

### Ideas and Closing Thoughts:

Hand held grafting tools are available, unfortunately, they do not work for woody peonies. The scion wood is damaged by these tools, thus they are not recommended.

Damp soil is a must in the grafting bed. Dry soil, in our experience, has always produced fewer successful grafts. If soil is dry we make sure to water the soil a day or two before planting. If soil remains dry within the bed after planting, dig a trench around the outside of the bed or between grafts and fill it with water. Water will wick through the soil without flowing down over new grafts.

Healing the grafted plants may be more important than the joining of the scion with nurse root.

Not all tree peony cultivars have the same success rates in grafting. The lutea hybrids are easier to graft than the suffruticosa and rockii cultivars. Different years will produce wide ranging results due to many variables.

Try to avoid peaking at grafts in the spring by removing soil. Curiosity often gets the best of grafters, who often begin digging around in grafting beds, only to break off newly emerging shoots.

Newly grafted plants will often look small and weak the first year of growth. Leaves are almost always small, underdeveloped and they may lose them early. Stems are usually narrow and short. After another year of growth the plants will show more vigor. Patience!

Many new grafts will make an effort to bloom their first year. We recommend removing buds as you see them. The flowers that would be produced will not look anything like a mature plant's anyway and the energy saved can certainly be used by the plant for growth.

Grafted peonies almost never flower in their second year of growth. During the third and fourth year flowers can be expected.

Make every effort to keep your grafts well organized and labeled. The newly grafted plants often look very similar and are easily confused.

Experiment. Allow yourself to try variations in all steps of grafting and growing. A different method may work better for you.

In closing, grafting tree peonies is not difficult and a rather high rate of success can be experienced with some practice. Expect better results with practice. Enjoy your successes and learn from disappointments.

## Guide to Grafting Woody Peonies

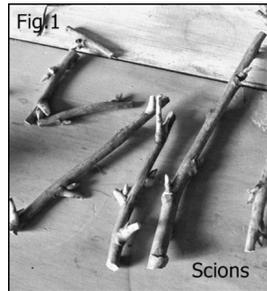
Nate Bremer, Jim Waddick & Leon Pesnell



The method of grafting herein described was derived from an article by Bill Seidl in the APS bulletin (314 & 315, Jun/Sep 2000). In turn, that was largely based on techniques practiced at the Reath Nursery. Bill's method works quite well, but we've found some time/labor saving techniques, as well as methods to increase success rates. A few myths have also been discovered along the way. Other sources of information and drawings were graciously shared by Jim Wad-dick and Leon Pesnell from their guide to grafting.

### Scions

Scions are cut with garden pruners/shears and the desired length of the scion is 2" to 3", with a terminal bud and a couple of side buds if possible. Leaves are pushed backward and they snap off at the axillary nodes leaving the buds intact (they may also be trimmed off with shears). The best scions for grafting have mature terminal buds and show splits in their "bark". These mature scions often have a woody look to them and have little green tissue on them. The ideal time for grafting in Wisconsin, northern USDA Zone 5, is mid to late August. Any earlier the scions are not mature, later the scion-nurseroot union does not grow together (knit) well enough before winter arrives. As grafting activities move further away from the optimum period, the success rate becomes markedly lower. Grafting in different locations across the United States will depend upon the conditions and scion maturity of the location. Itoh or Intersectional hybrid scions can also be grafted. Scions from these plants will make use of auxiliary buds found near the bottoms of the stems. Success rates with this group of plants can be expected to be lower. Scions produced on intersectionals are often very green, lacking the woodiness of their tree peony relatives. This may or may not be the reason for difficulty in grafting. However, we have noted a better rate of success by using scions harvested from stems at or just below the soil line. These scions are much woodier and buds are more developed. The same procedure is used to graft these scions as the tree peonies. Rockii hybrids and some AGLH's (advanced generation lutea hybrids) seldom have terminals due to heavy bloom, so a search for larger side buds is carried out. See Figure 1. Terminal bud scions almost always increase the chance of graft success. A side note, if you would like your rockii and other poor scion producers to grow large terminal bud scions, cut the plant you would like to graft to the ground late in the fall, prior to the year you plan to graft. The cut plant will produce an abundance of basal shoots of large size the following spring. Very old plants, that have few stems, may take a year or two longer to produce usable scions. Sometimes mice and voles in our area girdle the plants in our fields, the result is a huge flush of new growth from below the soil line the following spring, creating the same effect as being cut.



