

Add ons and hints

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1. Faraday Cage Construction (an example)

A simple and efficient Faraday cage can be constructed by using metal mosquito netting or (even more simple) bird cage wire (Fig. A1). A galvanised (zinc coated) or blank metal quality should be used, not a plastic coated or painted quality. If only painted mesh is available, the paint should partly be removed at the edges (use sand paper) in order to ensure electrical contact between the cage faces. The mesh width (holes of the netting) of 1 cm (!) is enough, smaller than 2 mm is exaggerated, expensive, and will keep light out that is needed for photosynthesis by the plants. Mosquito screen will need to be supported by a metal or wooden frame.

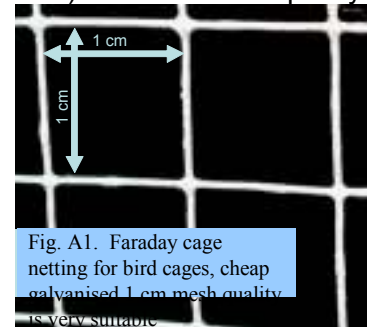
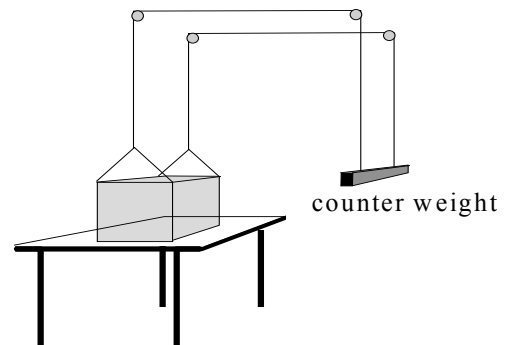


Fig. A1. Faraday cage netting for bird cages, cheap galvanised 1 cm mesh quality is very suitable

Standing cage on a table could be made. To access the cage's interior, an open front side is needed. To avoid noise (see noise Section in Giga manual) the open front should be closed during recording with hinged screen, or by a separate removable screen, hooked to the cage during recording.

Hanging cage, supported by cords to the ceiling and pulleys (wheels) to a counter weight (see figure) needs no supporting construction and is an elegant low budget solution. This cage can be elevated and pulled down in one movement, leaving the set up on an 'open table', accessible from all sides to change the plants, insect adjustments, etc.



Whatever type of cage you are using; always take care that all cage faces - front screen and bottom plate included - should be electrically interconnected to each other, which is critical when a wooden frame support is used. Occasionally, the cage front may be left open during recording if the noise level is very low.

The **size** of the cage should be big enough to contain the expected size of the (potted) plants and large enough for the stands with the EPG probes. The control unit can remain outside the cage so that any voltage adjustments can easily be made during EPG recording.

The **bottom** plate must be an intrinsic part of the cage and should make good electrical contact with the other cage parts. It can be made of the same netting but easier it can be a metal plate of damage protected foil. Using a thick (0.8-1cm) iron plate will enable the use of magnetic stands supporting the probes. These can be fixed firmly and electrically connected to the plate, if not painted (!). A cheap solution is to use aluminium foil but that is damaged easily. Of course it can be covered by a plastic or glass plate but will cause electrical insulation of stands from the bottom. This should be re-established by separate wire contacts then.

Never let the plants or soil make electrical contact to the bottom during EPG recording. Always place the pots on an insulating dish. If a stereo microscope is used for visual inspection the cage should either be large enough to put it inside or small enough to remain outside leaving space to move in the front face.

2. Silver Glue Recipe for water based insect glue

Preparing your own glue may be an option but remind that drying out is the main risk. So, make small vials for use (2 ml) and close the lid always after use! Save the stock solution at about 5° Celsius in a tight (!) container. With 2 ml you should be able to wire 1000 aphids, or more!

