Grafting fruit trees

T. F. Herlihy

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Fig. 1.—Tools required for grafting. Left to right: Saw, splitter, secateurs, knives and sharpening stone.

Grafting Fruit Trees

By T. F. HERLIHY, Senior Horticultural Instructor

GRAFTING is a process whereby a portion of one tree is joined to a rooted portion of another and subsequently unites through the mutual response of both stock and scion. Although it is possible to successfully graft and rework some kinds of fruit trees on to others a more successful "take" is assured if the botanical relationship is very close, i.e., peaches grafted on peaches, apples grafted on apples, etc.

However, apricots can be successfully grafted to plum stocks while almonds also do well on peach stocks.

Pears, too, are often sent out from the nursery grafted on to quince stock but only certain varieties are fully compatible and for that reason—together with the possibility that the combination may result in a dwarfed or weak tree—the practice is not recommended.

In an endeavour to assist the less experienced commercial grower and also the home gardener, an easy-to-read chart, showing the compatibility of the various varieties, together with the recommended grafting methods has been prepared and appears in this article. A quick reference to it may save many disappointments and costly failures.

TERMS USED IN GRAFTING

To the experienced grower the terms used in this article are everyday phrases, but to the beginner and home gardener, they may be unfamiliar, therefore a brief explanation of the more essential ones will not be out of place.
Stock—is that part of the tree on which it is intended to graft.

Scion or Scion-material—the mature wood from a tree of the desired variety which will be used to graft on to the stock.

Cambium—is the layer between the bark and the wood. It is the growing tissue which provides for the expansion of both wood and bark.

Callus—is the healing tissue which grows around cut surfaces as a result of the cambium activity.

Rework—to graft an established tree other than a seedling.

Frameworking—method of grafting old established trees when the framework of the tree is retained.

TOOLS REQUIRED

Fig. 1 shows the tools required. They consist of a pruning saw, secateurs, grafting and budding knife, a pocket-size sharpening stone and a combination tool known as a splitter. The latter tool is used for making clefts in the stocks and when withdrawn and reversed the chisel edge is inserted in the cleft to keep it open while the scion or scions are inserted.

It is essential that all tools are kept in first-class condition, clean and with keen edges.

REASONS FOR GRAFTING

The main reasons for grafting fruit trees are as follows:

(1) To rework old-established trees to more popular and profitable varieties. (See last paragraph of this article.)

(2) To propagate young trees in the nursery rows.

(3) To rework trees which produce fruit that is not true to type, or an unsuitable variety or seedling of poor quality.

(4) To rework late-maturing varieties to early-maturing varieties in an endeavour to minimise losses caused by fruit fly infestation.

(5) To graft whole trees or single limbs to provide for cross-pollination purposes.

TIME FOR GRAFTING

The best time to carry out the work is when the sap has commenced its upward movement and bud swell is noticeable. For apples and pears the period September-October would be suitable while for stone fruits and almonds the work can be commenced as soon as the bark lifts freely from the wood.

For those who have large areas of apples and pears to graft, a commencement during the second week in September would be in order, but where there are only odd trees to be done it would be better to leave the job until the sap is well up, say the first week in October.

Providing the scion material has remained dormant without drying out, the work may be carried out until the end of October or even until the first week in November.

SELECTION OF SCION MATERIAL

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Fig. 3. — Whip and tongue graft, showing A—stock and scion prepared; B—planted together; C—bound ready for sealing.

be regular producers of high quality, true-to-type fruit and to be free from virus or other sap-borne diseases.

As scions for grafting are obtained during the dormant period—while pruning is being carried out—it would be necessary to attach tags in prominent positions during the growing season while the fruit is on the trees. Only scions which are well-grown and have fully-matured buds should be selected.

In some instances, and particularly with apples, the basal buds are often blind.

The top two-thirds of the scion material is the best but for apples, where Powdery Mildew is not a factor, the terminal portion of a shoot can also be used.

The scion material should then be tied neatly in bundles of 30-40 for convenient handling and labelled with metal tags.

The bundles are then buried in moist sand or soil in a cool position or kept in cool storage until required.