- 3) Attach labels to each graft (plastic or aluminum tags tied to the scions works well).
- 4) Place the labeled grafts horizontally (parallel to the surface) in the sand inside the litter pan. They may be placed side by side-by-side in the sand with little space, as the grafts will only spend two weeks in this position.
- 5) Cover the scions completely with more damp sand, so that the litter box is completely full. Cover the top of the litter box with a plastic garbage bag to reduce evaporation.
- 6) Leave grafts in the litter box to heal for 2 weeks. Check the sand every couple of days to make sure it remains damp. Add water as needed to keep sand damp during this period. Monitor temperature and adjust as needed.
- 7) After two weeks unplug the mat and allow the grafts to cool down for a couple of days.
- 8) Remove grafts from the sand and litter box and pot them up in containers filled with commercially produced potting soil. Grafts will need to be oriented in an upright position. The top bud of the graft should be above the soil line, but the entire nurse root should be below the soil.
- 9) Lightly water the container(s) so that the soil is damp, not wet. Place each pot inside of a sealed bag or group the containers into one large bag.
- 10) Place the bag(s) in a refrigerator or cold basement area to go through dormancy. They should remain dormant for at least a couple of months.
- 11) Watch for growth from the grafts and remove them from the bags when they begin growth. The containers can then be placed in bright window or outside if conditions permit.
- 12) Do not over water the young grafts in the containers, as this is an easy way to kill them.
- 13) It is recommended that the plants be allowed to grow in the containers for the remainder of the growing season. The pots can be sunk into a protected garden area that is somewhat shaded. They will need to be monitored for water needs while they are in containers. In fall they may be planted in the garden like any other woody peony, making sure that the nurse root is approximately 4 to 6 inches below the surface.

or bark; straw or hay tends to mold and hold moisture excessively. During this period, the soil will continue to cool (due to the low angle of the sun) and the nurse roots can begin to grow. If healing was successful, the scions will also swell and elongate slightly (out of sight below the soil). Leaving the plastic on the grafting bed for a longer period often causes the grafts to begin growth, something that should not occur until the following spring.

8) As fall frosts begin to occur regularly, reapply the plastic for winter and mound soil along the edges to hold it in place. This prevents water getting into the area over the winter and it also makes it difficult for critters to get into. Some people apply another layer of mulch on top of the plastic for the winter for further insulation, but we have found this unnecessary. Freezing is O.K., but freeze-thaw cycles should be avoided.

9) In spring, as soon as you can possibly get into the garden, remove the plastic covering. Do this as soon as the snow is off and the ground. The soil may still be frozen, so some effort may be required. Since tree peonies begin growth when soil temperatures are very low, they may begin to grow and emerge in their protected environment. Removing the plastic will synchronize the grafts with the season. Loosen the mulch or remove mulch carefully.

New grafts will begin to appear soon after the frost leaves the ground. Some late risers can be expected, so don't be impatient and begin digging around looking for them.

Leave the grafts in their bed for 2 to 3 years and transplant them to their final growing location. At this time they should be planted more deeply, so that further root formation can take place from the woody stems.

**Method 2 (indoor healing):**

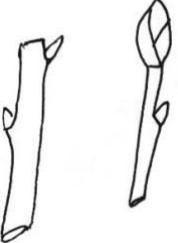
This method may be better for grafters that prepare a few grafts per year or for those that have an outdoor environment that makes it difficult to heal grafts.

