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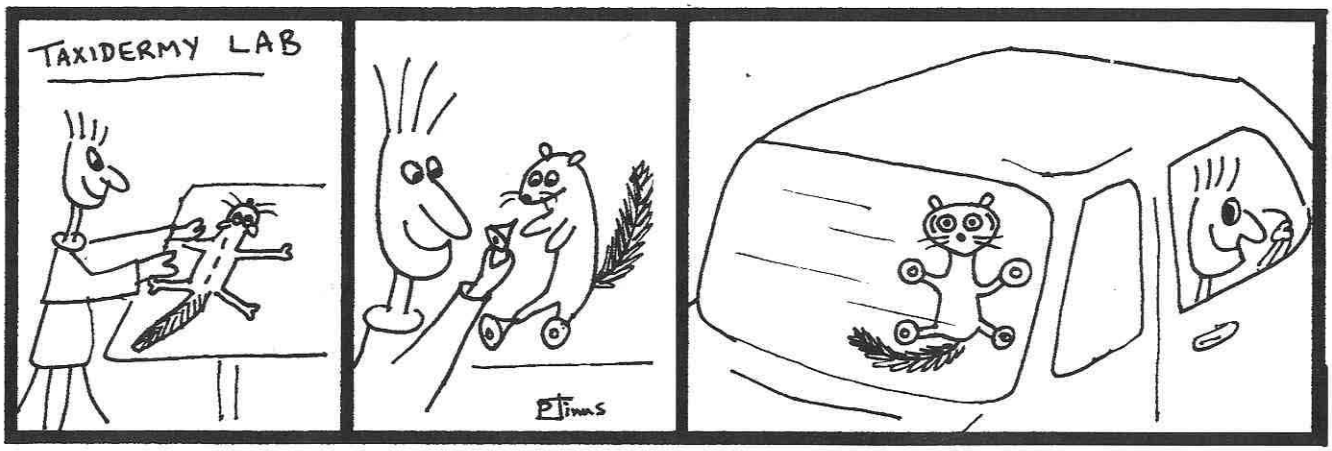

supplied by Sir J.E. Smith which are largely duplicates of specimens now kept in herb. LINN-Smith.

2 Joseph Dickinson (c. 1805-1865) was a lecturer and physician at Liverpool School of Medicine and Liverpool Royal Infirmary. He became Secretary of Liverpool Botanic Garden, from whose living collections he prepared vouchers.

3 International Code of Nomenclature for Cultivated Plants (1995), edited by P. Trehane et al., is published by Quaterjack Publishing, Wimborne as vol. 133 of the series Regnum Vegetabile.

4 The University of Liverpool's cultivated herbarium (part of LIVU), which is now incorporated into the Liverpool Museum's herbarium (LIV), was previously kept at the University's Botanic Garden at Ness which had been founded in 1897 as the private botanic garden of Arthur Kilpin Bulley (1861-1942). Bulley, a socialist and philanthropist whose wealth was derived from cotton trading, sponsored many field expeditions by noted collectors such as George Forrest.

5 A biographical memoir of James Bolton of Halifax was published by the National Museums & Galleries on Merseyside in 1995.

PLANT COLLECTIONS FOR NON-BOTANISTS WORKSHOP PART 1

It is stating the obvious to say that not all museums blessed with having a natural history collection have a full set of specialist curators and that the most common absentees from the equation are botanists. This workshop, held at Liverpool Museum on 26th February 1996, set out, therefore, to fill an equally obvious gap by providing practical guidance for non-botanical curators with plant collections in their care. It must be said, however, that of the 57 people who attended many had come for supplementary purposes while others just wanted to see what other curators got up to. This was fine as the largely practical nature of the day allowed people to get what they wanted out of it.

