**OUTLINE OF TOPICS FOR CLASS ON SUMMER CHIP BUDDING**

**Terminology:**

There are certain technical terms that are useful in understanding the process of successful chip budding. The material in quotes is from Hartmann and Kester’s Plant Propagation: Principles and Practices (7th Ed.).

1. “Grafting is the art of joining two pieces of living plant tissue together in such a manner that they will unite and subsequently grow and develop as one composite plant.” One of the two parts will form the new shoot system of the graft (referred to as the *scion*) and the other part will form the new root system (referred to as the *rootstock, understock,* or *stock*).
2. “Budding is a form of grafting in which the scion consists of a single bud and a small section of bark . . .” There are several budding techniques, the most common of which are T-budding and chip budding.
3. “Vascular cambium is a thin tissue located between the bark (periderm, cortex, and phloem) and the wood (xylem). Its cells are meristematic; that is, they are capable of dividing and forming new cells. For a successful graft union, it is essential that the cambium of the scion be placed in close contact with the cambium of the rootstock.”
4. “Callus is a term applied to the mass of parenchyma cells that develop from and around wounded plant tissues. It occurs at the junction of a graft union, arising from the living cells of both the scion and rootstock. The production and interlocking of these parenchyma (or callus) cells constitute one of the important steps in callus bridge formation between the scion and rootstock in a successful graft.”

**Versatility of Chip Budding:**

Chip budding can be used in dormant season grafting in both bench grafting and frameworking (also called topworking) of smaller limbs on established trees. In the growing season, chip budding is rapidly replacing T-budding for summer budding tasks. T-budding can only be done in August, when the bark slips. In our climate, chip budding is usually done during the first couple of weeks of August, but can also often be successfully done in late July and late August. In addition, southern parts of the US can use this technique in June.

Chip budding can be used to (a) propagate new single-variety trees, (b) create combination trees – for example, more than one variety of apple on an apple rootstock, (c) add a pollinator branch to an existing tree, or (d) topwork existing trees (for example, convert an apple of one variety that that has fallen out of favor to a new, more desirable variety).

**Selecting and Preparing Scionwod (also referred to as budwood or budsticks):**

Budsticks are collected from the current season’s growth. The best buds on the budstick are the mature “resting” ones found in the middle of the stick. The ones on the top end are usually not adequately mature and those on the base end are often flower buds. After selection of the budstick, the leaves are cut off toprevent desiccation (drying out), leaving a short stem, known as the petiole. The short section of petiole serves as a small handle for the scion (you should not touch the cut surface of the chip so a handle is handy) as it is positioned in the cleft created on the rootstock to receive the chip. Although the budsticks can be refrigerated in a plastic bag with a piece of moist paper towel for a period of time, the buds should be used as soon as possible to maximize the take rate of the buds.

**Optimizing Condition of Budwood and Understock**

If possible the trees from which the scions are taken and the understock should both be well watered prior to budding.

**Preparing the Notch or Cleft, Cutting and Placing Buds:**

 The pictures, diagrams, and commentary associated with making the cuts and placing the buds are on <http://thefruithouse.weebly.com> (“Grafting”, “Chip Budding”). After wiping the surface of the understock clean, the notch or cleft to receive the bud is made on a straight, uninterrupted (no buds) section of the understock. The bottom cut at 20 to 45 degrees serves two functions. It serves as a shelf on which to rest the bud while you wrestle with getting it aligned and properly tightly covered with unwieldy polyfilm. The other function is to increase the surface area where the cambiums of scion and understock make contact.

 Note that when cutting the bud to be placed in the notch or cleft, as the knife is drawn under the bud (#3) you usually encounter resistance due to the concentration of fibers at that location. When under the bud use your wrist to rock the knife through the resistance (alternately you can use the wrist to “saw” the knife back and forth under the bud), once through the resistance proceed with a slicing motion down to meet the angled cut used to initiate forming the chip.

 The callus bridge is formed in the zone between the edges of chip bud and the edge of the cleft created in the understock to receive the chip bud. When you cut the chip bud, you use the same two types of cuts that were used to create the cleft. Match the chip bud size to the size of the cleft created in the understock. You cannot recut the tiny chip to change its size, but you can make additional cuts on the cleft to get it the right size to receive the chip bud. You do not want any part of the chip to overlap the receiving cleft. Even though an overlap seems harmless, it prevents cambial contact in that section of chip. You are better off to have a little more space between cambial layers in a section of the zone between the chip and the receiving cleft than to have overlap. Avoid touching the cut surface of the chip bud (natural oils and dirt from your skin can interfere with the callusing process). Hold onto the leaf stem (petiole).

**Wrapping & Labeling:**

 The objective of wrapping is to press the chip tightly against the understock for optimal contact between them and create a moisture-tight barrier so that the cut surfaces do not dry out while the union is being formed. Start at the bottom, overlapping as you go up. If wrapping with parafilm, you will find it sticks to itself, you can cover the bud with one or two layers and the bud can grow through it. If using polyfilm or budding rubbers, you will need to tie them off at the top and carefully cut them the following spring to allow for growth. Do not cover the petiole (instead crisscross around the petiole). Label the variety of both the scion and the rootstock (e.g., “Nero on G. 30”).

**Inspection of Viability:**

 Much of the callusing activity takes place during the first two days after placing the bud. Over the first couple of weeks the union between scion and rootstock is established. Inspect the bud for survival after 4 weeks. A successful chip bud will have a healthy color like the budstick from which it was taken (not dried out) and have a petiole that will sough off when touched. If the petiole is rubbery and doesn’t slough off then likely the bud did not take and has shriveled up and did not form a successful union with the stock. If the bud appears to have been successful, indicate that on the label with the date inspected. If the bud appears to have failed, indicate that on the label with the date.

**Initiating Growth In The Spring:**

 Just before growth begins in the spring, cut the stock just above the location of the chip bud. Also remove any wrapping material that might be left on the stock. Removing the stock above the chip bud will cause this bud to form a strong shoot that will display apical dominance by growing straight up without the formation of side shoots or flower buds. A couple of weeks later come back and remove any competing shoots coming up below the chip bud. If the chip bud was part of a top-working or frameworking project, guide the shoot out at a 45 to 60 degree angle to stimulate the formation of flower buds.