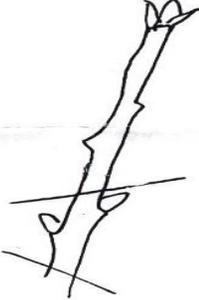
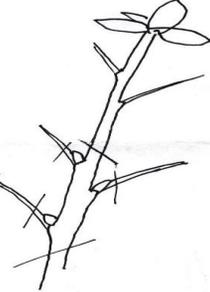
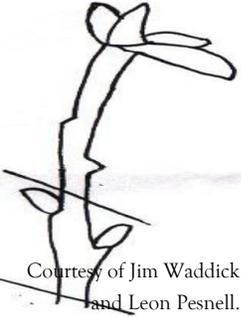
Needed materials: coarse or beach sand, seed starting mat, thermostatic mat temperature controller, cat litter pan, plastic bag.

1) Place seed starting mat on flat surface and plug it into the thermostat. Set the thermostat to 83 degrees Fahrenheit. Plug in the controller to a power source.

2) Fill a cat litter pan half full of damp coarse/beach sand. Place the pan on the mat for a couple of hours to make sure that the thermostat is working properly. The temperature does not need to be exactly at 83 degrees, but this is a good general temperature for healing.

Harvesting scions does not necessarily reduce the number of flowers that plants will produce the following year. In fact the donor plants generally show more vigorous growth the next spring. This is especially true with the lutea hybrids, while the suffruticosa and rockii complex hybrids are more reliant on old wood for flower production.

		 <p>Courtesy of Jim Waddick and Leon Pesnell.</p>
<p>Scion with terminal flower bud</p>	<p>Terminal growth showing two different scions</p>	<p>(Left) Trimmed scion without a terminal flower bud (Right) Trimmed Scion with a terminal flower bud</p>

<p>More examples of scions</p>		
		 <p>Courtesy of Jim Waddick and Leon Pesnell.</p>
<p>Terminal shoot showing leaf axils without buds and a suitable scion below</p>	<p>Terminal shoots with spent bloom and a suitable scion below</p>	

Scions are cut a day or two before grafting (convenience only) and placed in plastic bags with their name written on a label in the bag. They are kept cool, but not refrigerated. Scions do need to be kept damp during storage, so a bit of damp paper towel wrapped around them helps keep their vitality.

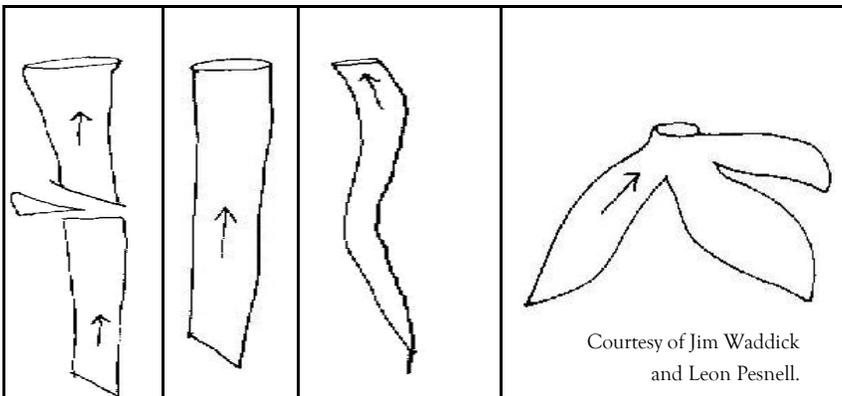
### Nurse Roots

Nurse roots serve as a temporary root system, until the woody peony scion can produce its own roots. Any lactiflora cultivar's roots work, but it is recommended to choose a rapid grower, that is disease resistant and easily heals to tree peony scions. This may take some experimentation. The use of herbaceous hybrid roots is not recommended due to their propensity to produce adventitious growth, which tends to overtake the tree peony over time.

