Queens for Pennies

or

How to produce about 8 queens

for a couple of bucks in less than a month

This Powerpoint presentation goes with my article "Queens for Pennies" at ScientificBeekeeping.com.

This method is for the recreational or sideline beekeeper who only needs to produce a few queens.

This is not how we produce queens commercially. If you want a Powerpoint on how to produce queens on a larger scale, skip to the end of this presentation.

It’s easiest, and you’ll get the best queens and matings if you rear queens during normal swarming season.

Best results during swarming season

Set up a queenless starter/finisher containing:

- A frame of pollen
- A frame of young brood
- Lots of nurse bees

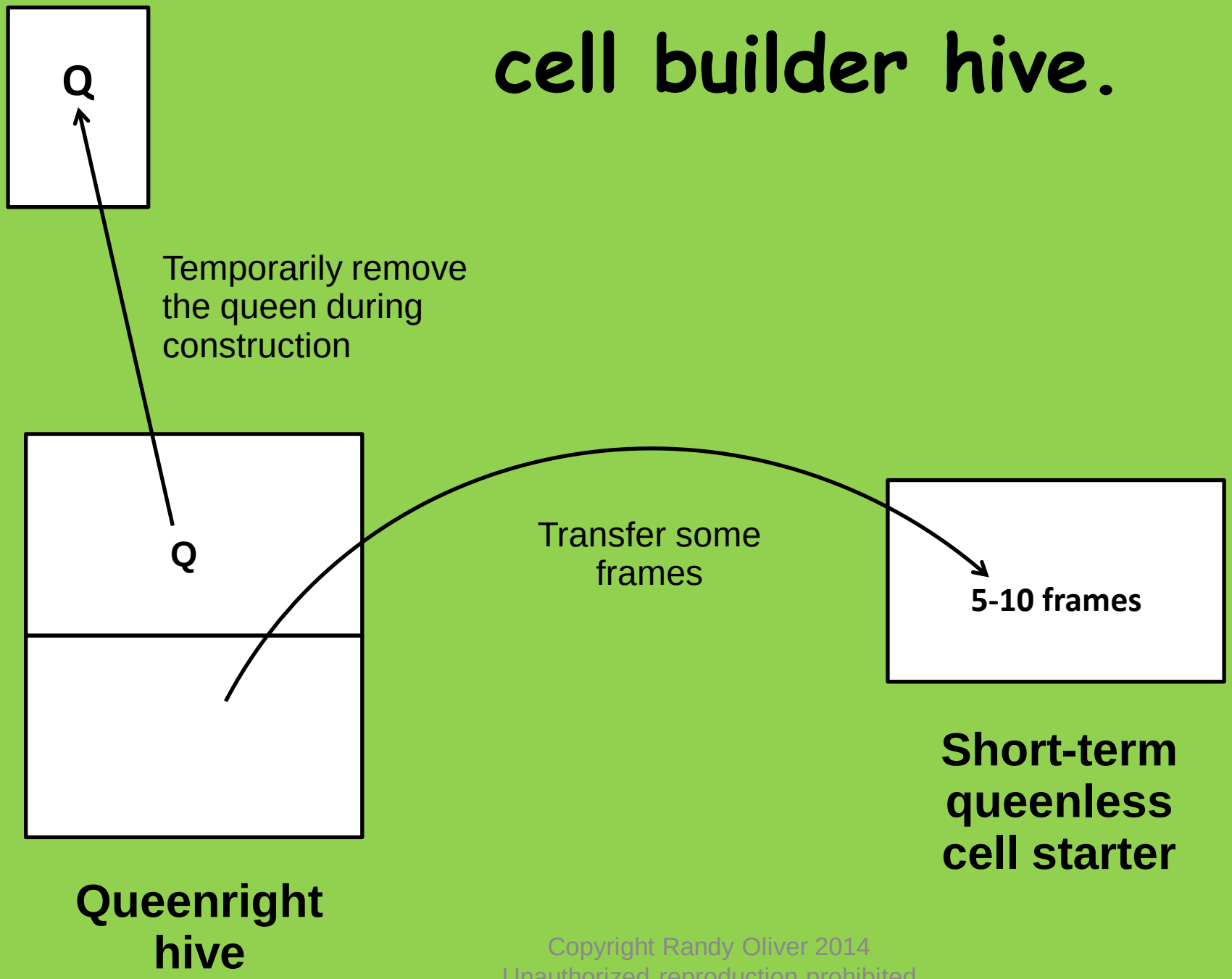
This simple method uses a queenless starter-finisher colony (the cell builder).

- **Start by selecting your breeder queen colony.**
- **You can use either that colony or another strong, healthy colony to set up the cell builder.**
- **Set up your cell builder in an empty brood chamber on a bottom board set at least a few feet away from the parent hive.**

***or above another colony, over a swarm board, to transfer heat in cold weather.**


First make sure that you have some 1st-instar larvae to graft from.

Then prepare a queenless cell builder hive.



Use bees from a colony with plenty of emerging brood.

Assemble your cell starter from a strong healthy colony

You don’t want to disrupt the bees any more than necessary.

Approach the queen from the rear, and pick her up by both wings with your thumb and index finger.

Remove the queen

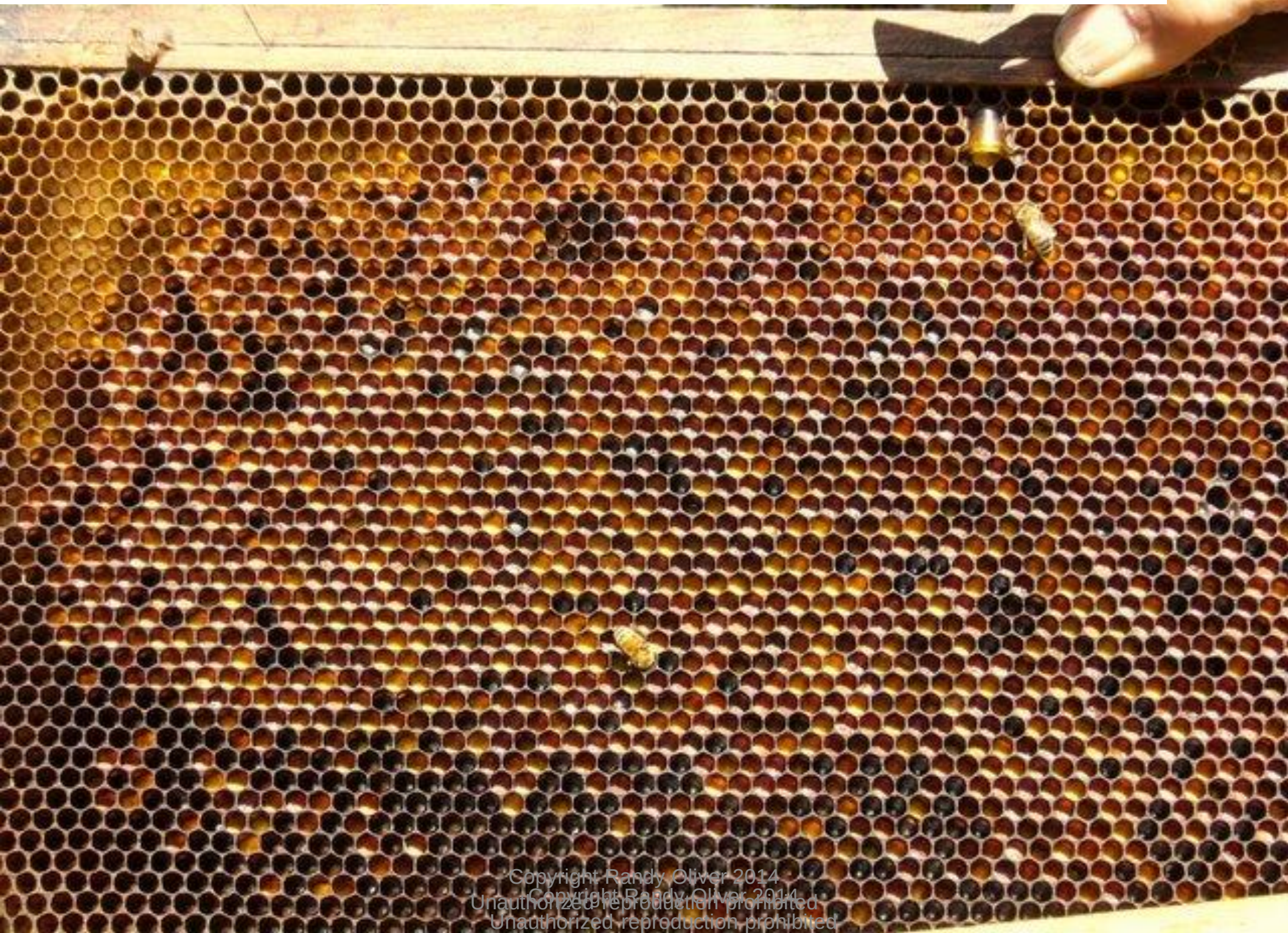
I keep a nuc box handy in which to place the queen on her frame. This tip saves you from misplacing the queen

Place her aside for safekeeping

Look in the lower brood chamber, second frame in from either side, the side facing toward the broodnest.

Find a frame of pollen

A frame of mixed colored pollens is most likely to provide complete nutrition. Or make a frame using frozen natural pollen.



A patch of newly-emerging larvae will produce the pheromones that attract the nurse bees to the queen cells, and stimulate the nurses to produce abundant royal jelly.

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I like to set up my cell builder away from the parent hive, so that the older bees will fly home and take care of the queen. This method uses a single-story queenless cell starter/finisher. Commercially, I use a queenless starter, and the next day put it over a queenright finisher over a queen excluder. Queenright colonies are less prone to sting.

With enough bees to cover all frames and hanging from the lid

Shake extra bees from brood frames

Shake from frames of open brood (larvae).

Lots of nurse bees

You can shake from more than one hive—the old bees fly home; nurse bees remain where shook, and don't fight.

You want the cell starter packed with bees, until they cover the frames and hang like grapes from the lid. The colder the weather, the more bees you want, so that the cells don't chill.