The day started with two introductory presentations looking at herbarium practice, then and now. This was followed by two practical sessions. The first covered aspects of vascular plant curation and care comprising:- 1. The Preparation of Material in the Field; 2,3 & 4. Mounting Techniques à la The Royal Botanic Garden, Edinburgh, The Natural History Museum and The National Museums and Galleries of Wales; 5. Conserving Old Collections; and 6. Collections Arrangement. The second practical session focused on non-flowering plants and economic botany collections and included:- 1. Fungi; 2. Lichens; 3. Bryophytes; 4. Large Algae; 5, Diatoms; and 6. Economic Botany and Timbers. Many of the write-ups for these are based on information sheets used for the sessions while others are retrospective compositions. Neither, unfortunately, capture the impromptu question and answer nature of the demonstrations, however, all demonstrators included here will be happy to talk to you further should you have any specific queries. The afternoon was taken up with tours led by members of Liverpool Museum's Botany Department looking at the Natural History Centre; the James Bolton Exhibition; the Plant Room and use of living plants in NMGM. The day concluded with a well earned cup of coffee and a lively 'Curators Question Time.'

Mike Palmer
Natural History Centre
National Museums and Galleries on Merseyside

Herbarium Practice, Then and Now

THEN: Herbarium Collections

Dr Angus Gunn, National Museums and Galleries on Merseyside.

The tradition of collection and pressing plants for study dates back to the latter half of the 16th century with the establishment of herbaria at the Universities of Bologna (1570), Basel (1588) and Oxford (1621). The oldest surviving collections are probably in the Naturkundemuseum in Kassel (c.1569) and one of similar age in the Vatican collections.

These early collections consisted of specimens pasted into bound volumes and were used in very much the same way as a book of illustrations.

By the 18th century, herbaria began to be kept on loose sheets. This had a number of advantages. Specimens could

be compared side by side, and the order of the herbarium could be re-arranged to take into account new acquisitions and new ideas on how they should be sequenced. These advantages led to the demise of bound volumes except for some exsiccatae[1]. Some amateur naturalists continued to use bound herbaria throughout the 19th century and pre-prepared "flower books" could be purchased for this.

In 1751, Linnaeus published his views on how herbaria should be prepared -

"The plants should be dried between sheets of paper and as quickly as possible, but hardly with a hot iron. The herbarium specimens must be as complete as possible; the fructification should receive extra care; they should be stuck on the paper by means of fish glue; there should only be one specimen per sheet.; the genus to be written on the front side, the species and the ecological and geographical details should go on the back side; the herbarium should be arranged methodically."

Apart from the unusual positioning of the label details on the reverse of the sheet, a curator who followed Linneus's recommendation today would not go to far wrong.

The 19th century saw a period of experimentation with mounting techniques, some more successful than others. Adhesives such as starch based pastes and, later, latex based adhesives were sometimes used as alternatives to animal glues with considerable success. Fixing specimens with gummed paper strips or attaching by sewing were also extensively adopted and are still used to a small extent today. Some (Withering, 1830) even went as far as recommending that specimens were kept un-mounted in folders to make them *"conveniently accessible for study"*. Although never scientifically verified, observations in the Liverpool herbarium (which has representatives of virtually every type of herbarium preparation technique ever used) suggest that specimens which have been stuck down onto their sheet have fared much better than other methods. Loose specimens in particular have suffered damage through years of handling while specimens attached solely with paper strips have also been more easily damaged. The disadvantage of all-over adhesion is that it is more difficult to remove parts for study. A good modern compromise is to keep a portion of the specimen loose in a fragment capsule which is attached to the sheet.

At an early date it was realised that, in general, the more rapidly a specimen can be dried the better preserved the specimen is, thus, from the end of the 18th century, new methods were tried to speed the drying. William Withering (1796) described the method use by Thomas Velley, to press his herbarium, particularly algae and grasses using a hot iron. These specimens are still preserved, in excellent condition, in the herbarium at LIV. Other methods devised such as a heated sandbox were recommended. The biggest advance in drying technique was probably the introduction (Collins 1910) of corrugated cardboard separators which could be placed at intervals in bundles of drying specimens to allow air through the bundle and speed drying. More recently still, improving the airflow using a gentle heat source to create convection currents through the bundle or by using small fans means that modern herbaria can dry and press hundred of specimens very rapidly to a very high standard. Microwaving has been tried but it can be difficult to control and the very high temperatures produced kill any seeds on the plant so reducing its value.

