healthy phylloxera-infested Monastrell was spotted in Spain in 1984, for instance. It is worth pointing out that it is rarely phylloxera alone that kills a vine, but rather the diseases, notably fan-leaf virus, which usually attack a plant weakened by phylloxera.

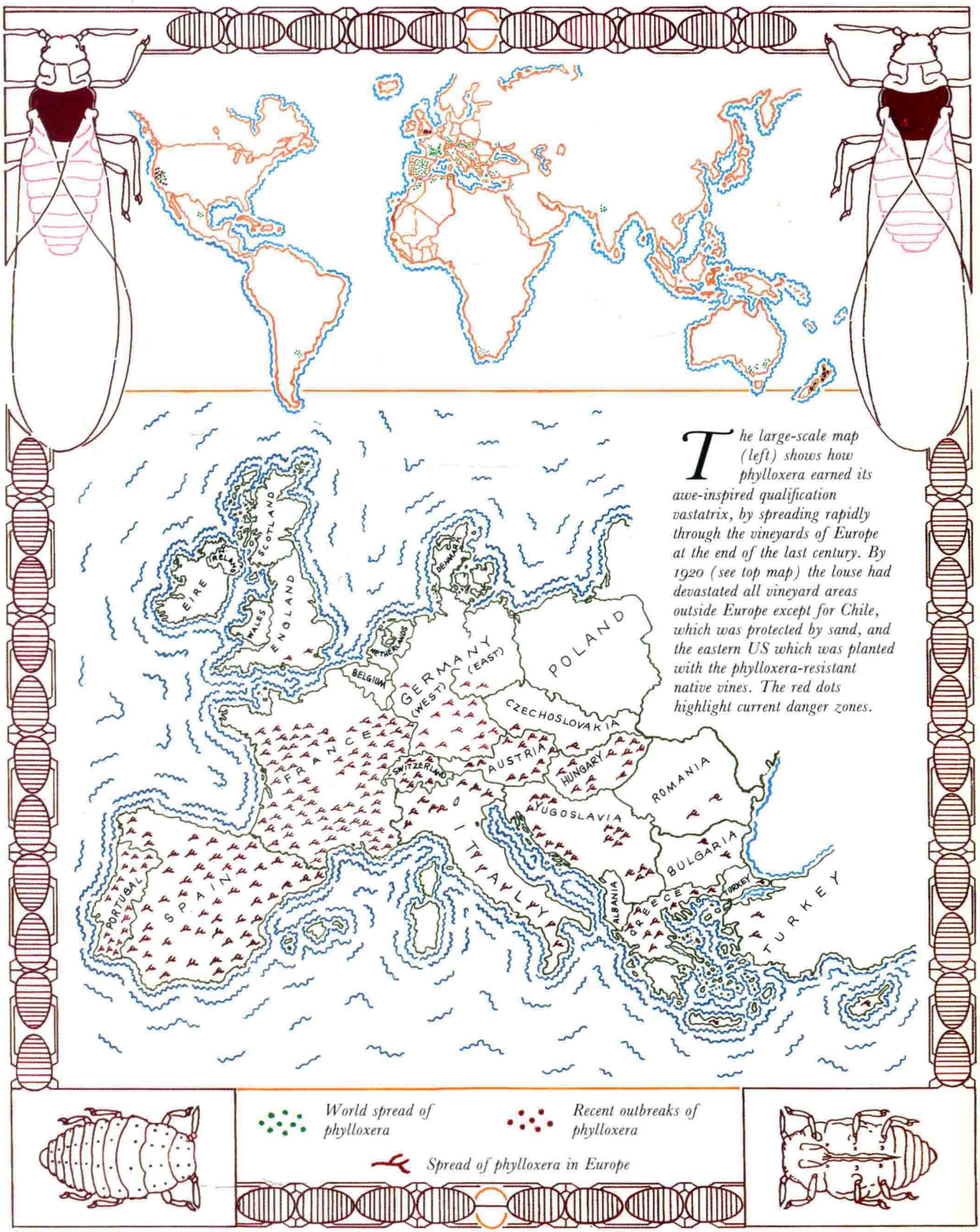
VINE HEALTH AND VIRUSES

It is heart-breaking for the lover of wine to observe how poor is the health of much of the plant material used to create such a dramatic increase in wine production in the newer wine regions. South Africa, California, Australia and New Zealand – probably in that order of gravity – each has a major crisis of confidence in the quality of the vines planted with such enthusiasm over the past two decades. Superb technical conversion of substandard fruit into wine is the happy norm in all these countries.

The most common problem in each of these countries has been some sort of virus infection. Fan-leaf or *court-noué* and leaf roll are the two most common forms, though several others are well-known in specific areas of Europe. Shoot necrosis is the scourge of Apulia for instance, and it can be traced to a single vine, such is its virulence. Quite apart from making the afflicted vines produce fewer grapes of poorer quality and taking years off their productive life, viruses can also ruin a vineyard for future vine plantings unless it is fumigated. There is no practical cure for virus diseases; prophylaxis in the form of using only virus-free plant material for both cuttings and rootstocks is the only measure available.

The Californians at Davis have been the most convinced of the need for antivirus treatments of vines and have developed a bank of more than 200 varieties of certified "clean" budwood and rootstock. They instituted a programme of developing plants from cuttings found to be free of all known viruses, and have in many cases subjected them to heat treatments in an effort to eliminate any viruses so far unrecognized. These are despatched to customers all over the world and it is, therefore, easy to see how vital it is that they should be genuinely healthy, and correctly identified.

Of course, this is just one step towards vine health. All



The large-scale map (left) shows how phylloxera earned its awe-inspired qualification vastatrix, by spreading rapidly through the vineyards of Europe at the end of the last century. By 1920 (see top map) the louse had devastated all vineyard areas outside Europe except for Chile, which was protected by sand, and the eastern US which was planted with the phylloxera-resistant native vines. The red dots highlight current danger zones.