The next few slides show how I use a sieve box (a medium super with a queen excluder screwed to the bottom to keep from inadvertently shaking a queen into the cell starter). The sieve box works better if lined with sheet aluminum.

Sieve box

Place the sieve box over the box that you wish to add young bees to. In this photo I'm using it over a cell starter placed above a swarm board, which we do for commercial production.

Old bees fly home!

Say “old bees, fly home” with gusto, and they will immediately obey your order! Only the young bees suitable for rearing queens will go down through the excluder.

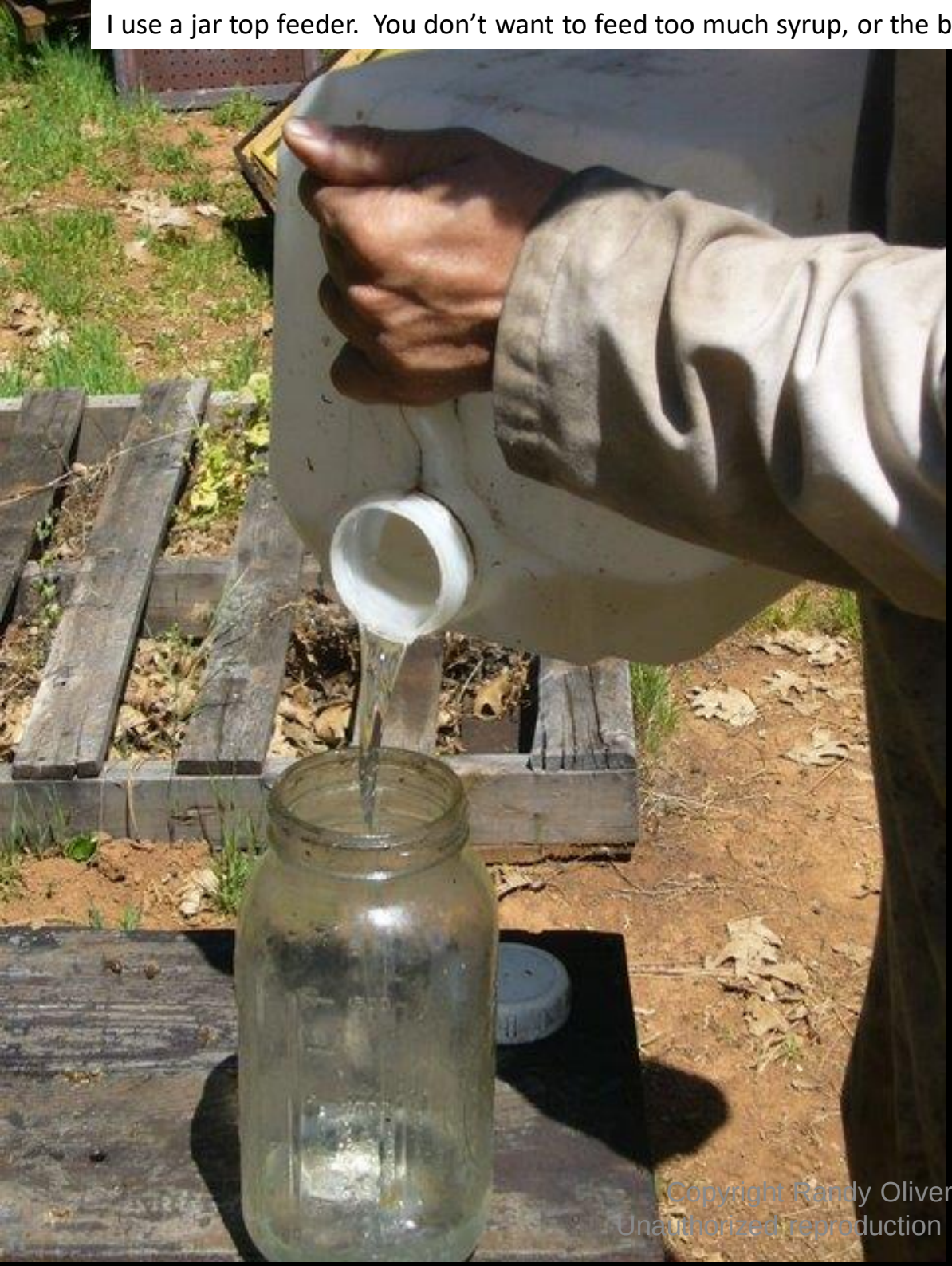
Gently brush the bees down off the sides, using a minimum of smoke around the edges to guide them down.

Make sure that there is no queen in the cell builder!

Optional: I add the frame of “hatching” eggs from my chosen breeder queen at this time. This allows the bees time to flood the cells to be grafted with extra jelly, which also makes for better grafting. I remove this frame in a few hours to graft from (brush the bees, don’t shake) and then do not put it back into the starter.

If nectar shakes from the bees when you shake them, you don't need to feed; otherwise give them a light drenching with 1:1 sugar syrup.

I use a jar top feeder. You don't want to feed too much syrup, or the bees will build comb around the cells.



Feed if no nectar flow

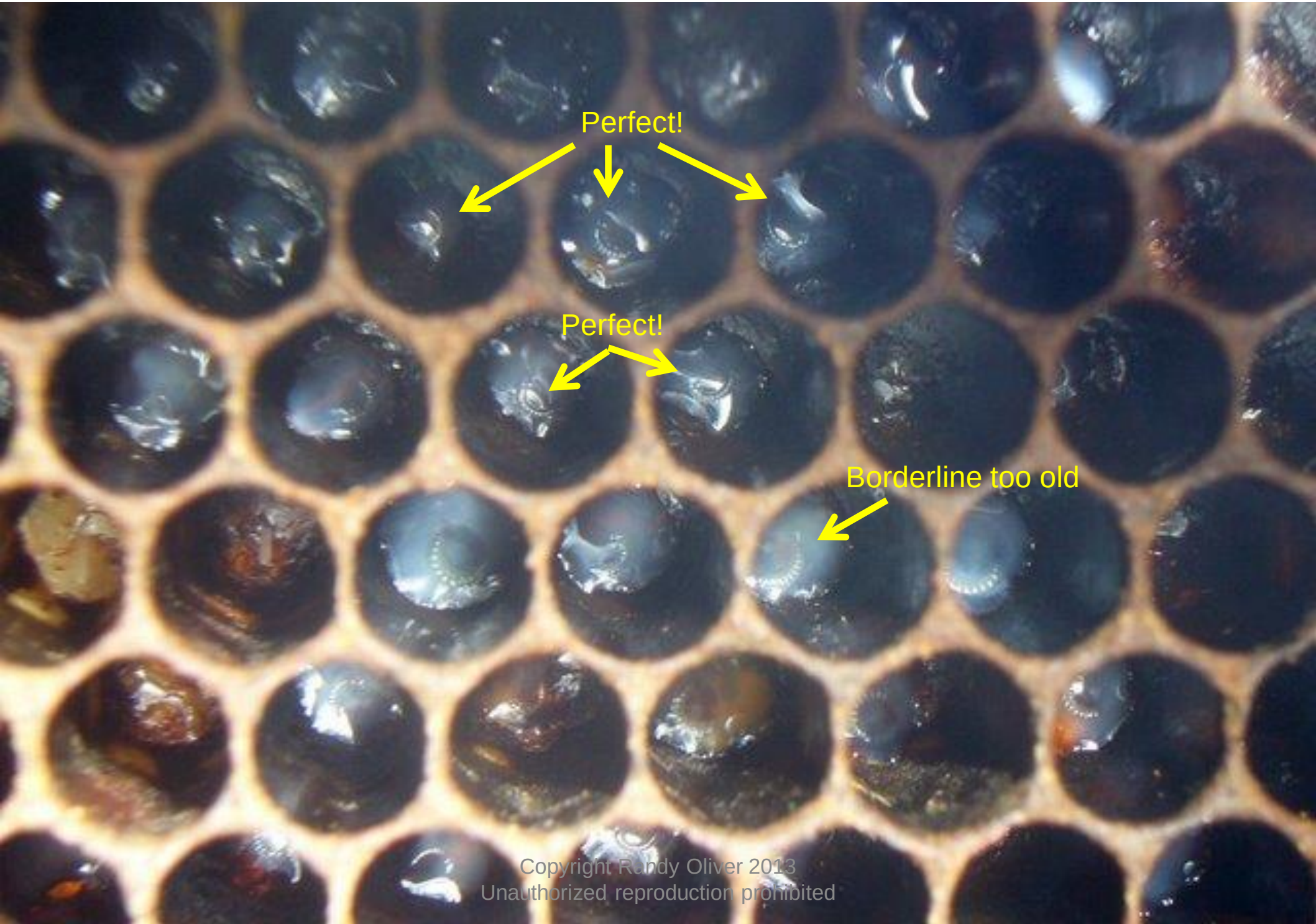
Wait a few hours...

Right-aged larvae may only have been fed a little jelly. They should be about the length and diameter of an egg.

Graft freshly-emerged larvae
(less than 24 hrs old)

After their first moult, the larvae are too old to make good queens.

The younger you start the larvae, the better the queens. The larvae in the top three rows are the right age. Only graft from an older dark comb, since the bottoms of the cells with then be rounded. It is difficult to graft from new combs.



You can use natural cell cups cut from the combs, but the bees prefer the plastic cups, and there is no chemical contamination of wax to affect queen development.

This is one way that we do it commercially; about 17 cups on a bar, three bars per starter.