INGREDIENTS:

1. Water
2. Paper glue:
This is critical.
 - I use transparent glue (in a 'glue pen', see 2 different samples here; the brand is not important but look for 'Glue Pen' sold in cheap shops (e.g. 'Action' [Europe]; 1\$ or 99¢ [USA])
 - Rather ordinary stuff, but NOT all transparent glue is suitable!
 - Try first a small amount on a microscope slide glass and look whether it mixes well with the silver powder
 - If no smooth suspension is achieved, try another glue source.
3. Detergent
Triton X100 or any other
 - a few droplets / 100 ml is more than enough
4. Silver powder (fine grain, about 2 micrometer or less)
 - This is expensive and one should consider that a minimum amount is sold by some suppliers
 - Look at the internet for a supplier of silver powder (grains or flakes < 10µm)

PREPARATION:

For 10 ml glue

- use a tube of ≥ 20 ml, to be closed tightly
 - put the empty tube on an electronic balance and tare to 0
1. Weigh subsequently and pour/add into the tube:
 - 4 g water
 - 4 g paper glue
 - 4 g silver powder
 2. Add a few droplets of detergent
 3. Close the tube and mixed thoroughly, shake or vortex until a smooth the contents become a smooth suspension.
 4. Store cool, at about 5° C
 5. Fill one or two small 2 ml vial (eppendorf test tube) directly
If filled later shake or vortex well filling

USE:

- Make a styropor stand for the 2ml vial to keep the vial upright (glue is spoiled otherwise)
- Shake or vortex well each time before use
- Close vial directly after each use (glue will dry quick! – add clean water if partly dried)



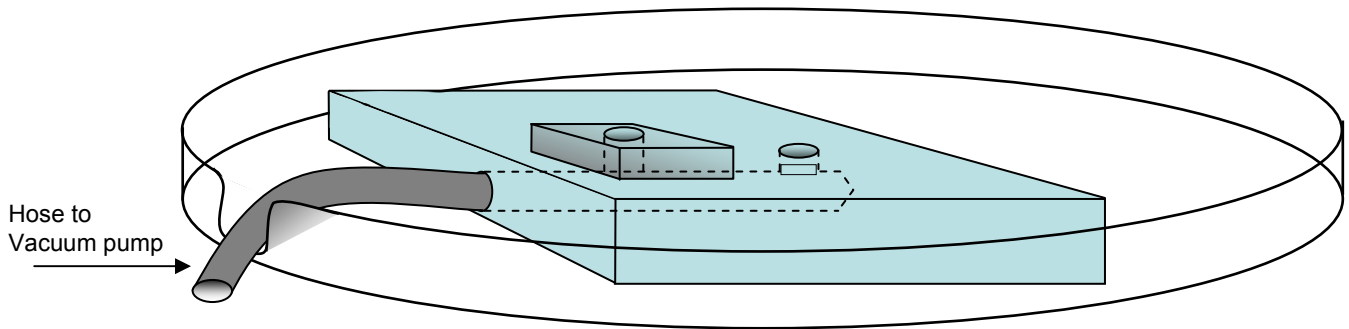
WARNING:

I cannot guarantee this recipe for all samples of glue. I have had some difficulties to find the good glue. The 'Glue pens' seem most appropriate.

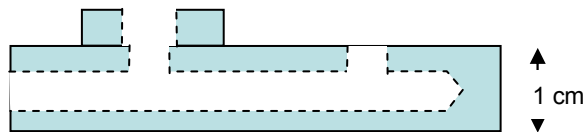
3. Vacuum Suction Device, construction/operation:

1. Basic construction

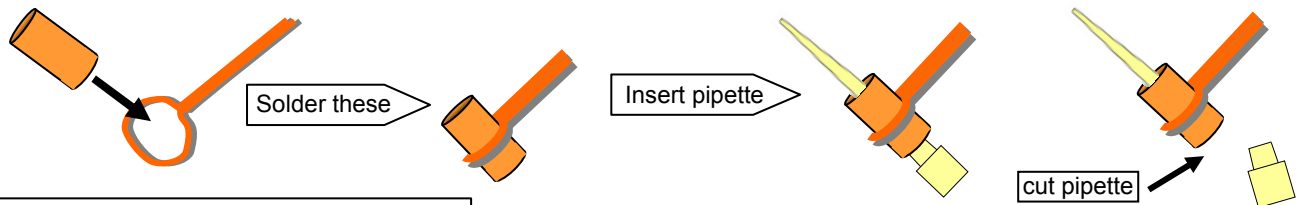
1cm PVC (or other plastic) plate
Drilled holes



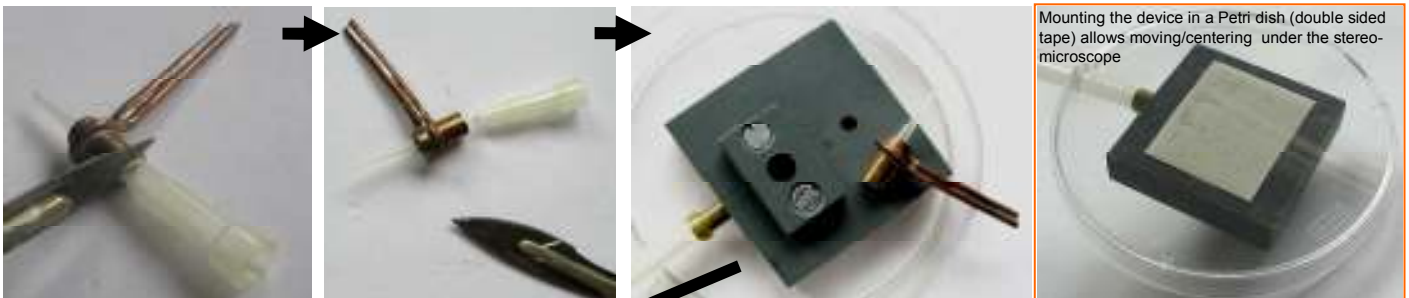
2. Cross section



3. Making the pipette holder with wire handle:



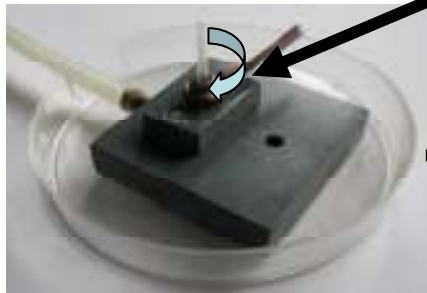
brass pipe Ø 6mm outside 4mm inside
copper wire make loop and solder
cut tip of Eppendorf pipet



cutting the pipet

inserting the pipet

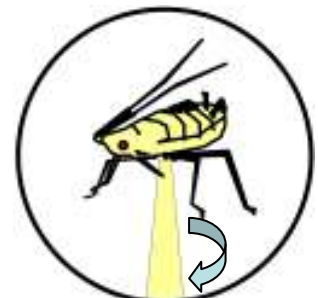
with holder into the device



connecting to the vacuum (pump or lab system)



suction control by sliding a piece of paper



fixed aphid

Under the stereomicroscope:

1. mount aphid on the pipet tip (adjust hole size to aphid size)
2. adjusting suction force by paper covering the hole more/less
3. use handle to turn it in a convenient position
4. first apply silver glue on the insect's dorsum, the insert gold wire

5. first apply silver glue on the insect's dorsum
6. then insert gold wire into the glue
7. let it dry
8. Remove paper, then wired insect

