



THE PLUM ON PEACH STOCKS.

Query by Hon. A. M. Brown, Villa Ridge, Ill. Dr. Warder is reported to have said in one of his lectures to his class at Champaign, that the plum should never be budded on the peach, but gave no reason. Is there any objection except the liability of the peach root to the attacks of borers? I know the plum grows with great vigor on the peach root, and I propose to bud a number of trees on seedling peach trees.

We have frequently heard it affirmed, and that too by some of our most intelligent and reliable horticulturists, that the peach is unsuited and should never be employed as a stock, on which to work the plum. It is possible that we may be regarded as being somewhat radical on this stock question. More than one prominent horticultural organization in the West has declared the wild plum the best of all stocks, but, notwithstanding these decisions, after a trial of various stocks, and of the peach extending through a period of more than a quarter of a century, with such special preparations as we shall name, we have come to prefer the peach to any other stock on which to work the plum. And today would not accept as a gift, trees on any other, unless it were well rooted suckers of the same variety as the grafts.

Grafts of the plum worked as most of our horticultural doctors prescribe on the Chickasaw or wild plum, unite freely and grow with moderate vigor both in the nursery and orchard. No sooner, however, do the trees attain to a bearing size than they are liable to several casualties; the most serious of which is the certainty that the trees, whenever they are heavily laden with fruit, being toppled over by the first drenching July or August rain, which happens to be accompanied with wind. A tree once thrown over can never again be made to stand sufficiently firm to resist an ordinary breeze, especially when the ground is saturated with moisture. We have stated in a former communication that we annually lost about nine or ten per cent. of our trees on Chickasaw or wild stocks; while other trees furnished either with peach or their own roots have invariably resisted the combined effects of high winds and saturated soils. Our first planting of plum trees in Illinois, embraced most of what were then considered the improved varieties and such as were supposed to be worthy of trial, and some of each of the varieties were budded on the peach. When we planted these trees we were not without our doubts with respect to their future success, as it was then claimed that only certain free growing varieties would succeed at all on the peach. On setting the trees in the orchard, we put the junction of stock with stem about four inches below the surface without lipping, and yet most of these trees rooted from the grafts. The reader will judge of their value and after productiveness when we state that the trees commenced bearing the third and fourth summer and in the sixth year, six Smith's Orleans trees produced an average of a trifling over six bushels of plums per tree, while Diamond, Imperial Sage and Blue Imperatrice yielded scarcely if any less. All these trees retained a firm hold on the soil, standing erect and were both productive and healthy, bearing each alternate year full crops, and the intermediate year fair crops, until the hard winter of 1855-6, when, as it happened to all orchard trees of the locality, they were much injured and were afterwards grubbed up.

With our present understanding of the values of different stocks, as a base for the plum, we should unhesitatingly, for our own planting, select thrifty trees on the peach one year from the bud and on planting such would flip them, as we described and figured in a former number when treating how dwarf pears could be changed to standards. In setting such trees they should be put deep enough in the soil to cover the ends of the lips four or five inches. Trees so treated would strike roots the first year, and generally by the end of the second the roots produced from the end of the lips will be numerous and large enough to sustain the tree. Whenever a tree so treated gets a supply of roots out of the grafted part, the peach will soon after perish, leaving the tree wholly on its own roots. When this occurs the effect is much the same, for a season as root-pruning inducing early fruitfulness. But when the union of stock and graft is above ground, the stock then seems to be much more liable to the attacks of peach borers than peach trees.

The propagation of the plum on the peach is precisely the same as is now practiced in budding peach on peach, except plum buds instead of being inserted several inches up, they are put within one inch or so of the surface of the ground.

This low point on the stock is selected for the bud, that the lips, which are to be made wholly out of the plum, may be covered sufficiently deep, to insure rooting without burying the roots of the peach too deep.

Plum trees grown on peach roots will be more valuable by giving the necessary care to secure a strong and vigorous growth in the nursery.

Plum roots induced by lipping will, like other plum roots, send up suckers or sprouts, these can be taken up and after being so pruned as to insure an equal emission of roots from all sides of the stem, may be set in the nursery rows, and when they are large enough may be transplanted to the orchard without being either budded or grafted. Also, pieces of roots eight or nine inches long, one-fourth of an inch in diameter may be planted in the nursery with the upper end one inch or less above the soil. All such bits of roots will send up a shoot which in two or three years, at most, will make trees large enough to sell or set in the orchard.