If it is intended to keep scions in cool storage for any length of time, regular inspection is necessary as they sometimes tend to dry out.

METHODS OF GRAFTING

There are various methods of grafting fruit trees and their use will vary according to the skill of the operator. Some of the methods are complicated and would be successful only if carried out by persons with a good deal of experience (e.g., the green graft of grape vines is not an easy graft to do, as both stock and scion must be very evenly matched before a perfect union will take place).

For that reason it is intended to mention in this article only those methods which are commonly used by growers in this State, and which can be carried out with confidence by persons who have a limited knowledge of the behaviour of the sap system of the tree to be grafted.
DESCRIPTION AND EXPLANATION OF GRAFTS

Whip and Tongue.

This method is used by nurserymen when propagating young trees, particularly apples and pears by rootgrafting, and also when the diameter of the stocks in the nursery rows is similar to that of the scion it is intended to use. The method is also used by experienced grafters on light lateral growths when frameworking trees.

Rootgrafting is usually carried out indoors during the months of July-August and is sometimes referred to as bench-grafting. It is carried out by joining together a piece of root and scion wood each of which are approximately four inches in length and of similar diameter. See Fig. 3.

A sloping cut approximately 1\(\frac{1}{2}\) to 1\(\frac{3}{4}\) inches in length is made on both pieces and in addition another small cut is made on each of the cut surfaces. This second cut commences about one-third of the way from the tip and runs at a slight angle to the first cut. The two pieces are then joined together as shown, firmly bound with damp raffia or other suitable material and then placed in moist sand for approximately one month to enable them to callus over before planting out in the nursery rows.

When removing the grafts from the callusing bed to the nursery rows it may be necessary to cut the wrapping material, otherwise a restriction in the sap flow may occur and subsequently cause death.

When planting out rootgrafts in the nursery rows it is essential that the point of union be buried well below the soil surface and it may be necessary to leave only the top bud on the scion wood uncovered. When the whip and tongue graft is carried out on above-ground parts of a tree or nursery stock a sealing material of either the bitumastic or wax type is also necessary as a prevention against the entry of air or moisture which would prevent the parts from uniting.

When the subsequent new growth is approximately six inches in length it is important that the wrapping be cut by drawing a sharp knife through the back of the graft.

Strap Graft.

The strap graft is used on limbs which exceed 1\(\frac{1}{2}\) inches diameter. This occurs when the main limbs have been cut back for frameworking, or for the provision of cross-pollination branches, or where whole trees have been cut hard back to within a few feet of the ground level for reworking to another variety.

A commencement can be made with this type of graft as soon as the bark lifts freely from the wood. It is a very popular method on account of the rapidity with which the strap grows over the cut sur-
face of the stock thereby causing the union to take place much faster than the cleft graft.

Where the strap graft is used on a number of trees, much more time is taken up in the preparation of the scions as compared with cleft grafting, but the neater union warrants the extra time spent in the preparation.

**Cutting the Scion**—The scion is held with the terminal bud facing towards the operator. The strap portion is usually cut first and the operator will find it much easier if a part is selected where the knife does not have to pass through a bud. If this is not possible then it is necessary to slightly tilt the cutting edge of the knife inwards when passing under a bud otherwise the blade will slip and the strap will be ruined. The strap will need to be an inch or two longer than the diameter of the stock it has to span, to allow it to be bent over and inserted between the bark and wood. Usually just enough wood is left on the strap to keep it pliable. A sloping cut is then made on the opposite side of the scion wood and finishes directly opposite the point at which the strap cut was completed. The end of the scion is then broken or cut out leaving a shoulder for the scion to sit down on the cut surface of the stock. As it is very important that the cambium layers of both stock and scion come in close contact, a \( \frac{1}{4} \) in.-\( \frac{3}{4} \) in. piece of bark must be removed from the tip of the strap and short end.

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Fig. 5.—Scion prepared for strap graft showing how the bark is removed from the outside tips of both strap and wedge to give close contact with the cambium layer of the stock.