Plastic cell cups

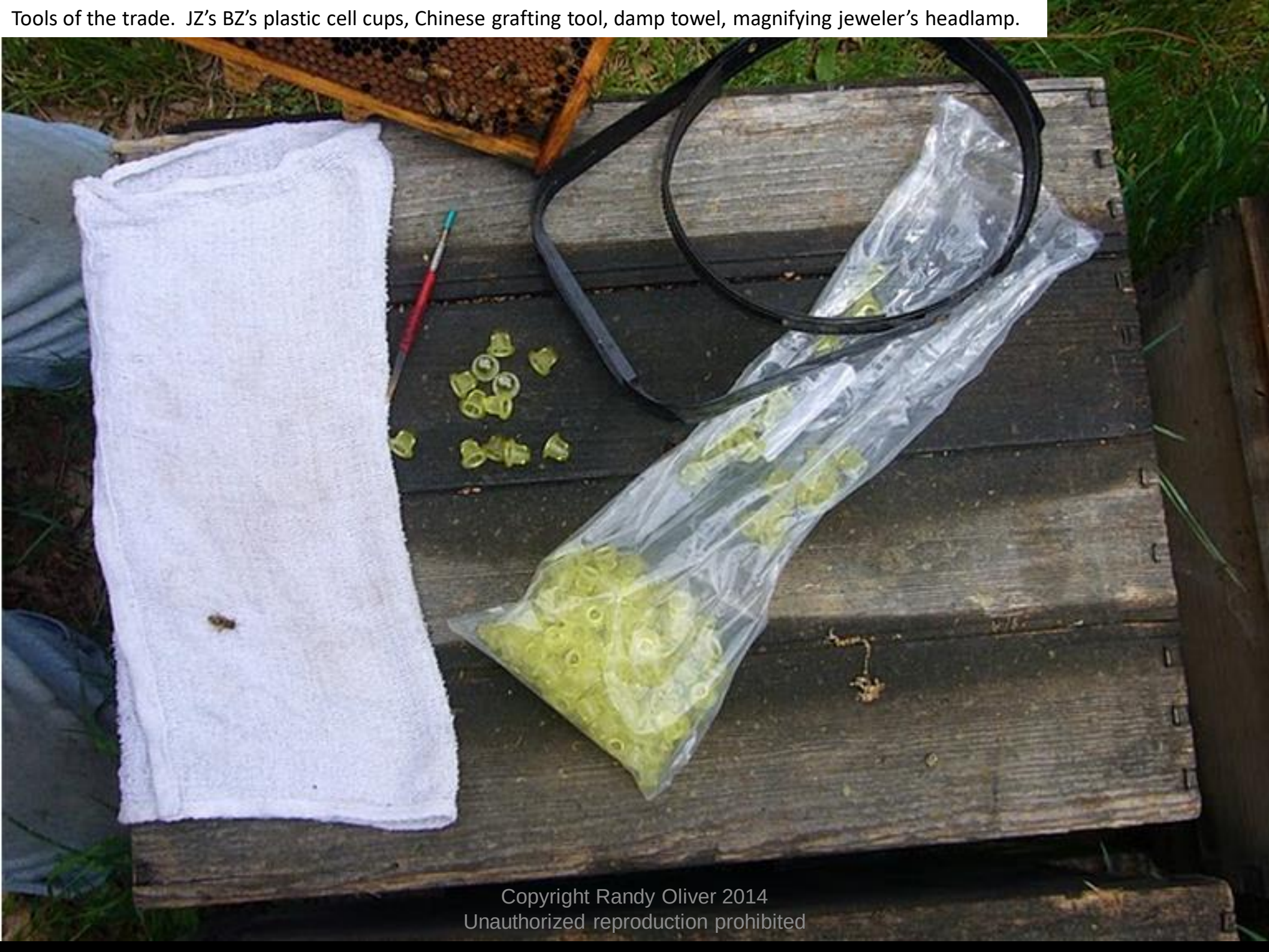
The bees will choose plastic cups left in the combs over natural cups when they raise supersedure cells! I see it time and again.

These natural cells in this colony is what gave me the idea for this simple method.

All you need to do is to scrape a channel in the comb on either the pollen or young larva frame. This creates a space for the bees to draw out the queen cells that we are going to add.

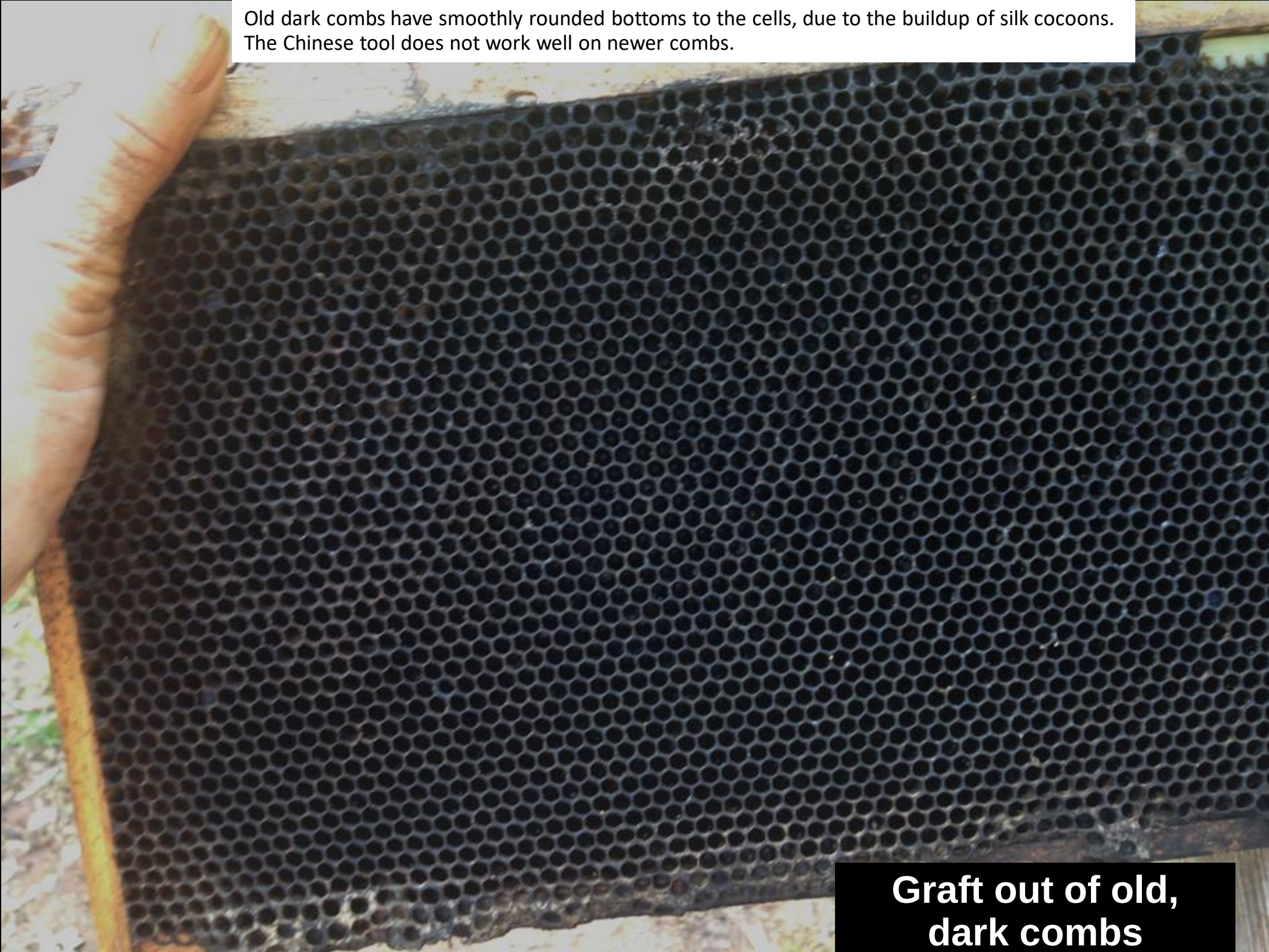
GRAFTING
(It's really easy!)

Tools of the trade. JZ's BZ's plastic cell cups, Chinese grafting tool, damp towel, magnifying jeweler's headlamp.



Chinese Grafting Tool

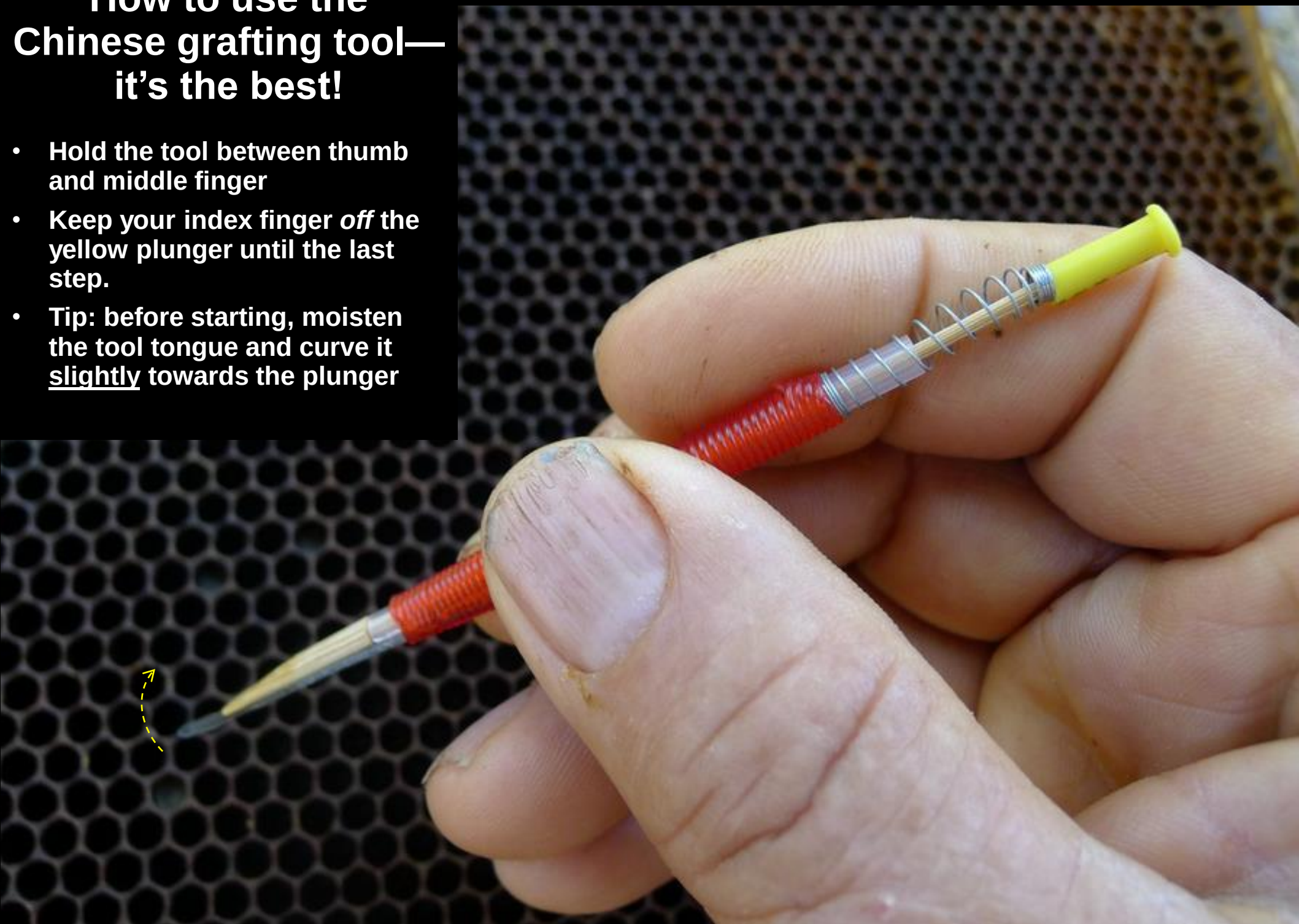
Old dark combs have smoothly rounded bottoms to the cells, due to the buildup of silk cocoons. The Chinese tool does not work well on newer combs.