CURIOSITIES OF VEGETATION.

The Night-Flowering Cereus,
(*Cereus grandiflora*.)

This singular plant may be said truly to belong to the curiosities of vegetation, inasmuch that there is something about it entirely different from what we are in the habit of associating with other known plants.

Most plants delight to open their flowers in the day-time; a great portion freely only when old Sol shines forth in splendor—some preferring morning, others mid-day and some the evening; but this Queen of the Night reverses this order of things, and expands only "when darkness crowns the scene." We have recently watched a very fine specimen of this curious plant that would have expanded five blossoms the same evening but that one was cut off and carried elsewhere, where it too expanded as those on the parent plant.

The plant, although several years old, is comparatively small in size, being in a seven inch pot and only trained to a common trellis. It however does not or has not the past three years grown at all in shoots, but flowers thus freely each year—last year the same plant having three flowers open one night and two another.

We have a young, thrifty plant that grows greatly each year, but so far has not flowered at all, nor will it until older, and this exuberant growth becomes checked.

The little tufts that afterwards become the flower are visible many months, but fail to grow much until two weeks before finally expanding, and during that time, more particularly the last few days, the growth is very rapid.

Each of these flowers, from the stem to point of flower, was about one foot, before the final expansion takes place; and so rapid is this expansion at last, that it was not until three o'clock in the afternoon that we felt sure they would all open the same night.

Early in the morning one flower showed signs of the calyx breaking away; about noon the corolla began to show through the same; one after another of each flower followed suit. About four o'clock the corolla was visibly expanding, and by dark nearly full. We watched the flowers until near midnight, when the house was locked up, but we felt sure the flowers would not close until after our rising in the morning. But, alas, by six o'clock on visiting them they had closed finally and forever.

In 1856 we watched a flower, which did not close the next morning, until half past eight in the morning, when it closed in twenty minutes.

M. Forel, Director of the Royal hot houses at Lacken, succeeded in getting one to expand in the day time by placing the plant in an ice house on the eve of its being ready to open, the cold of which prevented the flower expanding during the night; the next day the plant being carried into a parlor, the blossoms opened with their usual splendor.

Buist mentions a plant that flowered in his collection in May, 1880, at 12 o'clock noon, the only instance of the kind he had ever heard of known of.

When fully expanded the effect is very charming, the calyx composed of a great number of leaves, in this instance some sixty or so, outside of which is a sort of brown, while the inside is a yellowish white, all standing out from the corolla, which was composed of 16 petals of a beautiful white, the said petals being expanded to about four inches, while the calyx stood out fully 10 inches wide. The fragrance is very powerful and pleasing. The plant is a native of Jamaica, and was introduced into Britain in the year 1700.

It requires a warm green house or what is called a hot house, and very sparingly watered during winter.

MICHIGAN AGRICULTURAL COLLEGE.

The Lawn, Garden and Green-House.

The soil upon which all the plants grown mentioned in the following account is light gravelly, or sandy loam. Although naturally rolling, it is all thoroughly tile-drained, subsoil-plowed and manured.

THE LAWN looks well, all of it. A part was made of sods carefully selected, but it does not do as well as that where seeds were sown. The seeds which thrive best are Kentucky blue grass or June grass (*Poa pratensis*), white clover, David grass, (*Lolium perenne*), and sweet-scented vernal grass (*Anthoxanthum odoratum*) mentioned in the order of their importance. In autumn it is allowed to grow taller to protect the roots. Top dressing will be used here after.

THE SHRUBBERY has not demanded very much attention, though there is quite an extensive variety about the grounds. There is a good deal of heavy native timber in the neighborhood. The college is in latitude about 40 degrees, 42 minutes, and nearly 900 feet above the sea level. It may be interesting to know how certain plants endure the winter in open air. Hercules' Club, large hardy and in blossom. Kentucky coffee bean tree natural along streams. *Lonicera aurea reticulata* stands winter well. Peach trees apt to kill except in a few favored places. Deciduous or bald cypress, twelve feet high, kills partly every winter. *Adiantum* kills some, but grows very rank. It ought to kill clear down dead. *Magnolia glauca* (white Bay) and *M. Grandiflora* (Big Laurel) have killed several times in the ground. The unique Ginkgo tree from Japan (*Salisburia adiantifolia*) is thrifty, and for all the time it has been out, 16 years or more, perfectly hardy. The principal trees and shrubs are soon to be labeled with scientific and common names and the country where they grow.