Returning to adhesives, the 20th century has seen the introduction of synthetic adhesives the most popular of these have been PVA based. It is perhaps not widely realised that all PVAs are not the same and woodworking formulations are much less desirable than the "conservation" grade types that can now be obtained. Methyl-cellulose adhesives (the adhesive in most modern wallpaper pastes) have also been used. They have the advantage that it is a fully reversible treatment although the strength of the bond on narrow parts of the specimen such as twigs means that gummed linen tape strips are used to ensure these parts remain firmly attached.

[1] Exsiccata (pl. exsiccatae) is a set of dried specimens, usually with printed labels. Exsiccatae are usually prepared as sets for distribution. The term is often used to denote bound sets but is not be restricted to that usage. Conservation note: Bound exsiccata should be stored on their sides, not upright like a book.

NOW: New Developments in Botany Curation: Some Advantages and Disadvantages .

Dr. Rob Huxley, Natural History Museum.

The last 20 years have brought a number of new challenges to the herbarium manager. In particular, new user needs, new technology and health and safety demands. The introduction of new methodologies and loss of old have impacted on important aspects of collections management such as: **risks to specimens, accessibility of collections information, and health and safety.** What is the impact on these elements of four areas of change in the last 10 years ?

1. Accommodation - Compactors

2. Destructive uses - Chemical analysis

3. Pest Control

4. Digital Imaging

1. Accommodation- compactor storage

Space for collections is becoming increasingly at a premium as demand for laboratory space increases and new collections of material continue to pour through the doors. In response, many institutions have installed compactor units. These have their accompanying advantages and disadvantages.

Compactors can pose **risks to botanical specimens** if they do not have doors on individual cabinets. The trade off against lighter cheaper units is the increased risk of pest infestation and spread when aisles are left open. However, when closed the unit seals of compactors provide an extra barrier to infestation. The benefits are reduced overcrowding and related physical damage. Compactors can reduce **accessibility** when several workers wish to use different aisles of the compactor simultaneously. Scheduling visits and dividing large units into blocks can reduce this.

2. Destructive uses - molecular analysis

Destructive sampling for chemical analysis has been used by lichenologists as a vital taxonomic tool since the 1860s. The essential technique of thin layer chromatography would have been impossible without the removal of material and the usefulness of the collections to science considerably reduced. **Accessibilty** is increased by unlocking the suite of molecular characters available to the taxonomist.

The main **risks to specimens** are the gradual destruction of the specimen by repeated use and the damage caused by inexperienced handling and removal of samples. In the NHM, researchers are required to take only small fragments for analysis; any unused fragments and a slip recording the results are attached to the sheet or packet to prevent unnecessary repetition of the analysis. Supervision should reflect the experience of the user who may be from a non-herbarium background. See following list of questions to ask before permitting destructive techniques.

1) How abundant in the collection is material of that species?

2) Can alternative material be used or collected for the purpose?

3) Is there a non-destructive alternative or is one likely to be developed sufficiently soon?

5) Has the method been used before?

6) Will someone in the future want to repeat the work on the same specimens? i.e. will the specimen be reduced further?

7) What other methods of study, known or potential, are you preventing by allowing this destructive action?

8) What is normal taxonomic practice in a given classificatory group? (e.g. chemical analysis essential in lichens)

9) Is the material type or historically important?

10) Who is carrying out the work- an experienced taxonomist, a chemist, a student etc.

3. Pest control

The needs of DNA workers and Health and Safety have had drastic effects on the way we protect material from pests. Substances such as mercuric chloride and lauryl pentachloraphenate are no longer used in most collections and freezing is often the only method although heat treatments are being considered. The effect on molecular characters of the latter require investigation.

Ceasing to use chemical treatment possibly increases **risk to specimens** by reducing protection from pests particularly for specimens on loan. **Accessibility** is increased as chemical treatments damage valuable molecular characters.The **health and safety** risks of using potentially toxic/carcinogenic chemicals are removed by abandoning chemical treatment.

4. Electronic data capture - imaging

Digital imaging has an important role to play particularly when applied to delicate historical material. The Natural History Museum is piloting digitisation of parts of the 17-18th century Sloane Herbarium which is unavailable for loan and increasingly fragile. Capturing digitised images reduces risks to specimens by reducing need to handle and enabling "virtual loans". Accessibility is improved by making images available to a wider audience.