sorts of other non-virus diseases, such as Pierce's disease, affect vines even before they are planted, as well as the host of fungus diseases and physical disorders which can attack an established vineyard.

Many believe that careful clonal selection (see below) can be demonstrated to work and is far more valuable than trying to keep one step ahead of the development of vine viruses. They feel that antivirus treatments can never offer a guarantee and may even be a waste of time. The Davis heat-treaters have already found that some of the clones used in their virus-free programme were not particularly good quality.

In countries as isolated as Australia and New Zealand quarantines are imposed on imported vine cuttings, as on any other imported plant material, which are perhaps over-stringent. They are certainly a cause of enormous frustration to the domestic winemakers trying to keep pace with consumer demand for "exotic" varietals such as Chardonnay and Sauvignon Blanc.

THE RIGHT CLONES

The importance of clonal selection is now almost universally recognized. The Germans were the most effective pioneers. California has at last acknowledged the concept, has already made progress with its Chardonnay and Trebbiano material and is hard at work on Cabernet Sauvignon. Even Bordeaux has its individual proponents of this method of breeding only from carefully selected plants (the selection apparently being most effective by simple observation rather than by complicated measurement). By 1981, nearly 3,000 registered vine clones were available, mainly from France, Italy, Germany, South Africa, Czechoslovakia, Switzerland and Austria.

Of course, a programme of clonal selection is only as good as the basis on which the selection is made. Bordeaux and Burgundy can each, sadly, provide examples of unsatisfactory selection procedures. As discussed on page 81 many Burgundian growers have chosen to plant clones designed for high yields alone, with scant regard for concomitant poor quality. Meanwhile, between 1970 and 1975 in the wake of the truly rotten 1968 vintage, the Bordelais were officially only allowed to plant a clone of Cabernet Sauvignon specially developed to resist rot but near-impossible to ripen.