Graft out of old, dark combs

How to use the Chinese grafting tool—it's the best!

- Hold the tool between thumb and middle finger
- Keep your index finger *off* the yellow plunger until the last step.
- Tip: before starting, moisten the tool tongue and curve it <u>slightly</u> towards the plunger



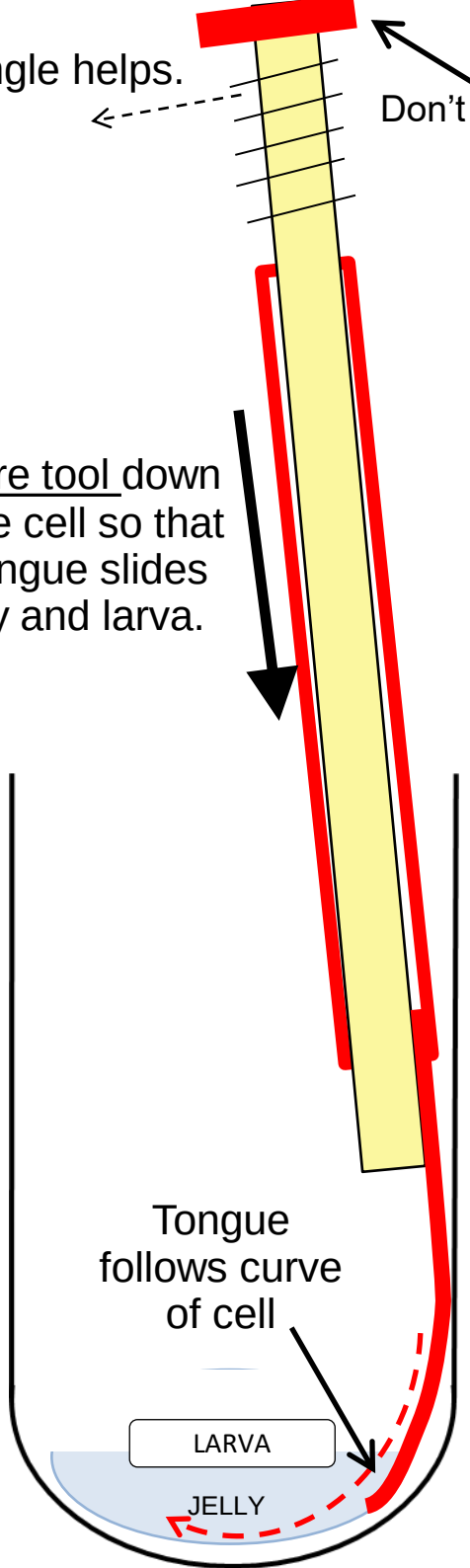
Step 1: slide the tongue down the cell wall

A slight angle helps.

Don't touch the plunger tip yet!

Good instructions at:
http://talkingstick.me/bees/grafting-tools/

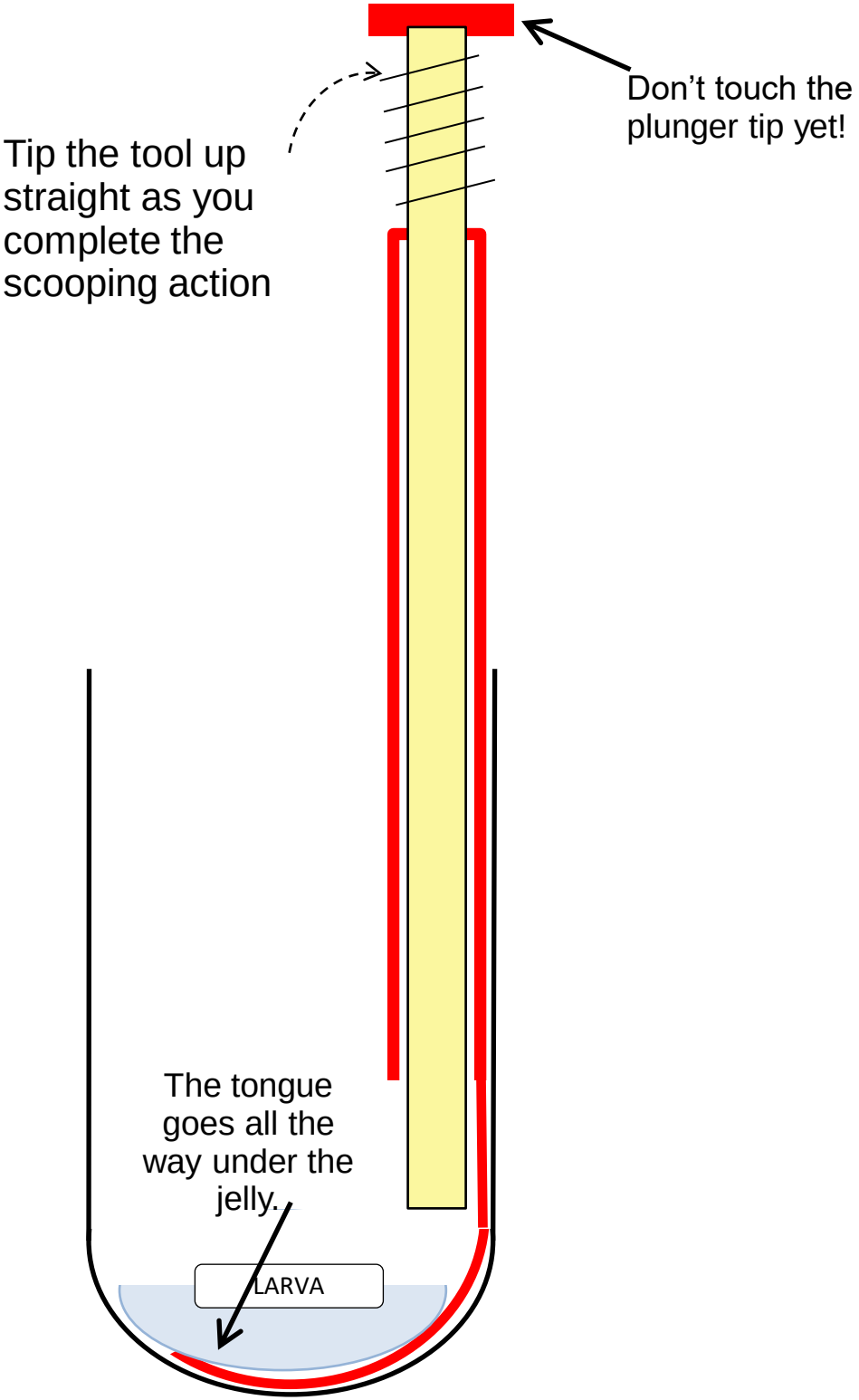
Push the entire tool down the side of the cell so that the flexible tongue slides under the jelly and larva.



The Chinese grafting tool works best in an old, dark brood comb in which the bottoms of the cells are ***well rounded.***

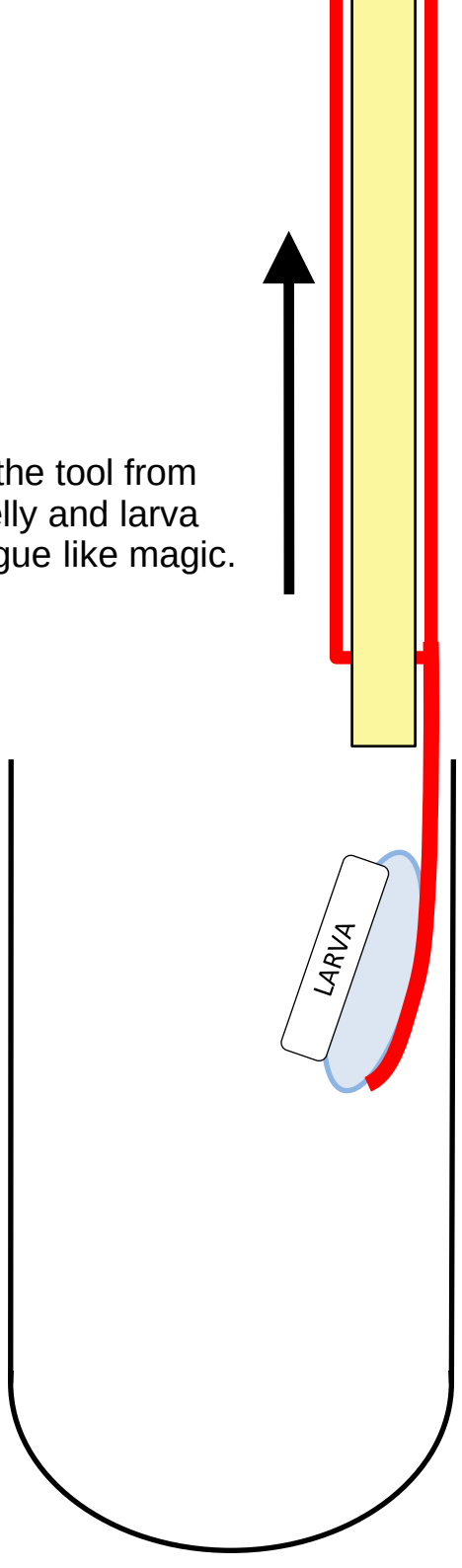
It will not work well in new white combs!