PRACTICAL SESSIONS

PREPARATION OF MATERIAL IN THE FIELD

Hints for Hard-Pressed Collectors (with apologies to Peter Davies)

Demonstrated by Dr John Edmondson, Head of Botany, National Museums and Galleries on Merseyside.

The following points are some of those which most frequently arise when botanists are asked for advice on procedures for pressing plants in the field. For further information the following main references are recommended:

Hints for Hard-pressed Collectors. Peter Davies. *Watsonia* 4: 283-289, 1961.

The Herbarium Handbook. D.Bridson & L. Forman (editors). R.B.G. Kew, 1992.

Manual of Natural History Curatorship. G. Stansfield, J. Mathias & G. Reid (editors). H.M.S.O., 1992.

- Specimens should be as complete as possible. Don't ignore roots, fruit and shoots.
- Data should be complete, and retained with the specimen, not inferred later.
- Record information which is either not obvious from examining the specimen (e.g. height of tree) or which may change colour with time (e.g. flower colour).
- When recording geographical information, use grid or lat/long co-ordinates as well as place names.
- Use a personal numbering system if possible; a single number sequence, unencumbered by code letters and symbols, is greatly preferred.
- Modern molecular techniques require rapidly dried, uncontaminated specimens. Use silica gel sachets in sealable bags to preserve small leaf samples.
- High quality information on the substrate can add value to the specimens; it may be helpful to include a well-mannered geologist in an expedition.
- Duplicates provide a powerful way of obtaining and exchanging information on identifications of your collections, and are also a legal or moral requirement when working abroad.
- Plant-animal associations (e.g. pollinators) and plant-plant associations (e.g. epiphytes, fungal associates) should be recorded.
- Rapid drying is essential. Use lots of drying paper, keep the presses warm and change the paper frequently (at least twice a day). Separate fleshy samples from the rest.
- Custom-made presses are much more effective than improvised boards. Specify springy timber (e.g. beech, hickory) and use rivets in preference to nails or bolts.
- When obtaining plant presses, don't skimp on straps. Use wide, nylon straps with stout buckles in preference to narrow leather ones, as the pressure achievable depends greatly on one's ability to grip and tension the straps.

- Every specimen takes at least as long to prepare after collection as it does to collect it in the first place. Sufficient time needs to be set aside for such work when planning a project.

MOUNTING TECHNIQUES 1

Demonstrated by Rita Calder, Mounting Technician, Royal Botanic Garden, Edinburgh.

There is one full time mounter/preparer at the R.B.G. Plant specimens are received for mounting in paper 'flimsies' each complete with its own identification label. This is glued onto the bottom right-hand corner of a c. 42.5 x 26 cm mounting board using Gloy Paste (water-soluble). We use 3 weights of boards - an archival quality lightweight or medium-weight for most specimens and heavy-weight for heavy or spiny plants. The specimen is arranged on the board, showing where possible upper and lower leaf surfaces, a small envelope is glued on with representative pieces of the plant in it. A pile of specimens is prepared in this way.

The second stage is gluing the plant on to the board using a water-soluble conservation quality PVA glue (also used for leather work and book-binding) mixed with some water on a large heavy glass sheet. The back of the specimen is placed on the glue and then put on the mounting board with sheets of blotting paper in between each board. After recommendations from visiting curators, I have started placing a sheet of greaseproof paper on top of each glued specimen to prevent the blotting paper from sticking to it. The specimens are piled up in a wooden box, metal weights placed on top, and left to dry for approximately 12 hours.

The third stage is taping and stitching the glued specimens on to the boards. We use sticky brown tape of a fairly heavy quality cut into strips of varying widths. Strong poly/cotton thread secures heavy specimens onto the boards. I use this third method as little as possible because of the pressure on dried and brittle stems. I try to confine sewing to thick roots, stems etc. I prefer to use the gummed strips.

MOUNTING TECHNIQUES 2.

Vascular Plant Mounting Techniques at the Natural History Museum.