The Germans have perhaps demonstrated most ably the success of clonal selection. Their average yield in the mid-fifties was 45 hectolitres per hectare, while that of the mid-seventies was 97 hectolitres per hectare. This is partly because a different pattern of more productive varieties now prevails, but also because individual clones of the old favourites Riesling and Müller-Thurgau have been selected for quantity and, they claim, quality too. If quality is measurable by must weight, no one can gainsay them. The French, of course, still argue officially that this is impossible, indeed contrary to the basic tenets of Appellation Contrôlée regulations which set lower maximum yields for the grander appellations.

While some advantages of clonal selection are obvious, it is important to keep the clonal options open. Too few clones would result in too limited a range of flavours (as has happened in regions dependent on only a few strains of yeast); and there is the scary possibility that a whole vine type could be wiped out by a single disease.

GENETIC ENGINEERING

Using work pioneered at Davis, it now looks possible that plants particularly resistant to specific diseases, pests and environmental disadvantages can be developed much faster than by cumbersome propagation in the nursery. Vine cells are artifically cultured and bombarded with the phenomenon to which resistance is required. The surviving cells are then regenerated to proper plants in this system of "mutant selection".

Yet more sophisticated gene cookery techniques are being developed although grapes, comfortingly to the wine lover, are proving a more intractable raw material than most other plant matter.

NEW VARIETIES FROM OLD

This sort of genetic manipulation could presumably be used, with intriguing results, to breed whole new families of vine varieties. Conventional methods have already yielded a host of useful, and not-so-useful, additions to the vine varietal range. The word "new", of course, is strictly relative. For all we know, half the varieties we call "classic" were bred, or at least selected, by a thoughtful vineyardist. Our knowledge is only as good as the records kept.

It is well-known, for instance, that Müller-Thurgau was bred from a Riesling and a Silvaner vine in 1882. Muscat Ottonel was developed in the Loire in 1852. Louis Bouschet was alreading working on crossing Teinturier du Cher with the local varieties of the Languedoc in the 1830s. Earlier examples of vine-breeding could doubtless be found.

The Germans, again, have been formidable in their work on crossings, bred solely from *Vitis vinifera*, as well as some hybrids in which another species of *Vitis* is involved. The leading exponent of this activity – so frenetic that the Germans ran out of names years ago – is Professor Helmut Becker of Geisenheim. A natural iconoclast, he claims to have developed several crossings and even one or two hybrids (of *vinifera* and *amurensis*) superior in every respect to Riesling. Only legal recognition and consumer education stand in their way. The hybrids are tested in England, still technically an experimental vine region in the eyes of the law, because they are so frowned upon by EEC authorities.

It is true that hybrids with *labrusca* antecedents tend to taste very odd and even offensive to many palates. There is no shortage of examples of hybrids, however, whose only fault is a certain neutrality of flavour but which can be extremely useful because they have inherited worthwhile resistance to, for example, cold weather or phylloxera. Seyval Blanc is a good example.

ROOTSTOCKS

The advent of phylloxera was good news for one group of people – nurserymen. It led to the development of an important industry in supplying suitable resistant rootstocks, though not before a number of mistakes were made. As outlined on page 9, the American species vary considerably in their resistance to phylloxera. *Vitis berlandieri* is particularly good at standing up to the pestilence, but will not root properly, so hybrids of *berlandieri* and *riparia* such as SO4 and 5BB or of *berlandieri* and *rupestris* such as 110 Richter and 99 Richter are particularly popular.

Rootstocks have to be chosen with other factors in mind, however. They must be compatible with the *vinifera* scion and the local combination of soil fertility and climate in their effect on vine vigour. If a vine is too vigorous, too much of its energy may be devoted to growing leaves rather than producing fruit. Over-vigorous rootstocks can lead to poor fruit set and, especially in cooler climates, may make the harvest date dangerously late. In New Zealand's coolish, damp and very fertile volcanic soils, for instance, extremely weak rootstocks are needed. The vigour of a *vinifera* variety can be "adjusted" as appropriate by the use of either a very vigorous or particularly weak rootstock. Particularly vigorous varieties include Sauvignon Blanc, Colombard and Grenache.