Step 2: scoop under the larva and jelly



Step 3: lift the larva and jelly from the cell

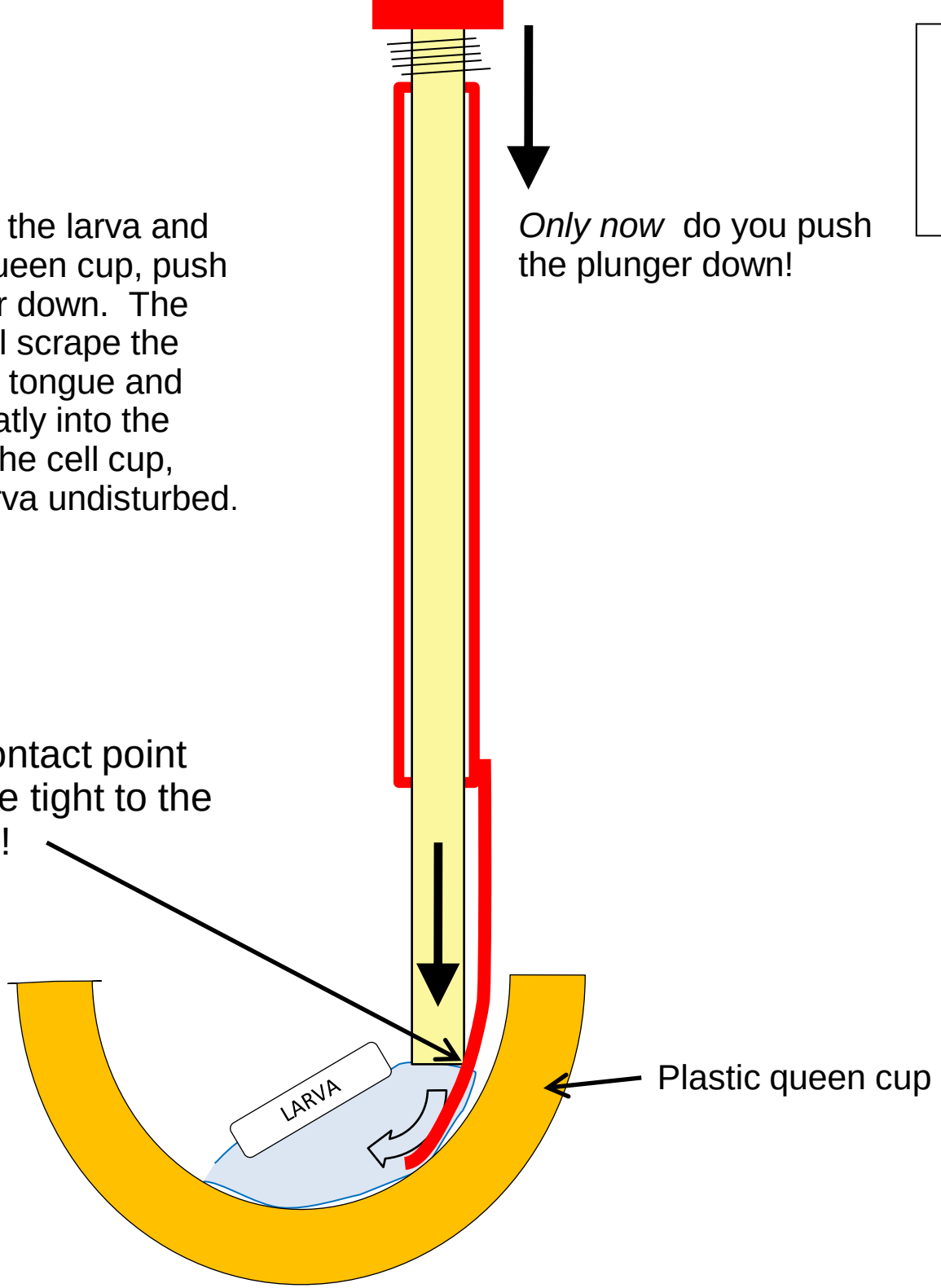
Now withdraw the tool from the cell. The jelly and larva stick to the tongue like magic.



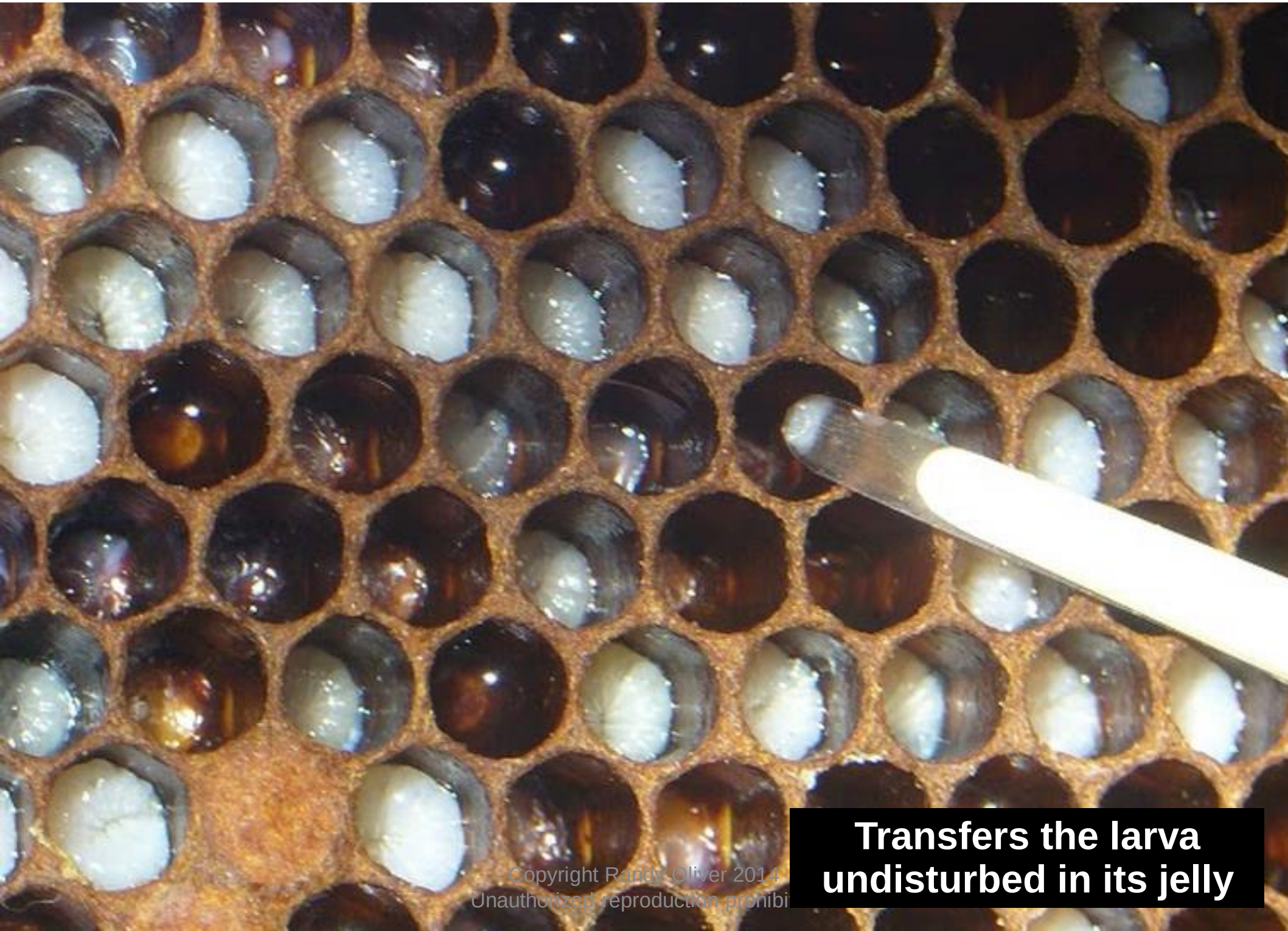
Step 4: transfer the larva to the cell cup

To transfer the larva and jelly to a queen cup, push the plunger down. The plunger will scrape the jelly off the tongue and place it neatly into the bottom of the cell cup, with the larva undisturbed.

