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Each year, millions of plants get started by and for gardeners.
Who starts all these plants and how do they make them grow?
... by plant propagation, a fascinating process involving science, patience and in some cases a little luck.
Plant Propagation: “the art and science of multiplying plants by sexual or asexual means.”

With seeds it is the sexual increase of plants.

With cuttings it is asexual, or vegetative.
Somewhere in time, humans noticed they could put seeds in the ground and watch them grow.
Likewise, they could cut sticks, put them in the sand next to the river, and see them grow...
Our pioneers were good examples of this. Many of the irrigation ditches were lined with poplars...
...simply the sticks they brought with them...
Since then, gardeners have learned to propagate many new plants from cuttings...
Cuttings: Asexual Propagation...

“Vegetative reproduction, i.e., multiplication that does not involve the seed cycle – clonal propagation.”
Clone... A genetically identical assemblage of individuals produced from a plant entirely by vegetative means. Hartmann and Kester
It’s easy to DUPLICATE or Clone many of your trees and shrubs from CUTTINGS...
So, Let’s Get Started…

- Types of Cuttings
- Hygiene
- Soils & Growing Media
- Propagation Environment
- Light
- Heat
- Moisture
- Humidity
- Methods
Types of Cuttings…

Asexual methods:

* Hard & Soft Wood Cuttings
* Layering; air layering
* Leaf cuttings
* Rooting cuttings
* Grafting
* Specialized structures
* Tissue culture; micropropagation
We will focus on only two of these methods:

Softwood

Hardwood
Softwood cuttings are new succulent growth that has not yet turned woody.
If you cut a start off Grandma’s heirloom geranium or Christmas cactus, it is a softwood cutting.
Softwood

Cuttings are usually taken from the first flush of growth in the spring April-June.
Hardwood Cuttings are from dormant wood.

They are slower to root but robust and not prone to drying out.
If you take a start off a pussy willow or grape vine when they are dormant, you are taking a **hardwood** cutting.
Some plants root easily by simply sticking a twig or branch in moist soil.

Some examples are:

- Willows
- Poplars
- Privots
Most require something a little more sophisticated... and a few are extremely difficult to propagate under any conditions.

Lilac is an example of a plant that is difficult to propagate from cuttings.
How do you know which plants you can propagate easily?
Choose a good book on propagation like this *American Horticultural Society* edition...
It can tell you how hard the plant is to start and the best time of the year to start it.
Hygiene...

Whether starting plants from seed or cuttings, keep the area clean to prevent diseases.

A good solution is 1 part bleach to 10 parts water.
A few handy wipes around will help you keep your tools and containers free from harmful bacteria or contaminants
An appropriate growing medium is crucial to success in propagation!

Some woody cuttings can be started in soil beds outdoors, but most methods require soil mixes or inert media.

The medium must be free draining so it does not become waterlogged, yet not so much that it dries out.
Never use garden soil inside because it has poor aeration and is likely to have insects, diseases and weeds.
Peat, vermiculite, clean washed sand or a soiless mix will make a good rooting medium.

A standard rooting medium typically contains equal parts of sand and peat.
Provide the right conditions and you can easily start many new plants.
Fail to provide those conditions and you will likely have little success in your garden.
Light is not as critical when doing cuttings compared with seedlings... but failure to provide light means there is no energy to form roots.
This propagation unit helps provide light that is needed for photosynthesis.
These lights, secured on a small chain, can be raised, or lowered to give the intensity needed for seed or cutting propagation.
The most critical factor seems to be heat, particularly bottom heat.
Take softwood cuttings, put them into cool soil and they will sit there and finally rot.
Raise the soil temperature to 80 degrees and you will see roots form in only a few days.
... and look like this in only a few weeks.
There are many ways to provide bottom heat…

- Heat lamps
- Heating cables
- Hot water piped
- Manure bed & straw
- Space heaters

**Caution:** Water and electricity are not safe companions... make sure you never mix the two! All power should come from a ground fault circuit.
Moisture...

Since the cuttings have no roots, a moist environment must be created.
Moisture is critical, but too much moisture induces diseases.
Humidity...

The more humid the air, the less plants transpire... so while new roots are forming, careful control of humidity is essential for survival of the cuttings.
A box like this, covered with glass or plastic, is a simple way to maintain humidity, yet allow plenty of light for photosynthesis.
Cold frames are helpful to provide the right environment for cuttings to root...
A converted aquarium makes a good propagation chamber for cuttings as does a covered flat.
You can use many devices to provide a protected environment for your cuttings to root.
...less expensive and readily available
In addition to glass bell jars or plastic bottles, you might use clay jars with removable tops.
... protected cuttings
Review...

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- Methods
Here’s how to start with softwood cuttings…

The new growth on this pussy willow has just started…

Take a few branches about the size of a pencil…
  cut them 6” - 8”…
Cut the base on a sharp angle to expose more of the cambium layer...
It helps to stimulate rooting by wounding the base of the cutting by slicing off a sliver of bark...
Dip your cuttings in a hormone rooting compound to encourage quicker root growth...

Rub off the buds from the base of the cutting...
Use a pencil or stick to make a hole in your planting media before inserting the cuttings...
A good drink and controlled humidity will get your cuttings off to a good start...
Tucked away from direct sunlight...

...or put where bottom heat will speed the rooting process.
Heel Cutting
Stem Cutting
Simple Layering
Serpentine Layering
Mound Layering
Tip Layering
Bigger is possible...

Willows & poplars are easy to propagate from larger cuttings

You can take a limb off several feet long...
Put it in a moist place...

Steel bar makes a good hole
Take all the branches off
The best timing is in the spring, just as the buds start to swell.
This cottonless cottonwood, hybrid poplar, is ready to be put in a post hole...

Scared base
Dig the post hole as deep as you can.

The cutting must stay moist, even saturated, until roots form...
A simple drip system can help you maintain a wet environment for root development the first few months...
5 years later...
...100 years later!
Now, go propagate!