Some control of the spread of virus disease is possible with the choice of rootstock, too. Professor Denis Boubals of Bordeaux has graded the commonly used French rootstocks in their resistance to the nematodes in soil which transmit viruses. SO4, 5BB and 99R are among those particularly nematode resistant, while the popular 3309C and, particularly, 41B are very sensitive.

Very dry climates need rootstocks with good drought resistance such as 110R and 140Ru of Sicily.

Careful consideration of soil composition, especially salt content, is also part of rootstock choice. In damp soils with a high proportion of active lime, some varieties suffer seriously from mineral deficiency (especially iron) or chlorosis, unless a very resistant rootstock such as 41B is used.

The most popular rootstocks in France are 110R, SO4 and 41B. In California, Rupestris St George (du Lot), the vigorous rootstock on to which Aramon was traditionally grafted, and Aramon Rupestris Ganzin 1 (AXR1) have been widely promulgated, while 1202 Couderc is widespread in Australia and New Zealand.

SOIL AND VINE VARIETIES

The exact relationship between specific vine varieties and different soil composition is a contentious issue. Calcareous soils, those with a high lime content, are traditionally associated with Chardonnay; the happy combination of Cabernet Sauvignon with gravel is disputed by few who have tasted the Médoc *crus*. Yet there is no scientific proof of a necessary connection between quality and soil composition on a varietal basis. Indeed, there are so many delicious exceptions that they surely *disprove* any posited rule.

Although the geology and resulting soil composition must influence the character of a wine, there seems no demonstrable connection between certain compositions and certain varieties. What seems most important is the unique combination of microclimate and soil *structure* defined by each vineyard. Apparently more important than the exact cocktail of mineral elements represented in the soil is its relationship with a single element – water.

THE VINE AS EFFICIENT WINE PRODUCER

Water is just as important to the ripe grape as to man, constituting between 70 and 85 percent of the whole. It is just one of three inputs, along with sun and soil nutrients, which result in the two outputs of ripe grapes and vegetative matter in the form of leaves and shoots. The secret of transforming a barren vine stump into the most inspiring liquid possible each growing season lies in optimizing the balance between these three elements for each vine variety in each vineyard setting.

As has already been mentioned under rootstocks, the relationship between vegetative matter and fruit is the most crucial. If too many grapes are encouraged to form by lax pruning techniques, there may not be enough vegetative matter to ripen them. If too few grapes set, then there may be so much growth that all of the vine's energy is diverted into leaf production with the same net result: too few ripe grapes. Somewhere in the middle lies the perfect balance for the well-run wine factory that the grower would like every vine to be.

It follows from this that the ideal vine structure varies enormously according to the fertility of the soil, the moisture and the sunshine available to the vine. On very fertile soils, the vine left to its own devices sprouts forth like a jungle and produces only a few, poor-quality grapes. It is much easier to achieve the right balance between the elements on poor soils, as has been found so gratefully by Europeans who need the more fertile land for other crops.

NEW WAYS OF MANIPULATING VINES

The equation can be loaded. Soil nutrients can be added artificially, though fertilizer is expensive. Dry land can be irrigated, either by sprinkler or drip. The effects of sunshine can be regulated to a certain extent by summer pruning or special trellising of shoots thereby producing shade. The amount of vegetative matter produced can even be controlled nowadays by chemical plant-growth regulators. The amount of fruit produced will already have been determined by the winter prune and the flowering, but some very dedicated winemakers even snip off whole bunches during the summer if they think fruit quality is being adversely affected by quantity. And it is not unknown for some varieties to shoot forth a second crop towards the end of a protracted growing season: New Zealand's South Island Pinotage, for example.

There are two more fundamental and interrelated methods of loading the dice: vine density and trellising.