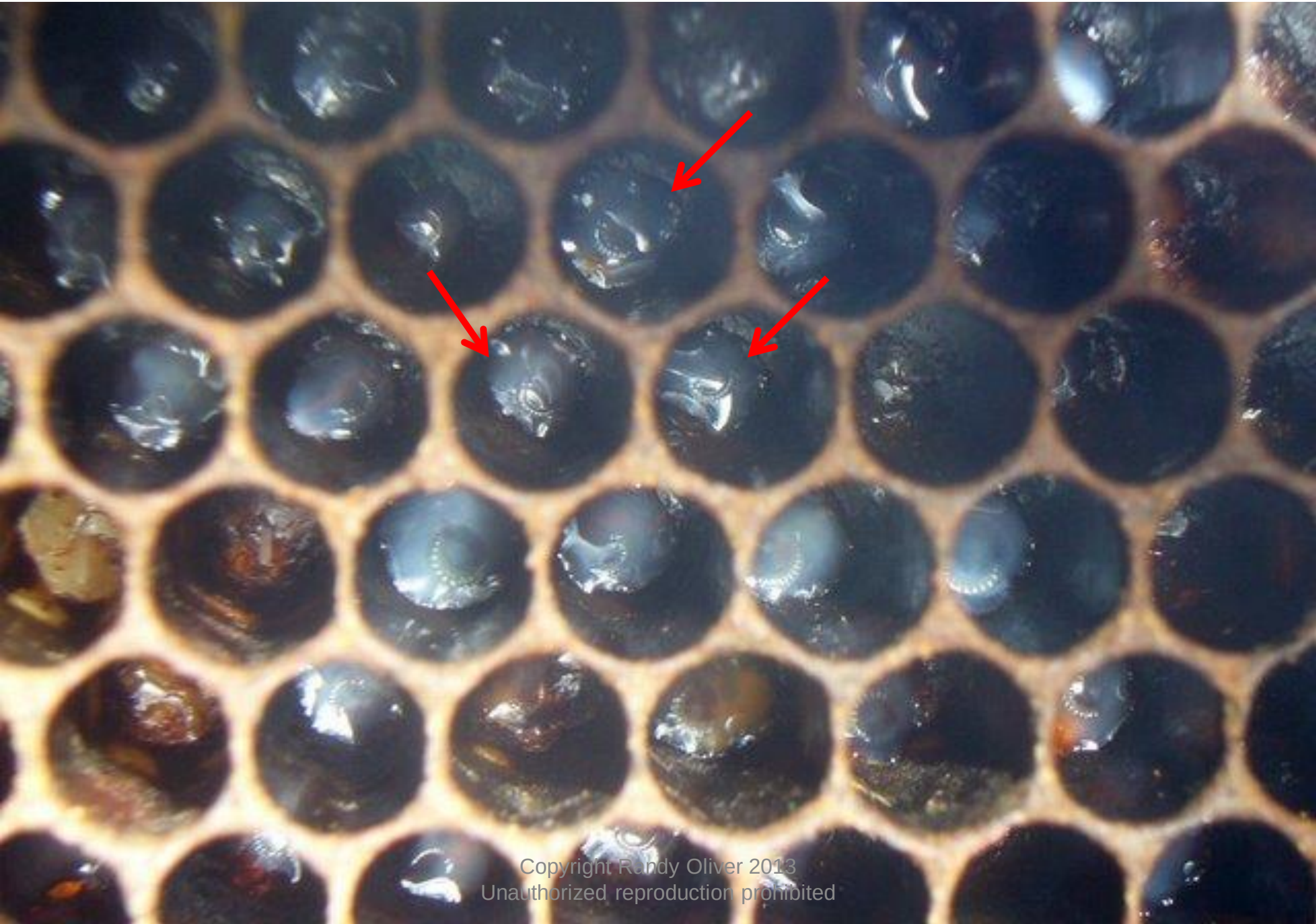
Only now do you push the plunger down!



The tool in use, having lifted a larva and its jelly. The larva is not disturbed. The entire process of grafting a larva should only take seconds.



If you inserted the grafting frame into the cell builder a few hours earlier, you can graft slightly older, well-fed larvae like the ones indicated.



High humidity

In our dry California weather, it's critical to keep the larvae from drying out. Chilling does not appear to harm them.

If you're over 40, it's far easier to graft in a very dark room! Here I'm using a jeweler's magnifier, with a backpacking headlamp centered on my forehead. This makes grafting much, much easier. I'm grafting into a cell bar—you can graft into hand-held cell cups.

Toggle this slide and the previous one back and forth to see what grafting looks like.

This lighted magnifier works well for grafting in either daylight or a darkened room. And if you're over 40, it's pretty damn handy to have for any sort of close-up work!

Use the 1.5x or 2x lens.

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Carson Optical Pro Series MagniVisor Deluxe Head-Worn LED Lighted Magnifier with 4 Different Lenses (1.5x, 2x, 2.5x, 3x) (CP-60)

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Here I'm showing off to a class by grafting in full sun out in the bee yard. Do not allow direct sunlight to hit the larvae!
Tip: if humidity is low, I mist the insides of the cells *very lightly* with water before grafting, and keep them face down on a damp towel.

As you graft each cell, place it face down on the damp towel. The larvae won't fall out.

Once you've grafted a dozen cells, you can press them into the top of the scraped channel, ¾" on center.

A closer view.

Here’s a grafted larva and jelly in the bottom of a cell cup.

A closer view of grafted larvae with the cups in a wooden cell bar.

Do this quickly so the larvae don’t dry out.

Now drop this frame back into the cell starter. Again, pollen facing young larva.

Here you can see the cups half full of jelly, and the bees starting to draw the wax cells. Two cells didn't "take."

This is how they'd look from the bottom—the future queens floating in jelly.

Two days after grafting. Cups now full of jelly, other than the one that didn't take.

Top view. You don’t need to pull the frame to check on how many took—you can see those with jelly through the clear cups.

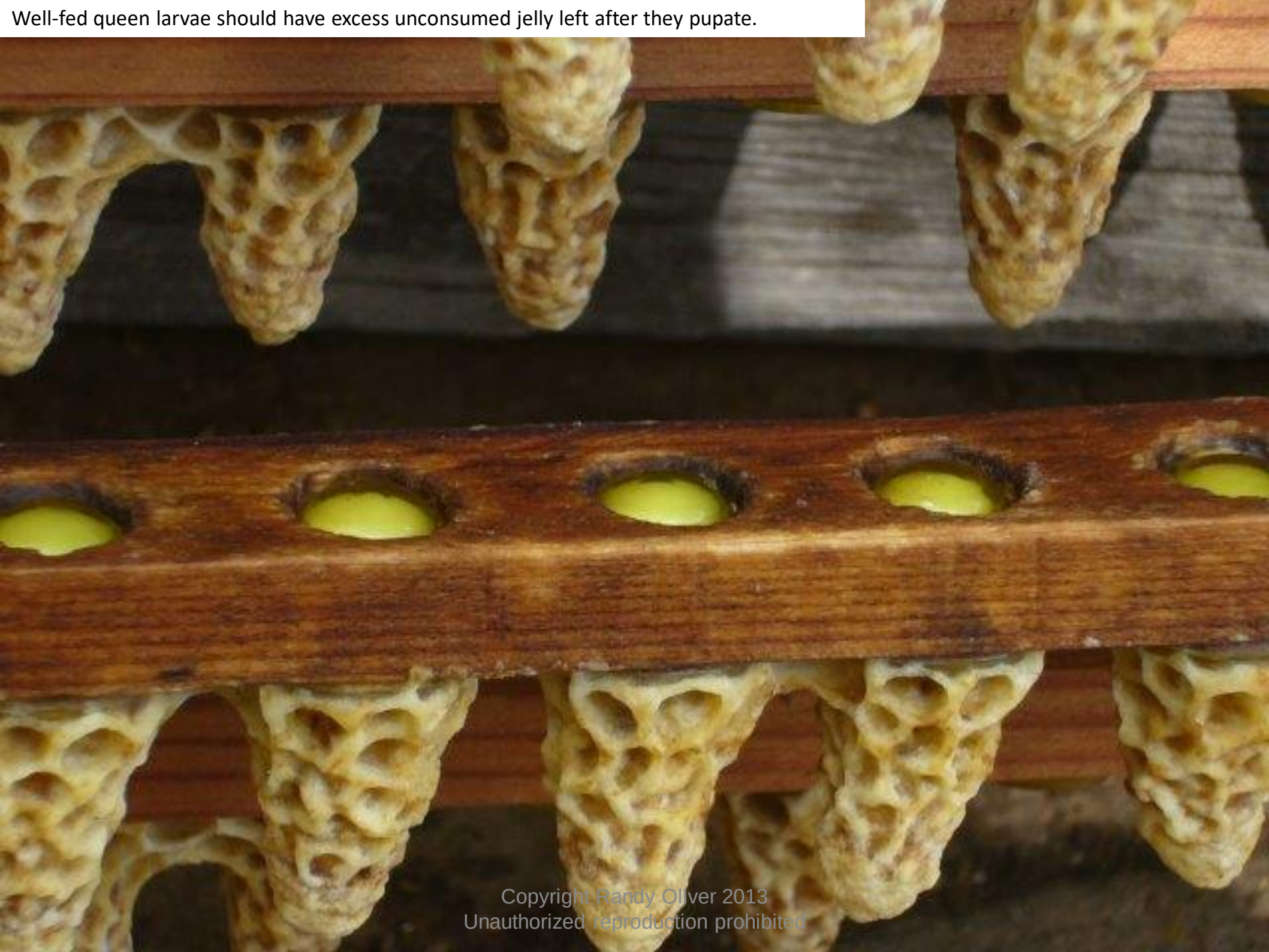
The cells develop rapidly.

At about 4 days after grafting, feeding is complete, and the workers will start to cap the cells.

The next six slides are how I do it on larger scale.

If there is a nectar flow on, the bees may build burr comb around the cells. You can carefully cut it off.

Well-fed queen larvae should have excess unconsumed jelly left after they pupate.



I generally put the cells into a home made incubator for safekeeping the last two days before emergence. You do not need to do this.

Oops! Screw up on timing. These virgins hatched out early!

Queens usually emerge on Day 11-12 after grafting.

