

Herbaria and Entomology Preservation Course. 18th – 21st October 2010
Institut National du Patrimoine, Paris

Angela Smith

Documentation Office, Gloucester City Museum & Gallery
Brunswick Road, Gloucester, GL1 1HP

Email: angela.smith@gloucester.gov.uk

Introduction

I was lucky enough to be offered the opportunity to attend this excellent course held at the Institut national du patrimoine (INP) in Paris, as part of my AMA training. The INP, or the National Heritage Institute, is a higher education institute specialising in courses for curators and conservators, ranging from a few days, to post graduate courses of up to five years. This course was one in Simon Moore's excellent series on the preservation of natural history collections, and focused on problems encountered with herbaria (both paper mounted and fluid preserved) and entomology.

There were 14 participants on the course, and were a mixture of curators and conservators. The amount of previous knowledge of the subject varied from very little to a high degree of expertise, but there was something for all levels of experience. As the course progressed the conservators were able to offer their own ideas and we had the opportunity to experiment with different ways of doing things. Throughout the practical work Simon came to each of us offering advice and encouragement.

The duration of the course was three days, one and a half days each dedicated to herbaria and entomology specimens.

Insects

The problems of entomology collections are well known to natural history curators; *Anthrenus* has a habit of creeping into boxes of specimens and producing larvae that happily munch their way through the collection. If you are lucky you may discover a few woolly bear casts and lose only a few wings, but an all too familiar sight is a box containing little more than dust and fragments of appendages.

It may be possible to reassemble some insects, restoring them to their former glory, while with others it may be a case of simply reuniting parts that were from the same specimen or scooping up recognisable parts into a polyester envelope along with their label.

Herbaria

With herbaria, what may appear to be a pile of stalks and seeds, gathering in the fold of an ageing, insect damaged page, can be reassembled and reattached in their original form. The paper too can be repaired and strengthened. As with all preservation techniques the object of the exercise is not to fool the observer into believing that the specimen has not undergone any damage, but to preserve the information by uniting the specimen with its original mount. Securing the specimen prevents any damage that may be caused by movement within the folder. Once the specimen has been repaired steps can be taken to prevent further deterioration, and attacks by insects and mould.

Day one

The day started with a presentation introducing the main points of concern with herbaria, some basic steps of collection care and simple remedial measures that can be taken by curators. The talk was well illustrated and accompanied by handouts of the slides.

The environment in which herbaria are kept is of utmost importance for preserving specimens. Ideally sheets should be wrapped in acid-free paper and stored in metal cabinets with doors that have gaskets to provide a seal when closed. A well-sealed cabinet and a controlled environment will protect against pollutants and prevent insects from gaining access.

Metal is a better material for cabinets than wood. Wood can give off volatile organic compounds (VOCs)

that can damage specimens. Oak is particularly potent although it does degas with age. Mahogany is slightly better and pine is considered to be fine after one year. Composites such as MDF also give off VOCs. Glues too can cause problems; PVA is acidic unless it is bought specifically as pH neutral (such as Evacon-R™ Adhesive).

Storing herbaria in cabinet drawers requires a good system of identifying specimens. If sheets are continually removed from drawers, plants are likely to get damaged. A combined system of numbering and colour coding was recommended, as used by Hampshire Museum Conservation Service.

Relative humidity should be kept low, ideally not higher than 40%, to prevent mould and discourage insects. Mould weakens paper considerably and insects can eat both paper and plant specimens. The main culprit is the biscuit beetle, *Stegobium* spp., which looks like a smaller version of *Anobium*, the furniture beetle. *Stegobium* can squeeze through very small cracks. Silver fish can cause extensive damage to paper, as can Psocids, or booklice. Regular checking of storerooms and store cupboards for insects, is vital to safeguard the collections, particularly in cracks and places such as inside old fireplaces. Remember that insects can feed on even the smallest invertebrate corpses, so be thorough with housekeeping and remove anything dead that you find. It's also worth noting that Psocids can jump, making them more mobile than some other insect pests.

Be wary of introducing insects into your store. Quarantine new specimens before they are added to your collection and make all staff aware of signs of insects to look out for. Any signs of insects should be reported and recorded with the curator and/or conservator so the relevant preventative treatment can be undertaken.

One method for killing insects without damaging specimens is to use anoxia treatment, whereby oxygen is reduced to a level of 0.5% and nitrogen increased to 50%. This does not suffocate the insect, but causes the spiracles to open up and the body to dry out. It is effective within three days, but the treatment should be continued for one week. Alternatively, insects can be killed by freezing specimens at -18°C for two weeks. If freezing, the drawers or specimens must be doubled bagged and sealed to prevent moisture loss.

The main problems associated with herbaria are:

- Insect damage
- Stains from mould
- Dust that may accumulate on paper and spread to specimens
- Tears in folds of paper caused when it is badly folded
- Glue drying out, causing specimens to become unstuck
- Specimens breaking or disintegrating

When presented with a herbaria sheet in need of preservation the first step is to photograph it, then remove all loose pieces and put in a Mylar envelope.