### Preparation of Nurse Roots

1) Dig a clump of a herbaceous cultivar. Roots should not be old and woody, but may be large in size. Contrary to printed material on grafting, large roots work equally well as small roots (perhaps better due to their greater energy storage). Save all roots unless they are damaged, diseased, woody or far too big or small to work with.

2) Roots are field dressed immediately after digging. This means cut off all the roots on the dug plant and place them in tubs in the field. It is important to keep track of the root orientation, since grafting must be done on the upward (crown) side of the root or the graft will fail. So, as the roots are cut, make sure the top gets a flat cut and the ends of the roots or root segments get an angle cut. You can then, later, identify the end that receives



a. Long root cut into two nurse roots. Note the wedge removed to give a flat top to the lower root and a slanted bottom to the upper root to maintain orientation. b. and c. Suitable nurse roots d. Unsuitable nurse root; difficult to graft on this mass or short roots.

day or two later.

3) On the day the grafts will be planted, remove the plastic from the prepared area and rework the soil. Take a moment to check that the soil feels warm to an approximate depth of 6 inches. A temperatures of 75°F to 85°F is a good soil temperature to promote healing. Unfortunately, the heating of the soil with this method is at the mercy of mother nature's ability to warm it adequately.

4) Plant grafts in the prepared ground that is damp and warm. An important point to remember is that dry or overly wet soil is a killer of new grafts. Plant grafts 1" to 3" apart, to limit the space needed to care for them during their first year of growth. Wide spacing of grafts also works, but requires more materials and a greater space to take care of. Since 100% of the grafts generally do not grow, large spacing between them will often leave even larger spaces where failure has occurred. The entire graft should be buried on its side (horizontally or parallel to the ground) to a depth of 3" to 4". Grafts should be planted so that the top of the scion is 2" to 4" inches below the surface. Grafts buried on their sides will grow out of the soil the following year in an upright position, while the roots will remain parallel to the surface. This technique has proven to promote faster own root production from the scion after 2 or 3 years.

5) Press the soil down firmly on the grafts. Don't be a wimp, push hard, it creates better soil contact—thus better rooting.

6) Tightly cover the planted area with clear plastic to heat up the soil, thus promoting healing of scion to nurse root. The edges of the plastic may be buried with soil to keep it sealed and prevent the wind from catching it. Remember that the optimum temperature for healing is between 75 and 85 degrees. In warmer areas of the United States, overly warm conditions may require that the plastic is covered with mulch to keep the warming rays of the sun from overheating the grafts. Remember to label your scions carefully so that you know what your hard work has produced in coming years. The plastic cover keeps out rain water, which would course through the soil, waterlogging it and penetrating the wrapping of the grafts (—not 100% waterproof—contaminating the joined surface with decay organisms). The grafting bed should remain covered for approximately two weeks. If winds blow off part of the plastic, repair it quickly, continuous warmth and freedom from rainwater is essential at this stage.

7) After two weeks the grafts are now presumed 'healed', the plastic sheeting can now be lifted and removed so air can cool the soil below. Mulch, with approximately 2" of material. Our recommendation for mulch is wood chips

Note: The use of budding strips and tape (film) is a two step process. Others have reported success without the use of Parafilm or grafting tape.

9) Place the finished graft in a bag with label. Add a few drops of water to the bag to keep the grafts moist. We've found that grafts that dry out, even slightly, often do not heal.

10) Clean and disinfect your cutting tools and surface with rubbing alcohol or other disinfectant before starting to graft another cultivar. This helps prevent the possibility of spreading a disease from one cultivar to another. You may also need to replace your cutting blade after 20 or 30 grafts are made.

### Planting and Healing Grafts

Grafted woody peonies need a period of warm damp time to heal. During this time the woody scion and herbaceous nurse root 'knit' together and become a single plant. The healing of the graft is easily as important as accurately joining the scion with the nurse root.