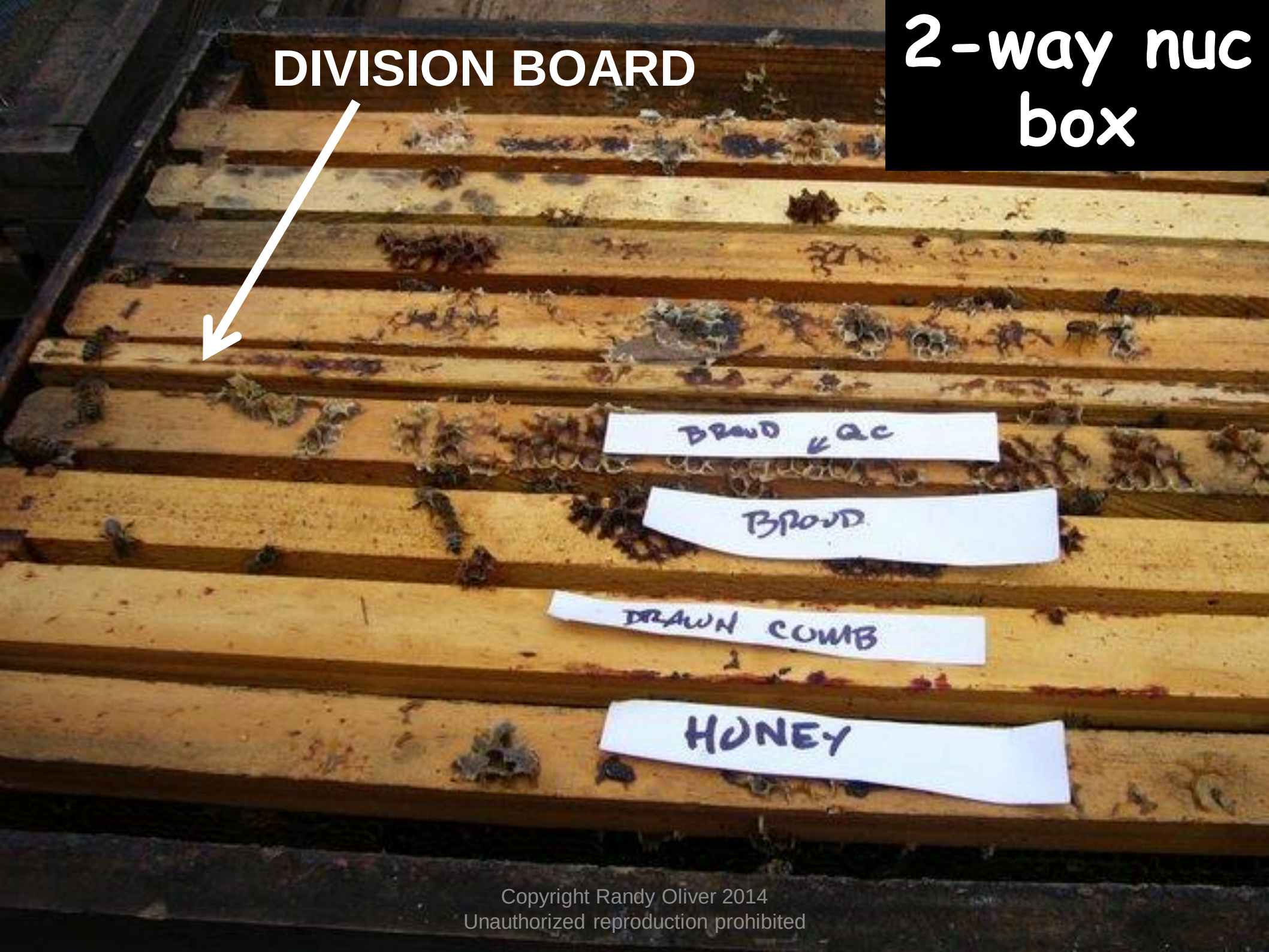
Make up mating nucs on Day 9 or 10.

You now need to make up a queenless nucleus hive (nuc) for each ripe queen cell. The virgin queen must emerge in a queenless nuc.

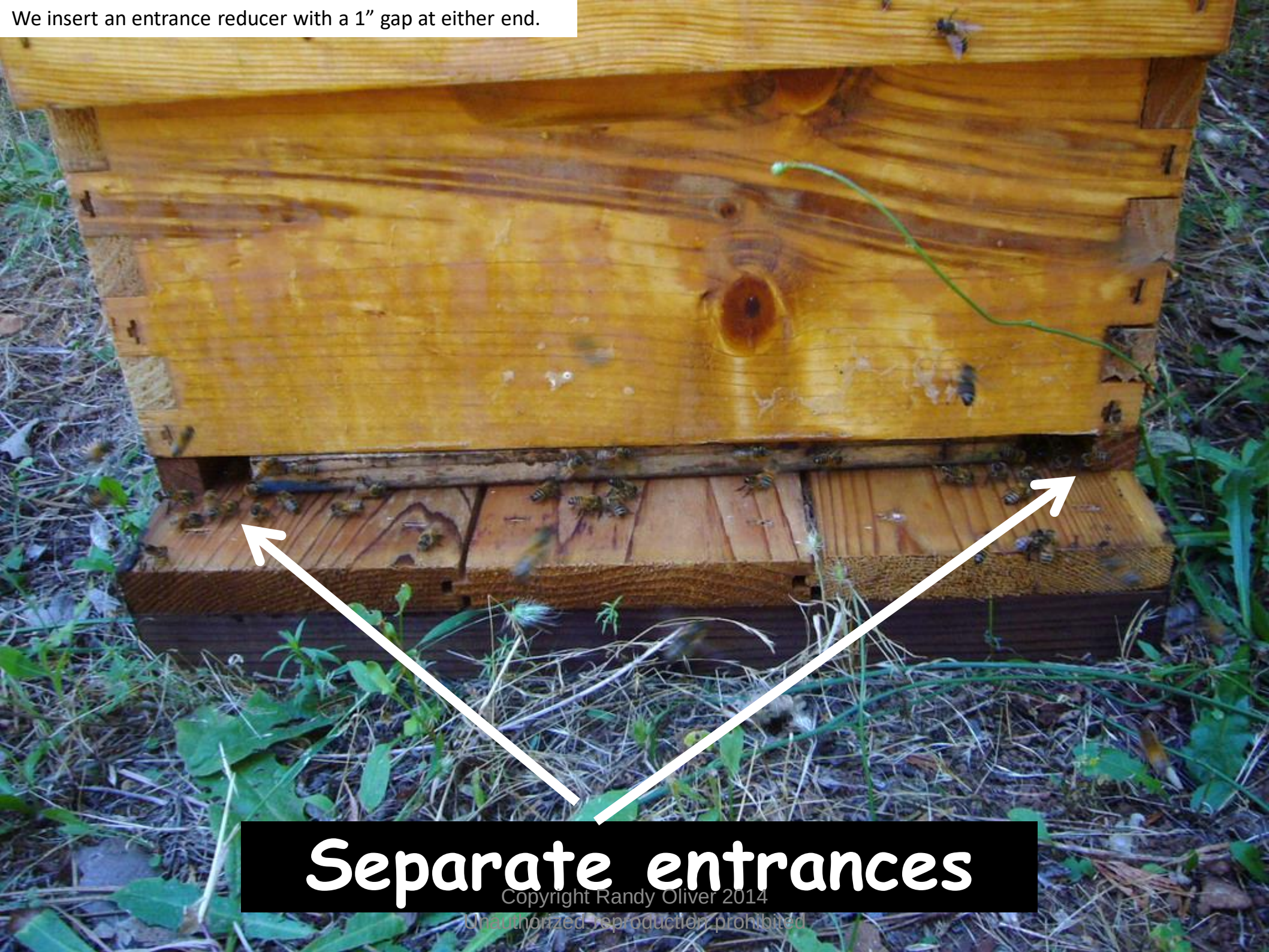
We set up an assembly line to break down strong colonies into nucs. For small scale, you can pull frames out of strong colonies, shaking all the bees off each in turn to make sure there is no queen on any; then place them in a hive body over a queen excluder, placed over a strong colony. Young bees will quickly climb up to cover the frames of brood. You can then remove the nuc; best to move it to another mating yard to avoid bees drifting back to the parent colony. On cool days, bees will cluster on your back.

We initially put only 4 frames into a 5-frame box to give us working room. If there is a strong nectar flow on, add a fifth frame of foundation. The nuc should remain queenless for a day prior to introducing the queen cell.

Here’s a plywood divider board (with “ears” and deep enough to touch the bottom board) that we use to temporarily split a deep box into two nucs. We really like this method, since you can easily pull the board to combine two nucs.



We insert an entrance reducer with a 1” gap at either end.



If the nucs will be exposed to hot sun, we shade them with extra hive covers.

Scatter nucs

Scatter the nucs into irregular patterns, ***thinking of how they'd look to a queen returning from her first mating flight.*** We typically put 5-frame boxes in pairs with the entrances facing opposite directions. You want lots of landmarks (we use the edge of fencerows or yard trash to help the queens to orient.

After the nucs sit for a day or two, they know that they are queenless, and will readily accept a ripe cell.

The full frame of honey that we put into each nuc is generally enough food. If not, we'll feed syrup or dry Drivert sugar. Note the use of the cleared soil as a landmark.

Transfer cells the next day.

Use your hive tool to pry out your ripe cells, prying only on the plastic cup. Do not shake or jar the cells. The cells usually emerge on Day 12 after grafting, but since I started breeding for mite resistance, sometimes they emerge as early as day 10½!

Here is what your finished cells should look like. Carry them either close to your skin or in an incubator box to keep them at broodnest temperature.

Insert cells into brood frames

Press the cells into a brood frame in the center of the nuc, pressing only on the plastic cup. If the weather is cold, make sure that the cell lies over brood cells, or the bees may not keep it warm.

Do this either bare fingered, or wear latex gloves. Leather gloves are too clumsy.

If you can’t wait a day, put the ripe cell into a cell protector to prevent the bees from chewing out its side.

Cell protectors

These are groups of four 2-way nucs, scattered closer than normal. But we still get acceptable mate out. Note thin gloves and cuffs.

You can tell if you accidentally got a queen into a nuc by the “beard” the next day when you arrive to put in the cells. Bees will drift from the queenless nucs to any accidental queenright ones.

By the end of Day 12 after grafting, the virgins should have emerged, leaving a round hole at the end of the cell. If there is a hole in the side, the virgin did not emerge.

This is what she looks like at first, and will fight any other queen.


Virgin queens are hard to spot!

In a couple of days she will be in slim flying trim, and usually takes her first mating flight in the early afternoon about 7 days after emergence, very much dependent upon genetics and temperature.

Another virgin (center), ready to fly. Virgins are very close in size to workers, but move more quickly on the combs.