THE FLOWER GARDEN is ornamental, but its chief value consists in the greatest number of standard new varieties, which it is

intended to keep here from year to year for the purpose of comparing any new variety or any old variety which may come up under a new name. This feature of the garden is of great importance to the students and to visitors, as it enables them to pick out the best kinds—the hardest, the most ornamental. For this purpose they have over sixty varieties of the *Pelargonium*, commonly called *Geranium*. Twenty-five or thirty pinks, several asters, twenty-five varieties of *Petunias*, red, white, blue and striped, twenty of Stock (*Matthiola*), seventy to eighty *Verbenas*, all conspicuously labeled. The plants of the entire garden and green house are remarkably strong and healthy.

The verbenas just mentioned are the finest I ever saw and are indeed splendid. To a great extent, this is owing to rich, well tilled soil, and to a weekly or semi-weekly watering with liquid manure. One verberna deserves notice, as it originated here. College Number One is a vigorous grower, holds in flower for a long time; truss large, pit large, color dark cherry, lighter towards the center, but no eye; larger than the Atlanta. Of *Gladioli* they have over fifty varieties, of which it is too early to speak except that the plants are healthy.

In passing, Prof. Tracy remarked that *Perilla Nankinensis* was worthy of more attention as it is easily managed and has such dark chorolate with metallic lustre. He called attention also to the Crimson Flax, (*Linum grandiflorum rubrum*) as desirable. He had confirmed the common belief that old seeds of balsam will produce flowers almost double. These should not be sown on too rich ground. *Thunbergia* he grows, running over the ground like a melon vine instead of tying to trellis or stakes.

THE GREEN HOUSE is in first rate order. The glass is shaded with muslin. Among the plants here noticeable, are *Clerodendrum fragrans* (*Horopleno*) (double flower) white and waxy—some like a *Tuberose*. In answer to how he managed to have everything so thrifty and healthy, the Professor remarked that in winter he kept plants dryer than common, giving all a season of rest, even so the *Fuchsias* lost every leaf, and in spring he gave them plenty of water. In spring *Fuchsias* are potted in light soil till they start, then taken out, roots shaken, and put in pots of very rich compost. They have now fifty-five varieties and species, in size from *Microphylla*, with flowers about a quarter inch long to *fulgens* three inches long. Perhaps one of the best for general culture, easily managed, is the Rose of Castile.

There are fifteen *Pegonias*, to which others will be added and all kept for comparison.

One of the grandest things in the green house is a plant in flower called *Colocasia esculenta*, originally from Central America. It is a little like the *Calla* in appearance; the flowers yellowish, not handsome, the leaves magnificent. One leaf I measured was forty-seven inches (over three feet and a half) long, and twenty-five and a half inches in width. Mother Eve could have covered herself with a few of these without much sewing. The leaves are pointed and hang down. In the point are one or two minute holes, which are continuous into the main rib and into a thickened strip along each side. In the evening or when the air is full of moisture, water constantly drips from the leaf points, coming out of the little holes mentioned. The little drops are apparently thrown out with considerable force, like the jets of blood from a small artery. So the water beats rapidly like the human pulse, or more slowly, keeping the floor moistened by its accumulation. I intend to try some experiments and make some examination with the microscope upon the structure of this curious and interesting *Colocasia*.

For information on these points and answers to many more Yankee-like questions, I am indebted to the kindness and patience of Professor Will W. Tracy, who is a graduate of the college, and now the efficient instructor in Horticulture, and Superintendent of the Gardens.

EXPERIMENTS WITH CURCULIOS.

The person who discovers an effectual method of guarding against the depredations of the plum and apple curculio will confer a lasting favor on mankind, and will add to the productive wealth of the United States millions of dollars annually. For it is not to be gainsaid that the depredations of the Little Turk are more destructive to the fruit, especially of the west, than all other diseases, —insects and enemies combined. For most diseases we have a remedy; against enemies we have a defence. The birds and various parasites are our allies in a war against other of the insect tribes, but when we attack the Turk it must be single handed. He revels in whale-oil soap, wades through the strongest decoction of tobacco water with the evident relish of a genuine lover of the weed; lifts his proboscis in derision at the offensive odor of guano; in short no preparation yet discovered disturbs his equanimity, or turns him aside from his favorite work of destruction. His coat of mail is proof against any enemy that has yet appeared; no bird yet found that, living or dead, will touch him.