#### **Method 1 (open field or garden):**

1) Soil in the area that the grafts will be planted should be prepared to receive them a couple of weeks in advance.

A. Consideration should be given to the moisture content of the soil. Even moisture is important. Water the soil if it is overly dry.

B. Cover the area with black or clear plastic during this period to warm the soil. Covering the edges of the plastic with soil helps to trap heat that might escape during the day and night. This creates a 'greenhouse effect' under the plastic which nicely holds heat and water in the soil below the plastic.

C. Rototill or dig the area deeply just before planting is to occur. The goal is to break soil particles down to a small workable size. This makes planting easier and allows soil to be evenly filled around the new grafts. Chunky or blocky soil is difficult to work with and often leaves air spaces in the grafting bed that causes uneven heating, drying, etc... At this time, some people work peat, perlite or other amendments into the soil, but not fertilizer.

2) Cover the area with clear plastic if grafts are to be planted in the bed a



the scion. The left over crown stubs are placed in another tub for dividing and replanting later. In hot weather it helps the roots to stay hydrated and healthy by filling the tub with water.

3) Place the dug roots on a washing table (a large table that has a top made of hardware cloth mesh with half-inch openings works well). Use a hose with a spray nozzle to wash the roots, so that no soil is left clinging to the roots.

4) Fill a bucket or tub with water and add liquid bleach at a ratio anywhere from 10:1 to 20:1 (water to bleach). Inexpensive bleach works as well as expensive name brands. Mix the solution well, as bleach will stratify toward the top.

5) Place nurse roots into the water-bleach solution for 20 to 45 minutes. This will disinfect the roots so that they do not have soil-borne fungi, bacteria, etc... on their surface. The roots will change color from brown to cream or almost white.

6) Remove the roots from the solution and rinse them thoroughly on the washing table again.

7) Place the roots in a clean bucket or tub and cover it with a bag so that they do not dry out. Roots can be stored in a cool place (the back of our machine shed) until ready for use. Roots may be stored for two weeks like this with no ill effects. If they are stored for an extended period before use, they may need to be disinfected again with water-bleach solution. Visual inspection will tell you if this needs to be done.

### Grafting

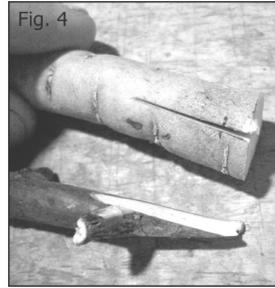
1) The following materials are used during the grafting process: A utility razor knife, new blades, budding strips (rubber bands approximately 5 inches long and 3/16<sup>th</sup>-3/8<sup>th</sup> inches wide), garden pruners/shears, rubbing alcohol, Parafilm or grafting tape (waxy tape material that may be stretched), quart size or larger plastic bags, hardwood cutting boards, a container of water, plant tags, pencil and markers. Keep nurse roots in bags to preserve moisture while working. Scions should be kept in bags with labels so that there are no mix-ups.

2) Select a herbaceous nurse root, generally a root of 3" to 6" works well. Short roots may not need to be cut to the desired length, but long roots can be cut in shorter segments. Once again it is important to



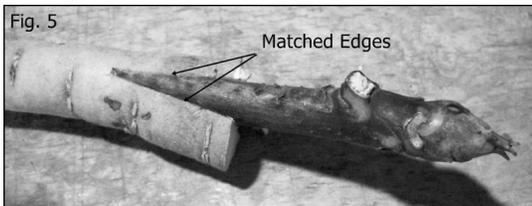
keep track of the up facing and down facing ends. Cut the down ends on an angle and the up ends on a flat perpendicular angle.