Demonstrated by Jenny Smithers, Plant Mounter Supervisor, N.H.M. London.

All plant specimens are stuck down firmly to archival quality mounting paper by means of a PVA gum (J Hewitt and Sons, PVA - M155) . The gum is applied to the plant specimens and labels by means of two 1.5″ paint brushes. Labels, other information and capsules containing plant fragments or fruits are attached to the bottom right hand corner of the mounting sheet using PVA gum. Two separate pots of gum are used, one for the specimens and one for the labels. This helps to keep labels free from plant debris when attaching them to the mounting sheet. When the gum has been applied, covering all of one side of the plant specimen, it is placed on the mounting sheet then covered with a sheet of waxed paper and several sheets of drying paper. On top of this a foam rubber pad is placed and the whole pile of specimens and pads etc., put into a press. It is left here for about 15-20 minutes. When satisfied that all that specimens have adhered firmly, small straps, cut from linen tape are stuck to various parts of the plant to double secure it to the mounting sheet. The whole sheet is then returned to the mounting box for the curator to incorporate into the collections.

MOUNTING TECHNIQUES 3.

Demonstrated by Tony Tipper, Herbarium Manager, National Museums and Galleries of Wales.

The materials used for mounting are:

1. Gelatine backed linen tape (CCI approved)
2. Lignin free, Calcium carbonate buffered mount board
3. Water soluble glue for sticking labels
4. Lignin free seed envelopes
5. Lignin free sleeves for keeping specimens in
6. Brown manila folders for separating species
7. Lignin free Type folder

The best material is taken for mounting. It is positioned so that both sides of the leaves or fronds can be seen. If it is a large fern then the top half is cut and placed with the fertile side down. No material is lost from one specimen. If it is a very large specimen then several sheets will be attached together. Care is taken to ensure the specimens are not mounted centrally on the sheet as this causes bulking in the middle when laid one on top of another. The linen strips are cut very thinly and used initially as anchor points to stabilise the whole specimen and then more careful mounting is required.

After mounting the specimen is held upside down to ensure there are no unsecured areas that are hanging down that could be damaged through handling. No glue is used to attach the specimens to the sheets as all the specimens are frequently frozen as a means of pest control and no glue has yet been proven to be able to cope with frequent freezing, and not causing stress to the actual specimen. Linen straps are extremely strong and flexible and allow for some movement of the specimen, allowing contraction and expansion with fluctuating relative humidity. Vascular material is housed flat within cabinets in Flora Europaea order.

Old, poor mounting techniques found within the collections includes usage of metal pins, glue and sellotape. These are removed and remounted using standard practice. Heavily glued specimens are humidified using gore-tex linings to prevent water soaking onto the specimen, this appears to help strengthen the specimen. Transference of all the data is very important and any new conservation information should be added at this stage for example if the sheets have been cleaned using a plastic rubber, what glue has been used on the label, method of pest control etc. All old labels must be kept.

Materials used for packaging cryptogamic material:

1. 100% rag paper
2. Secol (melinex) envelopes, open along two edges to prevent acid build up within

3. Bulky lichens and fungi laid within acid free tissue and placed within small specimen boxes

Data is typed directly onto the computer and then printed out. The specimen is placed within the melinex envelope and then placed within the folded packet. If there is a lot of loose material then the edges of the packet are folded inwards to prevent loss. Large fungi are freeze dried but are monitored frequently for pest damage, these are housed along with other bulky material within boxes whereas other cryptogamic material is housed upright in packets, in alphabetic generic and species order and then numerical vice county order.

Any incoming material is frozen at -20 C for 72 hours, this applies to both vascular and cryptogamic material

CONSERVING OLD COLLECTIONS

Demonstrated by Caroline Cotgrove, Paper Conservator, N.M.G.M.

This session was to demonstrate how the Paper Conservation Section and Botany Department had combined to find a solution for the preservation of the Royle Collection, a 19th century collection from India by John Forbes Royle.

Many examples of the problems encountered were displayed, e.g. very brittle specimens, unsuitable specimen sheets, overcrowded sheets, ink degradation of the paper, mercuric chloride on paper and specimen. Many examples of the solutions chosen to deal with different problems were displayed. Details of all the materials used were discussed.