The study of such one insect cannot fail to be of interest as well as profit.

With the hope of making some new discoveries that would aid us in further investigations, or lead to good results in some other direction, I have given a good deal of time and attention to this enemy, whose origin, nature, and modes of operation are enveloped in so much mystery. I confess the results have not been satisfactory; but little if anything new has been discovered. What I have learned by experiment only confirms the views advanced by others.

Of his origin or native land we know nothing, though from the manner in which he adapts himself to the extremes and rigors of our climate, it is a reasonable presumption that he is one of the Aborigines of our country, that he belongs to that worthy class, "the old settlers." My first inquiry was for his

winter quarters. This point I think has been definitely settled to be the earth. To test this, a plum tree was selected that had never matured a single specimen of fruit, though twelve years old. For the space of three feet from the body of the tree, the ground was made free from weeds and grass, and was made as smooth as possible; each morning the surface would be perforated with a greater or less number of openings, but no curculios could be found. At the suggestion of Dr. Hull, I placed at night near the body or stem of the trees, pieces of board or bark, after the manner of the Michigan traps. Here I found, adhering to the under side of these, curculios corresponding very nearly in number with the perforations in the surface. Here seemed the remedy, but after clearing the traps, I spread my sheet and jarred the tree, and never failed to bring down from eight to twenty-seven each morning. But where did these come from? Evidently from my neighbor's plum trees, where no such precaution had been taken. This trapping and jarring was continued from May 26 until July 7; since then more have been caught under the traps, and but few have been jarred, this July 16, but few were taken—hence I judge the season of active work is over.

The appearance of these coming out of the ground differ from those taken from the tree, in having a lighter color and in having the protuberance on the back less clearly defined, a difference due to age and atmospheric influences. Taken from the ground and placed in a glass for exposure to the light, in three or four days they assume the form and color of the others. My observation is that they have a decided preference for free stone fruit; hence they do not travel to any great extent over our common wild plum. A neighbor of mine has a fine large tree of what is here called the Wild Goose plum, and though within a hundred yards of my tree, not a single plum has been injured by them. How far this observation will be sustained by facts in other cases, I cannot tell; but hope this point will be noticed by others, who will report the results. If true, it may prove a valuable guide in selecting varieties for planting. It has been observed, too, that the egg is nearly always found deposited in the open space between the pit and pulp; and in the apple it is almost invariably found in the seed lobe.

The mode of attack is to puncture the fruit with a crescent-shaped cut. In this the egg is deposited, which hatches in from three to ten days, assumes the larva or worm form, which by feeding upon destroys the fruit, which soon falls to the ground, carrying the larva near its future home. Within a week from the time the fruit falls, this larva comes from the plum, descends into the ground, assumes the chrysalis form, in which and where it remains all winter and comes forth in the spring to renew its depredations. The depth to which it descends is an unsettled question—analogy would go to show any where below the frost line; its ability to penetrate a stiff, clayey, wet soil may well be doubted. But now for the remedy: Coming from below he is familiar with the smell of sulphur—he relishes lime—it took as long to drown him in ninety-eight per cent. of alcohol as it did in cistern water; but "Paris Green" he turned away from in evident disgust, and exhibited symptoms of "painter's colic." Here then is a remedy, a preventive; but, alas, not available; for in the language of a leading western horticulturist, Paris Green is certain death to big bugs as well as small ones. Another and harmless substance was experimented with. Two specimens were taken; one punctured and soaked in a strong decoction of salt water; the other taken fresh from the tree; both were placed in a jar with a number of curculios. They did not sting either of the plums, though they manifested a decided aversion to the salt one. If this should prove an antidote, a report from the orchards near the sea coast would throw light upon the subject, for the salt spray or dew falling upon the tree and fruit would guard against the ravages of the insect.

Whether any new truth has been developed may be questioned. One fact is clear, I have saved from one tree nearly one-half bushel of fine plums. I lost at least an equal amount, but this was not a source of regret as the tree was too full.