A drone comet chasing a virgin queen. She zigs and zags and makes them work for it! She's at the upper top left facing away

Another comet, a drone in the act at top left. Enlargement on next slide.

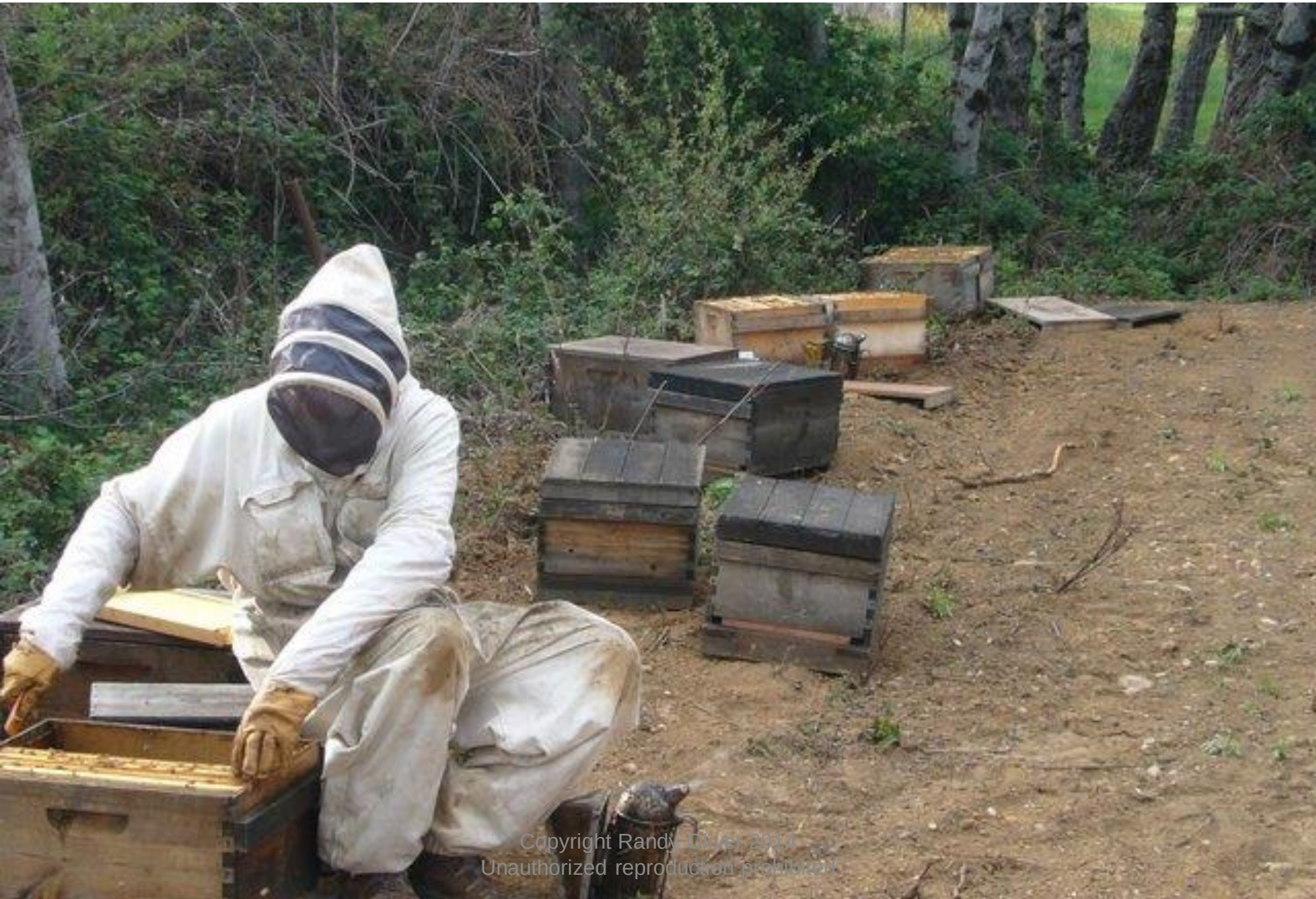
Drone starting to mount the queen at top left. Looks like the previous lucky drone is falling head down.

A freshly-returned queen after successful mating, carrying a “mating sign” (the endophallus of the last drone) protruding from the tip of her abdomen. The workers will remove it.

Notice that the workers still largely ignore the queen until a couple of days after she's mated.

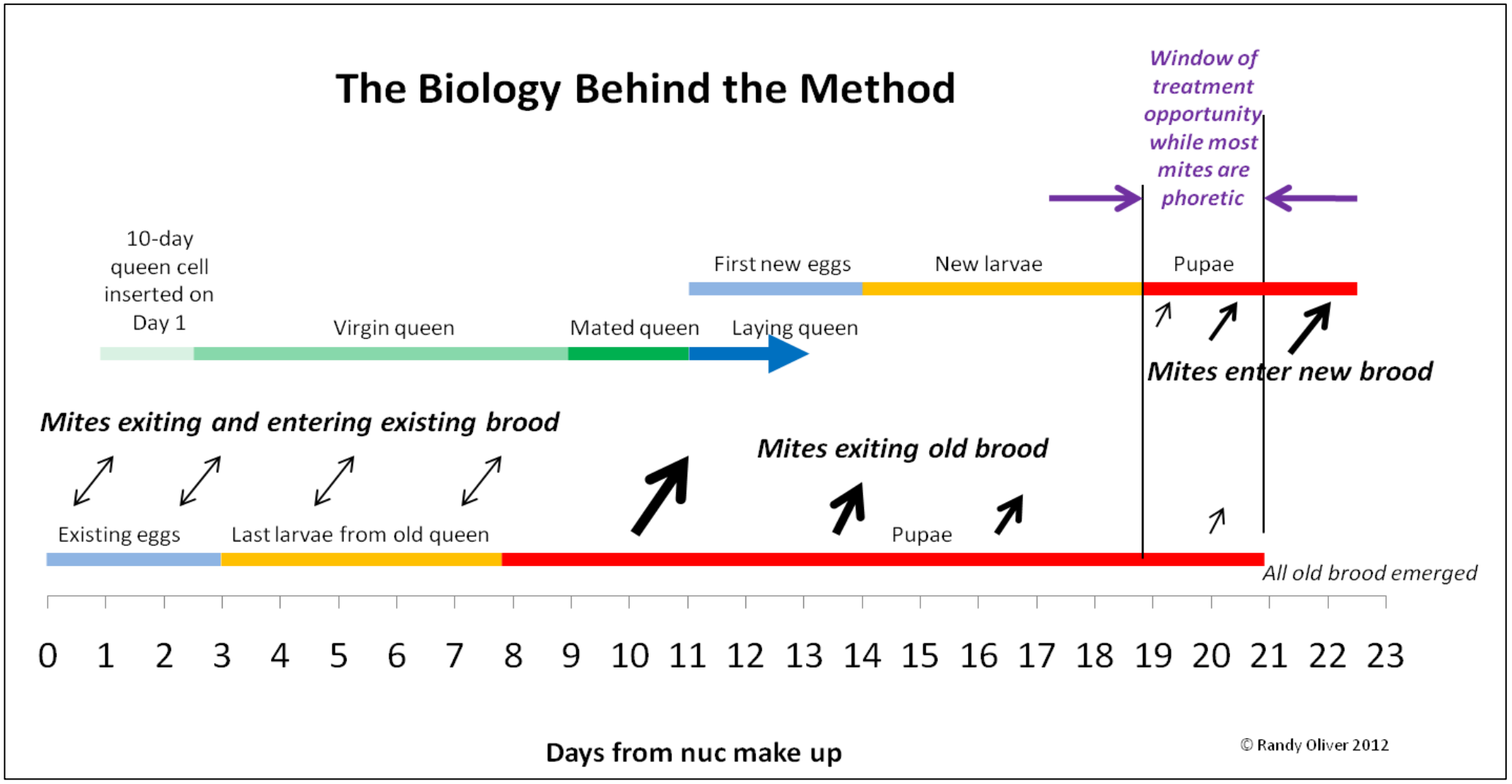
Her abdomen will swell after a couple of days as her ovaries fill full of eggs.

We typically check for successful mate out 14 days after we put in the ripe cells, if there has been good flight weather. Otherwise, the virgin queens may wait for 3 weeks. At 3 weeks, any nuc without a queen will start to go laying worker. You can tell if they have a queen present, as they will keep the center of the broodnest open in preparation for her to lay..




At Day 18, hit the nuc with an oxalic dribble

Alternatively, we check back on Day 19 after nuc make up, and apply an oxalic acid dribble to knock back varroa during this one-day treatment window opportunity. See my article "Simple Early Treatment of Nucs" at **http://scientificbeekeeping.com/simple-early-treatment-of-nucs-against-varroa/**



This is the best part—getting a good mate out! In good weather, typical success rate is around 80% (95% gives you bragging rights). In poor weather, you may only get 30% or lower. At this time we add the frames from the unsuccessful nucs to the ones with mated queens to make them all up to 5 frames.

You don’t need to actually see the mated queen—you only need to see a good laying pattern. A queen will lay one egg per cell, usually in the center and tipped all in the same direction (she may lay more than one egg per cell during her first exuberant days, esp. if the nuc is small). Laying workers (typ. after 21 days of queenlessness) will lay multiple eggs, scattered, and not centered).

The fruit of your labor—a lovely young daughter from your selected breeder. Note the formation of the retinue of bees around her—indicating that she is secreting plenty of queen pheromone, which is critical for good colony morale.

At this time you have three weeks max. until you need to transfer the nuc to a larger box. The nuc will then explode in strength as the first round of brood emerges. Feed 1:1 sugar syrup until the new frames are fully drawn.

For rearing 50 cells at a time, go to:

The Oliver "foolproof method" of queen rearing

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Beekeeping Through the Eyes of a Biologist

small scale queenrearing GO!

Once you've practiced, you'll find that it's really easy to rear a few queens.

If we work together to propagate mite-resistant, locally-adapted stocks of bees, we can win the fight against varroa!

Good luck, and happy beekeeping!

Randy Oliver

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