The method that is currently employed for this collection is to remove the specimen from the original sheet, all information is cut out and preserved. Specimen adhered down onto a sheet of cotton rag paper, of a suitable weight, using 2% sodium carboxymethyl cellulose solution (SCMC), applied with a small soft brush, later strapped with linen tape. All labels are attached by a method depending on the media used, adhered down or hinged with Japanese paper. Cotton rag paper fragment folders are also adhered to each sheet. The sheets are then housed in archival quality specimen and genus folders.

A full account of the Royle Conservation project can be read in *Conservation and the Herbarium,* published by IPC, Leigh, ISBN 0 9507268 6 9

COLLECTIONS ARRANGEMENT

Demonstrated by Donna Hughes, Assistant Curator, Botany, N.M.G.M.

This demonstration looked at how herbarium specimens are protected and taxonomically grouped by placing them inside various folders and covers. Different methods in which these are then arranged within the herbarium 'cabinet' were explored, dependant upon the type of collection being curated.

Herbarium sheets are housed in their respective species 'folder'. These one-fold covers should be acid-free, light-weight (with grain running parallel with the fold) and just slightly larger than the herbarium sheet. Each species folder may hold one or more examples of that species but should not become overcrowded. An additional folder may be used or a spine incorporated into the existing folder to accommodate more material. If the later method is used it is important to ensure the folder is still larger than the mount sheets themselves. The bottom right hand on the outside of the folder should be marked in either pencil or waterproof ink with i) the country or district (in larger herbaria), ii) the species epithet and number (see orders), and iii) any infraspecific taxa.

Species folders are then grouped and placed within a genus folder either in alphabetical order or their systematic order. In turn, the genus folders can be kept in systematic or alphabetical order. Again these folders should not become overcrowded. They should be made from thin acid-free card and scored with a spine c.2cm. The folder should close slightly larger than the species folders for their protection. Some herbaria use different coloured genus folders or coloured labels to indicate geographical areas. The folder should be marked on the outside bottom right-hand corner with i) the respective family and number (if any), ii) the generic name and number (if any), and iii) species epithet and number (if any) or the initial letters of its contents e.g. D-H.

Type specimens need extra care and protection. They are usually housed in folders which totally envelope the herbarium sheet by overlapping on all four edges. They should be made from acid-free paper about the same weight as the species folders. So that these important specimens can be identified immediately in the cabinet, the folders are usually banded with a bright colour (often red) on the outer folded edge. The outer of the folder should be printed with the name of the institution and its herbarium code (see Index Herbariorum) and the word TYPE in bold letters. Written in the bottom right-hand corner should be the name of the specimen (full; with author), if it is a synonym then also write the currently accepted name. The type folder should be placed in its respective species and genus folder, to the top of the pile.

The folders should be housed in dust-free cabinets with pigeon-hole compartments. The size of the folders used is often determined by the size of the compartments. The folders should be able to be removed easily without damage. The arrangement within the cabinets determines the accessibility to the collection for both the curator and visitors to the herbarium. A simple way to order the collection is alphabetically. Though this has its use at species level, it is impractical to arrange the whole collection this way because related, similar taxa will inevitably be housed far apart from each other, causing problems when trying to access specimens for identification.

Systematic arrangements of the collection places closely related taxa together. Several different sequences are used by herbaria, and the choice is often based on tradition and familiarity. British and Commonwealth collections are most often based, with modification, on *Genera Plantarum* (Bentham & Hooker 1862-83), continental herbaria are often based on "Englerian" arrangements (e.g. Dalla Torre & Harms 1900-07), while many American herbaria base their collections on more recently devised systems such as Takhtajan (1987) or Cronquist (1981).

At Liverpool, the European herbarium follows *Flora Europaea* (Heywood *et al* 1964-80), an "Englerian"

sequence, while the Extra-European Herbarium and British Herbarium, which is ordered according to Kent (1992), follow "Cronquist" based schemes.

A selection of useful and relevant books was also displayed as part of the demonstration:-

Essential reading for setting up a British herbarium:

The Herbarium Handbook. Edited by D. Bridson and L. Forman. (1992).