CARLISVILLE, ILL. WM. STEVENSON.

HORTICULTURE AT CHAMPAIGN.

Lectures by Dr. Warder, of Ohio.

THE VINEYARD AND VALEDICTORY.

In this the last lecture of the course, it will be our duty to consider the subject of Vineyard Culture. Before proceeding to the discussion it may be well to enquire whether we need a vineyard, and for what object we design to plant it.

The primary end in view for such undertakings when conducted on a large scale, is necessarily the production of wine. It will not be necessary for us to discuss the temperance question upon this occasion, since we are met in the interests of fruit growing only, and we shall consider the cultivation of the grape in vineyards for the sake of producing a luxury for the table. You need not be told how grateful to the palate is the fruit of the vine, nor how attractive are the luscious clusters of the purple grapes.

My first advice to you is that you be not misled by the glowing accounts you may have seen of the great productiveness of the vine, which is indeed proverbial, nor of the immediate returns in money that are to be realized from the investment of capital in vineyard culture. Moreover, you must recollect that a large capital is requisite to go into this business extensively; then for you, and all others who are disposed to plant, are earnestly recommended to make haste slowly, to commence at least, in a small way. You may learn as well upon a patch of a quarter of an acre, as you can upon a field of forty acres, and at much less cost; your experience must be acquired by personal effort, and can be obtained only by the expenditure of capital and labor, both of which will require the closest observation and care. You will have everything to learn in this new business, both practically and theoretically, the culture of the vine is altogether different from that of the cereals, such as wheat and corn, or that of the grapes, on the one hand, and from that of orchard fruits on

the other. Vineyards require a mode of treatment peculiar to themselves.

Selection of Soils.

The lecturer then proceeded to describe the soils best adapted to the cultivation of the grape, and though he admitted that the native vines seemed to have a wide range, their natural habitats being found in the bogs and swamps, on the river banks, in the sands of islands, in our rivers, on the gravelly terraces and upon the extensive drift formations, made up of clays and gravels, as well as upon the rocky summits of our hills and mountains; still, it was found in practice that the cultivated grape, even those varieties that were supposed to have been introduced from the *Labrusca* species, or Swamp Fox-grape, all of them required a porous soil, such as is susceptible of thorough drainage.

There were differences in opinion as to the texture and composition of the soil; some authorities recommending clays and clayey loams, while others expressed their preference for lighter soils, sands or sandy loams. Indeed there were among our cultivated varieties, as with the natives, diversities of adaptation—some seem to succeed better on one soil, some on another. It was well said, that there was no variety that could be safely recommended for all localities and equally adapted to all soils. The general appreciation of this fact would probably induce the further attempt to find the best grape for all places, and prevent the offering of any more Greeley and Langworth premiums for such a purpose, as this settling this vexed question.

Site and Aspect.

The choice of a situation for the vineyard is a matter of no small moment. It should be elevated and well exposed rather than low and sheltered. Here in the prairies there might be little room for choice, the differences in level could not anywhere be very great, but the rolls only should be selected for vineyards. An open exposure was necessary with gentle slopes to carry off the surplus water, and also to avoid the accumulation of cold air on still nights, when the effects of radiation, particularly from the black prairie mold, would often be accompanied by frosts that might prove disastrous to the crop. By all means, therefore, select an elevated position, and, if possible, one that had an abrupt projection above the general level of the country.

As to the aspect of the ground, that was perhaps a matter of very little consequence; it mattered not whether the slope were to one point of the compass or to another, though an eastern exposure was usually preferred.

Our earliest teachers were emigrants from the north of Europe, the highest limits of grape culture on that continent, and the books that related to the vineyards upon the vine clad hills of the Rhine. Such teachers naturally led us to seek steep declivities upon the hillsides of our rivers, and especially those which were well exposed to the open sunshine. These and many other foreign ideas were adopted as upon authority, until we learned that they were not at all necessary for our American vines in our very different American climate; so that now in most grape regions of this country, very little attention is paid to the exposure of the site in regard to its aspect, provided it be well elevated and open to the influence of the currents of air. The hill-sides are abandoned for the hill-tops where these conditions prevail.

Preparation of the Ground.