Paper can be gently cleaned using first a dry paintbrush to remove loose particles (Fig. 1). A soft eraser can then be used to remove surface dirt. Groomstick will remove mould and more stubborn marks. It has the texture of soft putty and can even be used to remove surface ink from newsprint without smudging, so it is ideal for removing mould spores. Live mould should be treated using cotton buds dipped in alcohol, cleaning pads (which are washable and hence reusable), or a glassine sponge, although this may contain diatoms, which may scratch the surface of the paper. Unfortunately stains caused by humidity are irreversible.

If the surface is sticky it can be cleaned with Draft Clean, a powder similar to Fullers Earth. The granules are gently rubbed into the paper, and then brushed off using a soft brush.

The question was asked whether it would be possible to remove the specimens and remount on new paper. Although the specimen would look much better, most museums would agree that it would be unethical to do this, as you would lose the history associated with the paper. The paper is as much a part of the collection as the specimen.

Once the paper has been cleaned, any tears or insect holes can be repaired using Japanese tissue. There are two main types of tissue: traditional hand laid paper, which has fibres running in the same alignment, and

factory produced paper where the fibres are more randomly aligned. As you would imagine, the hand laid paper is much more expensive, however it is far superior. A small amount will go along way and if you can afford it, it is a much better buy.



Fig. 1. Simon Moore cleaning a pressed plant specimen.

There are three types of hand laid tissue each named after the place where it was made. All tissue is available in different weights that can be used in different ways. The tissues that we used were 9 gsm (grams per square metre) Tusa Tengujo which is quite fibrous and 10 gsm Gampi, which seems less fibrous, tears better, is stronger and easier to work with, but is more expensive.

Tissue should be torn to shape rather than cut. Torn tissue gives a more invisible repair once secured in place. The adhesive to use is either a 50% solution of neutral pH PVA (diluted in deionised water) or methyl cellulose. Do not use glue from animal products, as this will attract insects. Put a drop of adhesive onto a glass slide and pull the tissue through it using forceps. Continue to drag the tissue along the glass to remove any surplus glue. Place on the tear and apply light pressure using a soft brush.

An alternative method was suggested by a participant on the course, who was a paper and book conservator. Dye a large sheet of Japanese tissue with watercolour dye to faintly colour it. By using different dyes for different weights of tissue you will be able to identify the weight of tissue when you come to use it. After it is dry, add a small amount of methyl cellulose and allow to dry on Plexiglass or a similar acrylic plastic. This will give you a glued tissue that you can reactivate. When needed, tear a piece to size, or score and tear for a more precise shape, and rehydrate using a sponge, such as artificial chamois which is very soft. Do this by placing the sponge in a saucer of water and allowing it to become saturated. Press a strip of tissue onto the surface of the sponge to wet it then remove surplus water with your finger. Take care not to wet it too much or this will take off the glue. Place tissue in position on the paper (Fig. 2). Put two small pieces of conservation grade blotting paper on top and apply light pressure. A piece of synthetic tissue between the blotting paper and the glued tissue will prevent the glue from sticking to the blotting paper.



Fig. 2. Paper repair of a herbaria specimen using Japanese tissue.

This also works well for larger repairs or to strengthen where weakened by mould. Put a piece of tissue on a piece of glass and wet with sponge (but not too much). Lay the tissue onto the paper in position. Add blotting paper, wool felt and gentle pressure, for example by placing a ream of paper on top. Again, the tissue will dry quite quickly.

Once the tissue is dry, the fibres around the edge can be blended in using glue and a soft paintbrush.

Sometimes mould and damp can cause paper to become stuck to the sheet beneath. If this does not affect the specimen, it is probably best to leave it, as to try and unstick it can cause further damage. If, however, this is causing the page to tear, or there is plant material stuck between the pages, it may be possible to separate the sheets by soaking the stuck area in alcohol, leaving for a short while, then teasing the paper apart very gently with a spatula.

When the paper repairs are complete, if you are sure of where loose plant material has come unstuck from, you can restick it using either archival grade linen hinging tape, with only part of the backing removed so that it does not stick to the specimen, or a 50% dilution of neutral pH PVA. Broken stems can be repaired using a small piece of wood shaved from a cocktail stick, which is then inserted into the stem and used as a splint. Again, neutral PVA can be used to secure this. Alternatively, Japanese tissue paper can be used to join together pieces of broken stem.

Simon briefly mentioned fluid preserved moulds and lichens, although we did not attempt to do any repairs on these kinds of specimens. Conservation fluid fixatives include Kew mixture (ethanol, glycerol, formaldehyde and distilled water) or Copenhagen mixture (70 ml ethanol, 29 ml distilled water, 1 ml glycerol, 2 drops methanol). Other fixatives should not be used because of their affect on chlorophyll.

Day two

Day two began by finishing off the work begun the previous day and perhaps attempting something a little more difficult. It was important to have a go at using the different materials and methods. Now was the time to make mistakes and ask questions while Simon was on hand to give advice.