New Flora of the British Isles. Clive Stace. (1992).

List of Vascular Plants of the British Isles. D.H. Kent. (1992).

Flora of the British Isles. Clapham, Tutin and Moore. (1987).

Systems in general use in herbaria:

Bentham and Hooker, *Genera Plantarum* (1862-1883)

Dalla Torre and Harms, *Genera Siphonogamarum* (1900-1907) (known as the 'Englerian' system)

Cronquist, *An Integrated System of Classification of Flowering Plants* (1981)

Dahlgren, Clifford and Yeo, *The Families of the Monocotyledons: Structure, Evolution and Taxonomy* (1985)

Useful books to have on hand:

The Plant Book. D.J. Mabberley (1993)

Dictionary of British and Irish Botanists and Horticulturists. R. Desmond (1994)

Botanical Latin. W.T. Stearn (1992)

Index Herbariorum. Holmgren, Holmgren and Barnett (1990)

Flora Europaea . Heywood *et al.* (1964-1980)

**Vascular Plant, Families and Genera*. R.K. Brummitt (1992)

& a gazetteer of the British Isles and a local flora if published.

* Now available as a text file on the Internet.

Here ends Part One of *Plant Collections for Non-Botanists*. Part Two will look at curatorial aspects of non-flowering plant and economic botany collections. Part Three will look at storage and display.

Historic Collections - The SPNHC Conference, 1996

This years SPNHC (Society for the Preservation of Natural History Collections) conference was held at the Academy of Natural Sciences in Philadelphia, USA. The conference had a central theme based on 'Historic Natural History Collections', and a workshop on the 'Valuation and Insurance of Natural History Collections'. Fewer Brits made it to this years conference than last years at Toronto, probably reflecting on both tighter budgets and the Cambridge WCCR held in August.

The talks occurred over two days and were then followed by the workshop. The whole event was surrounded with organised tours of other institutions and the Academy's collections. The end of conference banquet was particularly fine being held in the academy's Dinosaur Hall, with a excellent spread of food, Cajun music and a free bar!

The talks started with Meredith Lane of the National Science Foundation (NSF) discussing the changing views of natural history collections, in which she outlined the problem that many early American collectors did not have suitable depositories for their specimens, and this was used to emphasise that natural history collections are a fundamental and indespensible resource when many specimens cannot be re-collected. The main point was the importance of co-operation not competition if all the information on all collections is to be brought together. NSF is working on the development of computers in Natural history collections, but finds there are two main problems;

- Using a standard relational database.
- Standardising the fields to be used in the database.

An evolved catalogue will improves a specimen's value. The delegates were encouraged to 'think of new and expanded ways to contribute and make relevant to society the output of natural history collections'. The requirement to make collection information more available requires interconectivity between museums, increasing the collection value as a whole whilst aiding research, education and even entertainment. The act of any museum trying to database it's entire collection as a whole is a daunting one, but which can be started by putting selections of the collection onto the World Wide Web.

Robert Waller (Canadian Museum of Nature) discussed preventive conservation planning, specifically for large and diverse collections and related this to implementing and being responsible for funds directed towards preventative conservation measures. Robert outlined the means of setting up such plans with the objective of setting up a pragmatic method for setting priorities which adopts or adapts existing systems.

The basis of the plan is three systems:

1. Risk assessment and management; this identifies and assesses the risks and uses this to identify and evaluate risk mitigation methods with an approach that is comprehensive, cost effective and convincing.

2. A system of setting up categories of specimens to direct resources available for risk mitigation projects by identifying the most important part of the collections. Specimens are given a 'value' with type or recent extinct species being of highest priority.

3. A collection profiling system to identify the issues affecting collections. This works on a base unit known as a collection storage unit which is effectively a cabinet, drawer unit or shelf, and looks at factors such as the collection processing level and the level of preservation, but works by only recording practical information. The collection profile provides a base for determining activity and resource levels required for continuous maintenance, whilst aiding proposals for remedial maintenance projects comparable amongst different collections.

It was concluded that several frameworks must be applied which require a great deal of information, but it is possible! The advantages of planing means effective use of resources,