Formerly it was considered necessary to trench the ground very deeply with the spade, aided by the mattock and pick; if stones abounded, they were removed. Where the hill sides were precipitous the land was thrown into terraces or benches, and these were supported by sod banks or expensive stone walls, so as to reduce the slope to a series of levels or steps upon which to plant the vines; these benches varied in width from a few feet to as many yards, according to the abruptness of the declivity. Now that the hill tops or more level ground are devoted to vine culture, the land is much more cheaply prepared by the plow and it is found to answer as well for the vines. Some planters use only an ordinary team and break the soil eight or ten inches deep, but the best cultivators recommend trench plowing, and some prefer to follow with the sub-soil plow, so as to stir the earth from fifteen to twenty inches or more.

After suitable preparation by harrowing, or cross plowing, if necessary, so as to insure a good tilth, it is well to mark off the land in the direction of the rows, returning in the same furrow, which makes a sufficient excavation for planting and much more cheaply than digging the holes with a spade.

It should have been premised that a plan of the vineyard ought to have been agreed upon; it must have been already determined whether we shall plant closely or widely. Formerly the vines were set three or four feet apart, but now they are set four or five feet apart. After a while a greater distance was allowed, gradually extending the space by five or six feet, to six by eight, the latter separating the rows, then to eight by eight, and ten by ten, until now some are planted ten by twelve and even wider.

The direction of the rows must also have been determined upon; this may be from north to south, which gives the best exposure of all parts of the vine to the light and sun, and is therefore preferred, but if the surface be irregular, it will be necessary to lay out the rows so that the lines shall be nearly level, descending gradually to one end.

In planting we may either set the cuttings at once in the stations, in which two are planted together, or one may use plants with roots, such as we receive from the nurserymen. These should be well rooted yearlings—or rooted layers. The canes of last year's growth should be cut back so that a single eye only will appear at the surface when planted. The roots also had better be cut back to about eight inches.

The stations should all have been marked by inserting short stakes in the furrows, this will greatly expedite the planting. The holes are dug with a spade and should be at least twenty inches long by about eight wide, the soil loosened deeply, a portion thrown out and a part made mellow, and making an inclined plane next the stake. All these holes should be on the same side or in the same direction from the stakes; this will greatly facilitate the future operations of the vigneron.

Cultivation.

Should be most thorough at all times, but the other treatment during the first year is very simple; if the vines grow vigorously they may be trained to the stakes. In the fall they should be cut back to two buds and covered with a little soil for the winter. In the second year they are uncovered in the spring and supplied with stakes three or four feet high, and as they grow some attention will be required in pinching back the points of all the shoots but one or two, according to their strength; these should be tied to the stakes as they grow. Clean culture must be continued throughout the season. After the fall of the leaf the young vines may be trimmed, cutting them back more or less according to their strength. The severity of the trimming should be in the inverse ratio to their strength, the weaker vines being again reduced to two buds. The covering of earth may again be applied on the approach of winter. Indeed in northern latitudes it is considered advisable to protect the vines from severe cold by covering them every winter.

The third season the same treatment is to be pursued, keeping in view during the summer the importance of training upward those shoots we desire to grow most vigorously and putting the others into a horizontal or dependant position. This season we shall expect some fruit, upon the stronger vines, and these will have been trimmed with canes of a foot or two feet in length. At this time the vines should have been supplied with permanent stakes of sufficient height, seven feet in length, or with the permanent trellis made of wire, or strips of lumber or even poles, and the training must be modified accordingly. The vines should never be allowed to over-bear, and a large portion of the fruit ought to be removed by cutting away supernumerary branches, or by rubbing out a part of the shoots entirely.

Summer pruning should be attended to, but not as usually practiced, cutting away large portions of the growth at midsummer. On the contrary it should be done very early in the season, by pinching the ends of the stronger shoots that need repressing, and rubbing out supernumerary shoots so as to reduce the number of shoots to a just proportion, leaving only enough to cover the trellis or to occupy the stake without crowding and smothering. This will soon be learned by the observant vine-dresser.

The winter pruning of old vines, as illustrated to you on Saturday in the field, depends upon the removal of all the old wood that is not provided with sturdy canes for producing fruitful shoots, and also in cutting away a surplus of healthy young wood, the canes themselves being shortened back according to their strength, remembering also that the lower buds are not usually productive of fruit, particularly on very strong canes; these should be left sufficiently long to retain the buds that will give us fruitful shoots.