After lunch it was time for the second part of the course, beginning with the customary lecture. Again, the presentation was well illustrated and was accompanied by handouts of the slides.

Insect problems are well known and it's a rare museum that has not at some time had insect pests. As an adult *Anthrenus* can crawl through a gap of 0.5mm, it is wise to check whether those close-fitting lids really are as close fitting as one might imagine. Even in a seemingly unaffected box, by blowing softly on the wings you might discover woolly bear casts, larvae or even adults that have been hidden underneath. Under the right conditions *Anthrenus* can produce two batches of eggs a year.

The principle of repairing insects is the same as repairing herbaria. Japanese tissue, such as 9gcm Gampi, methyl cellulose or neutral PVA, and cocktail stick splints can all be used to good effect. The main difference when attempting repairs is that insects are more three dimensional. In order to work with gravity, insects can be mounted on stands so that the side to be repaired is uppermost. A very good way to do this is by using a polystyrene cup as a stand. This has the advantage of being unlikely to over-balance while you are working.

In most cases it is necessary to work on the underside of the insect. Remove the pin and re-pin from the other side. If the pin will not easily slide out, heat the pinhead using the tip of a soldering iron. After a minute or so, the pin will slide out easily. Remember to hold the pin with forceps when removing it!

Pin the insect in position on the polystyrene cup. Cut a triangle of paper or transparent plastic and pin this in such a way as to support the part that you will be repairing. Insects are fragile and light; adding tissue and glue causes the appendage to be weighed down, so it needs to be supported in position until the glue has dried (Fig. 3). Alternatively use gravity (Fig. 4) or a piece of polystyrene foam, or a similar material, pinned into position (Fig. 5).



Fig. 3. Image to illustrate the supporting triangle cut out when repairing parts of specimen.

When repairing holes in Lepidoptera wings, microscopic scales can cause a problem because they are not water absorbent, so PVA has a tendency to form blobs. This may not be a problem, but if it is, it might be better to use methyl cellulose. Another potential problem is that small pieces of tissue can roll up when

glued on one side, so to overcome this, after pulling tissue through glue on a glass slide, pull it back the other way, so that both sides of the tissue are coated. Apply the tissue to the tear or hole and tease into position with forceps or a soft paintbrush. Tissue will strengthen the wing and so can extend the life of a fragile specimen. If the specimen is needed for display, it is possible to paint the tissue with watercolour paint, to camouflage the repair. When the glue (and paint, if used) is dry, paint on 10% paraloid diluted in acetone. This will camouflage the tissue. If the result is too shiny, paint on a fine layer of acetone over the top to give a more matt appearance. Any tissue that is visible overlapping the edge of the wing can be trimmed with small sprung scissors using a dissecting microscope.



Fig. 4. Re-attaching the abdomen with the aid of gravity.



Fig. 5. Re-attaching a leg using a polystyrene block as a support.

If antennae are soiled or dusty, they can be cleaned with a small paintbrush and alcohol. If the specimen is to go on display the antennae can be strengthened with paraloid, but this will clog them up, so it should not be used on a specimen that may be needed for scientific study.

If the body has totally disintegrated, it is possible to fashion a 'papier-mâché' body out of tissue and glue, and attach wings and other appendages from the same insect. Alternatively you can make card wings and attach the real wings to them. In this way you can keep dissociated body parts together along with the label. If neither of these options is possible, place the body parts into a Mylar or polyester envelope.

Unless you need to repair the insect for a specific reason, such as for display, there is no need to attempt any restoration. Removing pest insects, treating by anoxia or freezing, putting the specimen into a sealed box or cabinet and providing the right environmental conditions, will stabilise the specimen and prevent further deterioration. In any case, repaired specimens will also need to be treated thus, or they could well end up as a pile of wings and tissue!

Day three

The last day consisted of more practical work on the Lepidoptera, and, as our confidence grew, we attempted more complicated repairs. As with the herbaria, this last session gave us the opportunity to experiment a little with different ways of doing things and get a feel for how well different techniques work.

I found this course extremely interesting and would fully recommend it. Knowing simple techniques, such as how to remove pins from bodies or reattach plant specimens to paper, is invaluable. Just as important is learning when to attempt repairs and when to call in a conservator, and what kind of repairs are possible in the right hands.

Acknowledgements

I am very grateful to the Trevor Walden Trust for providing me with a grant, NatSCA for awarding me a bursary and Gloucester City Council for their contribution; without their generous help it would not have been possible for me to attend this course. Thank you also to Kate Andrew, my AMA mentor, and Andrew Fox, Gloucester Museums Manager, for supporting my grant application. Finally thank you to the reviewer for checking through the article and providing useful feedback.

Recommended Reading

Brideson, D., & Forman, L., (Eds). 1999. *The Herbarium Handbook*. 3rd Edition. Royal Botanic Gardens, Kew.

Carter, D., & Walker, A., K. (Eds). 1999. *Care and Conservation of Natural History Collections*. The Natural History Museum.