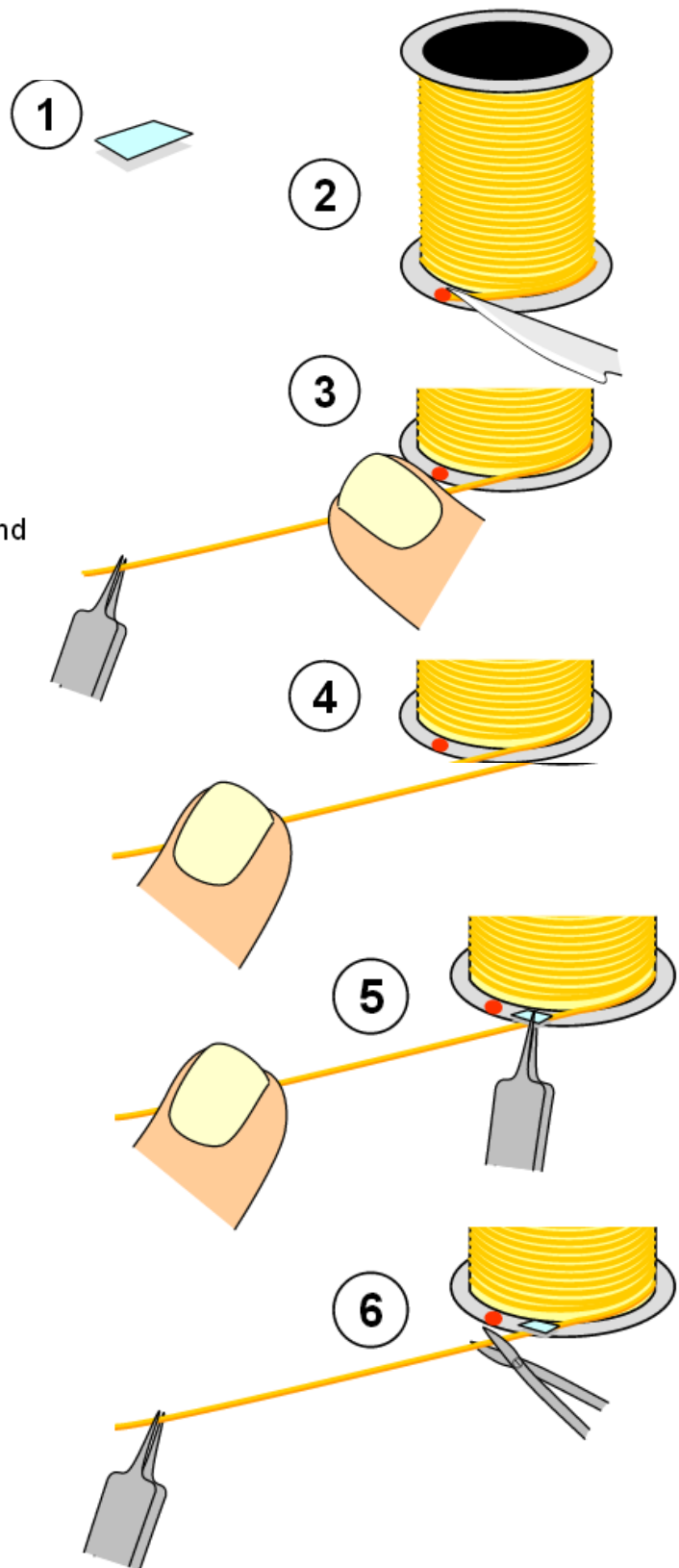
4. Gold Wire Handling to prevent an entangled mass of wire

First use:

- 1 Prepare a small piece of adhesive tape (ca. 2x2 mm)
- 2 Use a scalpel to cut the wire at the red spot side of the spool to get a free end

All next use:

- 3 Take the free end with forceps and unwind the wire a few windings (not more than ca. 10cm) and put your R finger* on the wire while keeping it stretched
- 4 Then remove the forceps and put your L finger on the end of the wire
- 5 Keep the wire stretched and fix it on the spool rim with the prepared piece of adhesive tape (see 1)
- 6 Get the free end of the wire with forceps again and cut 10 cm piece by small scissors or a scalpel to prepare electrodes of shorter length: 1 – 2 cm, depending on how much movement you will allow the insect.



* if left handed, change R and L