Upon these principles of culture and pruning the vineyard is to be treated for future years, but a few particulars remain to be considered. Vines that have ceased to make a thrifty growth of wood may be treated like feeble young plants in the new vineyard; they must be cut down to the stump, and for this necessity, that may at any time occur, it is well to encourage the growth of a single shoot near the ground in all vines, as a point from which to effect a renewal of the vines after any disaster, such as frost, which may have damaged the superstructure of the vineyard.

In case of the destruction of a vine by any means, it is very easy to replace it by layering a strong cane from its next neighbor, placing it in a trench some inches deep, and bringing it to the surface at the point where the vacancy occurs. This is called by the French *provoigne* or neighboring. It is much better than attempting to replant by introducing a new vine in the place of the old one, which is seldom attended with success. When we desire to change the varieties of our vines, grafting them is recommended, but it is a very uncertain method of propagation even in skillful hands, and is not recommended except as a means of quickly fruiting and testing new varieties.

Vineyards may suffer from winter frosts, that do not generally kill the stocks, but destroy the bearing wood, so that we lose a year or two by the accident. Summer storms, accompanied by hail often damage the foliage and tender shoots to such an extent as to destroy not only the crop of the present season but also the prospect for the next year. So great is the longevity of the vine that we should not anticipate wearing out, and yet old vineyards, especially if neglected, soon die out.

The most dreaded diseases are those of a fungus character. The leaf mildew causes premature defoliation of the vine, the *oidium* of Europe affects both the foliage and the shoots and is believed to cause the *mal de St. Pierre*. The fruit also is affected by troubles of this kind known as the mildew and the rot, which often destroys our hopes of profit.

Insects are very troublesome. In the early period of growth the steel-blue beetle eats the buds; other beetles consume the foliage, and a borer excavates the entire stock near the surface of the ground, which breaks off leaving a dead stump. All these require study of their habits and watchful care for their destruction.

In harvesting the crop we should observe the condition of ripeness, for the grape improves very much after it has changed color; the acids become transformed in the process of maturing into sugar, greatly improving the quality of the fruit; the pulp loses a great part of its firmness and becomes melting. Still for the market it is preferred to gather some varieties before they have fully matured, and the early product brings the best price.

Grapes should be cut, not pulled from the vine—this should only be done in fine weather when the fruit is dry; as cut, the bunches may be laid in small baskets or trays and these set upon shelves in an airy and dry fruit room, where they remain a few days before packing, so as to permit the evaporation of a portion of their superabundant moisture.

In packing the bottom of the box is removed and the bunches are laid in closely, in such a manner as to conceal the stems, and when full the bottom is replaced and fastened, the box reversed and the brand applied. This should indicate the variety of grape and the weight of the contents.

Valedictory.

With this lecture, my young friends, must close my engagement for this season with the Industrial University. My association with you during this course of lectures has been very agreeable, and this felt to have been only too short. It has not allowed an opportunity for us to become sufficiently intimate with each other, and yet it has afforded an insight into your characters. Your intelligent and persistent interest in the topics which have been so hastily presented to you in this brief course, and which there was not time sufficiently to discuss, has induced the agreeable belief on the part of your teacher, that you have been absorbing ideas grasping at the points of both principles and practice in fruit culture that it has been my aim to exhibit and explain to you.

It has been made apparent to your teachers that you are in serious earnest in this business of education. This is as it should be, and is encouraging to your friends. We may have hopes of your future.

Continue then, my pupils, in this earnest pursuit of knowledge. Above all, learn to observe; then note your observations, and last, learn to associate your observations to ratiocinate concerning them, and strive to deduce safe and rational conclusions. It is your business now to endeavor to grasp the great principles of science, upon which and from which to evolve and build up your future practice in the field.

In the details omit no opportunity of seeing as many operations as possible, and when opportunity offers take hold and do.

I learned English essayist tells us that "The man who can is King," and gives the derivation of the word as following: *Ich kann* (German) from *kennen*, to know, to can; hence, *der Koenig*, the man who can, the King. Here in free America as we are all *sovereigns*, should we not also strive, in this sense at least, to be *Kings* also?

The prospect for apples is unusually good along the coast from Maine to Georgia, except in Penn. and Maryland; Tennessee is the only interior State which can claim an average.