3) Keep the scions that are being worked with in a bag until they are to be used (drying of scions can impact viability). Select a scion and find a good matching nurse root. If the scions are large in diameter, the nurse roots should also be large in diameter. The nurse root diameter can be equal to or much larger than the scion's.



4) Place the nurse root on a clean cutting board. Flat-cut the top of the nurse root with a razor knife, so that the surface is fresh and clean. Then, from the top downward, using a razor knife, make a cut 3/4" to 1" in length through the center of the root. This divides the top part of the root into two portions. See figure 3,4 & 5. These portions will spread apart to accommodate the incoming "V" or wedge shaped scion. In his APS bulletin article, Bill recommended making two cuts and removing a wedge-shaped chip. The bisected portion can be spread apart to accommodate almost any scion. See figure 5. This is a departure from cutting a wedge that needs to accurately match the scion's cut. Creation of a 'cut out' in the nurse root is not necessary. Making the more simple cut saves time and provides two smooth, flat, matching surfaces without whittling away to remove a chip. In some instances, if the scion is very short, fat, and stubby, chip-removal might be advantageous so that scion stays seated in the nurse root.

5) Cut the basal end of the scion into a "V" or wedge shape. See figure 4. The "V" should be longer than it is wide and must be able to fit into the cut in the nurse root. The "V" cut may be done in two strokes, if you are practiced, by simply holding the scion with the base facing away from you and cutting



down and away with the razor knife. It is important that the surface that is created on the scion be flat. A fast and firm cutting motion generally produces this, while "whittling" often creates ridges, high points and a variety of problematic surfaces. If the "V" is longer on one side than the other, this is usually not a problem. In fact the "V" can even be off center, looking wider on one side than the other. The cut in the nurse root will accommodate this as well. The length of the "V" does not need to match the length of the cut in the nurse root. However, it cannot be longer or the cut surfaces of the scion will not be covered. See figure 7.

6) Once the scion has its "V" cut and the nurse root has its cut, slide the scion into the cut. You may need to push the scion into the nurse root with some force. Make sure that the entire "V" surface is below the top of the nurse root. Figure 7 shows a scion that is not seated deeply enough, the entire cut surface needs to make contact with the nurse root. It is fine if the "V" is well below the perpendicular cut top of the nurse root. Align an uncut edge of the scion with one of the outer edges of the nurse root. See figure 6. This practice assumes the vascular bundles that carry water and nutrients through the roots are near the outer portion of the nurse root, thus centering the scion would cause no contact between scion and the area that will accept growing material (the validity of this still needs to be explored). Press the two sides (portions) of the nurse root against the "V" of the scion to visually inspect the way the scion and nurse root contact each other. See Figure 5 and 6. In most instances, if the "V" has good flat surfaces, there will be a perfect matching of nurse root to scion surface. If you can see light shining between surfaces or there isn't a clean match, remove the scion, re-cut your "V" and repeat the insertion.



7) With the scion inserted into the nurse root start at the top and firmly wrap a budding strip or rubber band around the entire cut area. This will pull the nurse root and scion surfaces together tightly and increase the chances that they will heal together. Some gaps between the wound strip or loops are O.K. Enough of the budding strip needs to be left over to tuck it under the last loop (this takes a little practice). Some larger roots may need to have a strip of



greater length. This can be accomplished by tying two strips together or simply using two strips and applying them independently. When the girth of the scion is less than that of the rootstock, the sides on one side of the cut will match; the opposite sides will not. This projection of unmatched rootstock (shoulder) need not be cut off, as doing so does not make a difference in the success of the graft. See figure 6.

8) Using a strip of Parafilm grafting tape, wrap the entire area from the bottom of the cut to the first 1/4<sup>th</sup> inch of the scion protruding from the nurse root. More of the scion may be covered without impingement. In fact, the entire scion can be covered with Parafilm or grafting tape. The tape (film) acts as a barrier that keeps disease and water from entering the area that needs to heal. As the plant grows, covered buds will grow through the tape with ease.