Fig. 6.—Strap graft. A—Shows the stock prepared; B—Shows the graft in position.
Preparation of the Stock.—The cut surface of the stock or limb of the tree to be grafted is prepared by trimming the edges with a sharp knife. Make longitudinal cuts approximately 1½ inches in length through the bark commencing at the cut surface. Then with the aid of the knife the edges or flaps of bark are prised away from the wood. The scion is then placed in position by first inserting the strap end of the scion between the bark and wood of the stock on one side and with the strap lying across the surface of the stock the short end is then pushed down between the bark and wood on the opposite side. Care must be taken to see that the strap is lying flat on the surface of the stock (on large limbs it is wise to insert two scions opposite one another with the straps running side by side across the surface). The scions are then fixed firmly in position by using two ½ in. or ¾ in. shoe tacks where both ends of the scions were inserted under the bark and if necessary, one tack can be used in the centre of the strap to keep it flat on the surface of the stock. All cut surfaces are then sealed with a suitable material. If a bitumastic preparation such as Colgraft is used, it may be necessary to examine the seals the following day, as cracking sometimes occurs in which case resealing will be necessary. If mastic is used it is wise to cover it with paper as it is often taken away by bees and also as a protection against the sun’s rays which often causes it to melt and cause damage to the graft.

Cleft Graft.

Cutting the Scions.—A portion of scion wood is selected which has approximately four or five fully-matured buds. At the basal end of the scion—the end which is inserted into the stock—two sloping cuts are made. These are approximately 1½ inches in length, and form a wedge, slightly thinner on the inner edge and with a bud situated on the outside at the point of commencement of the cuts. (Fig. 9.)
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The cleft graft is used on stocks which are less than 1¼ inches diameter, and particularly on stonefruits and grapevines. It is a much quicker and easier graft to perform than the strap graft, but does not callus over as quickly.

It gets its name from the cleft or split which is made in the stock.

Preparation of the Stock.—The stock is prepared in a similar manner to that for the strap graft. The cleft is made across the cut surface of the stock to a depth of approximately, 1½ in. to 2 in. with a sharp-bladed instrument, such as illustrated in Fig. 1, and a mallet or hammer.

The splitter is then withdrawn and the cleft re-opened by inserting the wedge-shaped or chisel end of the splitter. (A large screwdriver or wedge-shaped piece of wood will suffice if a splitter is not used.)

As the bark of the stock is invariably thicker than that of the scion, precaution will need to be taken to ensure that the scion is placed so that both cambium layers will make contact.

This will only be done by positioning the scion in towards the wood of the stock so that the cambium of both stock and scion are directly opposite. To expedite callusing it is usual to insert two scions, one on each side of the cleft.

When the instrument used to keep the cleft open is removed, the stock should clamp tightly on the scions and there should be no need for tying. The cut
surfaces however, should be thoroughly sealed to prevent the entry of moisture or wood-rotting fungi.

**Stub Grafting.**

As the name implies, this method of grafting is carried out at the base of lateral or side growths when frameworking old trees.

This type of graft is ideal where the diameter of lateral growth is ½ in. to 1 in., and is in too awkward a position for a whip and tongue or cleft graft.

A sloping cut approximately 1½ inches in length is made on the top or side of the lateral growth across the grain and running towards the basal end.

The scion, which is usually four or five inches in length and has at least three fully matured buds, is prepared by making a sloping cut on the one side and a slightly shorter cut on the other. The scion is then inserted in position by a gentle pressure which opens the cut on the stock. When released, the stock closes tightly on the scion and tying is usually unnecessary. If for any reason it is necessary to tie the scion in position, precautions must be taken to cut the material used when the new growth has reached six to eight inches.

Surplus wood or growth of the stock is removed by cutting it away with the secateurs at the point where the scion is inserted. The cut surfaces are then thoroughly sealed.

**Bark Graft.**

This method is usually used on apricots, apples, pears, figs and citrus fruits.

The stocks are prepared in the same manner as for the strap and cleft graft, but the scion is inserted between the bark and the wood of the stock and then thoroughly sealed. (Fig. 11.)
Preparation of Scion.—The scion is prepared by making a sloping cut approximately 1½ inches long on one side and leaving a shoulder on the opposite side for the scion to sit down snugly on to the stock.

It is essential that the scion should have three or more fully matured buds, one of which should be situated on the bark of the cut surface.

FRAMEWORKING

In recent years it has been found that when an old established tree is cut hard back for reworking, the cut surfaces of large limbs are often infected with a wood-rotting fungus such as *Polystictus* before the graft has time to callus over. Once a fungus gains entrance it is very difficult to eradicate and will ultimately destroy the tree. For this reason frameworking, although much slower, has many advantages, of which the main one is that the framework of the tree is retained, thereby lessening the number of large saw cuts.

In addition, the tree resumes cropping much sooner and fruit quality is not impaired. In frameworking, large cuts are only made when unwanted limbs are removed entirely.

This is depicted in Fig. 12 which shows a portion of a block of old pear trees which were reworked to another variety by the frameworking method.

AFTER CARE

Consideration must be given to provide protection against damage by sunburn to the trunks of trees which have been prepared for grafting.

This is usually done by wrapping bags or some other suitable material around the butts of the trees until such time that the new growth has developed sufficiently to provide natural protection after which the wrapping material is removed. An alternative method is to paint the whole tree with a good whitewash. One of the main disadvantages when bagging, etc., is used, is that it provides a hiding place for the various chewing and sap-sucking insects which could cause considerable damage to, and possible death of buds and tender new shoots if precautionary measures for control spraying are neglected. Vigorous new growth resulting from trees which have been cut hard back and grafted is sometimes blown off at the base by heavy winds. This can be averted by providing a stake on which to tie the new growth.

A NOTE OF WARNING

As the new growth from reworked trees will be governed by the condition of the root system, considerable thought will have to be given by the grower as to whether or not it would be better to replant than rework the existing trees.

Only vigorous, healthy trees should be reworked, and those which are stunted, or are carrying limbs which have died back should not be considered for grafting.
Fig. 12.—Trees frameworked using whip and tongue, cleft and stub grafting. At left is a close-up of two of the branches.

### COMPATIBILITY CHART

<table>
<thead>
<tr>
<th>Existing Tree or Stock</th>
<th>Scion to Use</th>
<th>Recommended Method to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>Apple (All Varieties)</td>
<td>Whip and tongue on stocks or lateral growths up to ½ in. diameter. Cleft graft on limbs ¼ in. to 1½ in. diameter. Strap graft on larger limbs. Stub graft on suitable lateral growth when frameworking. Bark graft can be used in conjunction with strap graft on very large limbs.</td>
</tr>
<tr>
<td>Pear</td>
<td>Pear (All Varieties)</td>
<td>Same as for apples.</td>
</tr>
<tr>
<td>Quince</td>
<td>Quince (All Varieties)</td>
<td>Whip and tongue grafts on growths of similar diameter to scion. Cleft graft on stocks of suitable diameter. Strap grafts can at times be used on vigorous young peach trees. Not recommended.</td>
</tr>
<tr>
<td>Loquat</td>
<td>Loquat (All Varieties)</td>
<td>As for quince.</td>
</tr>
<tr>
<td>Plum (Japanese)</td>
<td>Plum (All Varieties)</td>
<td>Stocks are usually prepared during the autumn and the subsequent new growth budded during the following summer. Cleft grafts on stocks of suitable diameter. Strap grafts can at times be used on vigorous young peach trees. Not recommended.</td>
</tr>
<tr>
<td>Apricot</td>
<td>Apricot (All Varieties)</td>
<td>Cleft and bark grafts or prepare stocks in autumn and bud into the new growth during the following summer. Grafting not recommended.</td>
</tr>
<tr>
<td>Almond</td>
<td>Almond (All Varieties)</td>
<td>Whip and tongue grafts where diameter of stock and scion are similar. Prepare stocks in autumn and bud into new growth during the following summer.</td>
</tr>
<tr>
<td>Other Varieties</td>
<td></td>
<td>Seek advice of your District Officer.</td>
</tr>
</tbody>
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