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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 indispensable 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 improve 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 interconnectivity 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 planning means effective use of resources,



The Academy of Natural Sciences, Philadelphia

accountability, a sense of accomplishment and overall success.

Robert Huxley (Natural History Museum) described the reorganisation of posts at the NHM to the assembled audience, many of whose institutions had or were undergoing similar changes. It was explained that curation had been recognised as an activity in its own right which had led to the development of a more co-ordinated collection management structure allowing museum wide programmes (pest control, training, data capture) with overall co-ordination by a cross disciplinary steering group. In the staff set-up a collection leader has an equal role as a researcher. The curators spend most of their time directly on the collections but there is crossover into advisory and research roles. The aim has been to improve the flexibility of resources by using staff where they are most needed, providing a standard of maintenance that is common to all collections, improving communication and to provide a direct collection input into the corporate plan. It was felt important that research still played a role with curators as this improves the understanding of researchers' needs, develops specialist knowledge, aids regular dialogue and improves overall collection knowledge.

John Simmons (Natural History Museum, Kansas) explained the setting up of the US Organisation for Biodiversity Information, US-GOBI, in April 1996 with the aim of setting up the infrastructure required to organise the information derived from biological collections and associated biodiversity for maximum accessibility - 'biological collections to function as a community in response to the global biodiversity crisis'.

Onto historic collections. Jane Pickering (Oxford University Museum) considered the items surviving in the Tradescant Collection from the 17th century. Of the original '12 cart loads' of specimens making up this collection only

40 specimens, all zoological, have survived. Using the risk assessment system developed by Rob Waller, the collections survival over the last 400 years was considered. The material to be initially lost was that most susceptible to pest attack. However the effects of physical damage from visitors also appears to have been extensive, suggested by the loss of the bird egg and insect collections. The other major factor causing loss was custodial neglect. Many specimens lost their data and may still be in the museum. Most of the surviving specimens are the tougher parts such as bones and horn and show evidence of insect damage and physical damage from poor storage and handling. However little evidence of damage from light exists, neither does damage from fire and water appear to be evident.

Robert Huxley (that man again) gave his second talk of the day (a bit keen!) on the challenges facing the large historical herbarium collections at the NHM. Some 200 000 specimens were collected before the 1800's and the current state of access and storage to this material is unsuitable. The historic collections have a wide range of users: scientific community (large number of types); historical research; horticultural researchers; commercial bodies such as publishers; showing off to VIP's.

The collections are open to the usual risks such as fire, theft, physical handling and dust/ abrasion, although some collections had the additional risk of pirates plundering the ships when being brought to Britain!. Accessibility is particularly low, with no loans of certain parts of the collections, difficulties in locating specimens/ drawings, and little data readily available with many specimens (difficult to link specimens with publications, etc). The collections now need to be properly assessed and prioritised to direct remedial conservation work such as reinforcing paper mounts, separating prints from drawings and methods to reduce handling. The hope is to set up a special collections

room with the collections themselves being digitised and collated on database to allow greater availability of information.

On a different type of historic collection Tom Strang (Canadian Conservation Institute) described the work the CCI had been carrying out on a permafrost fossil tree site in Northern Canada which has intact but fragile unpetrified cones, needles, tree stumps and leaf remains. The CCI has been using PEG (polyethylene glycol) to try and conserve the fossil material as it is similar to wet archeological wood. They have also been using parylene coating technology to try and consolidate this very delicate subfossil material. The site is very exposed and barren. The CCI have also been attempting to measure the rate of soil loss at the site which is estimated to be about 4 million years of fossil material per year. This was done by detailed surveying of the site using plane, theodolite and G.P.S. All the tree stumps were mapped out in order to follow their rate of deterioration, and any which had been dug up were reburied. Many areas at the site are showing large expanses of exposed leaf matt which is extremely delicate. The greatest threat to the site now appears to be 'ecotourism' trampling over the site. Already visitor damage has occurred at the site which has no protected status. The extensive base line study carried out by the CCI will give a gauge for all future research.

Anatomical collections featured quite strongly at this conference. Thomas Crist (The Wistar Institute, Philadelphia) described the conservation work carried out on the fluid preserved collections at the Wistar Institute, and the health and safety plans developed to carry out the work. Where the fluid needed replacing then the formaldehyde has been replaced using a non-toxic fixing solutions (the details of which I couldn't catch but will attempt to find out) which was meant to incorporate a formaldehyde scavenger. The concept was interesting but the exact details need to be investigated as this was obviously a non standard preserving medium.

Problems with fluid preserved anatomical collections were also discussed by Andries van Dam (Museum of Anatomy, Leiden). Although the collections at Leiden date back to the 1500's some of the main problems relates to the newer combinations of preservative fluids, jars and sealants. Problems encountered are decreases in fluid levels, loosening of lids, and warping of plastics. These can be related to:

- Fluctuations in internal pressures in the storage container, related to environmental change.
- Dropping of fluid due to diffusion through the container lid or seal.

If the temperature rises then the vapour pressure in a storage jar will rise, causing an increase in pressure. The less air space in a jar the greater this effect will be (less volume available for fluid expansion). Conversely a decrease will cause negative pressure, a problem which is rarely recognised. Thus the recommendation that fluid collections are stored at a constant temperature, preferably at a lower temperature than the one at which the jar was sealed as this will create a slight negative pressure. However to combat temperature increase Andries recommends the following to reduce the effects of increased pressure: fill ethanol based

solutions to 90% of volume and aqueous fluids to 95% volume.

With diffusion effects it has been noted that silicon rubber sealants have a greater water loss than sealants such as Tixophalte (Shell). This is important to consider since a negative pressure can be caused by diffusion, especially with plastic containers which will ultimately deform. The result is that plastic containers tend to require regular venting, but to do this regularly is time consuming. This has led to the development of a two way valve which consists of a piece of silicon tubing as a gasket on a polypropylene stopper at one end and a piece of polyethane rod on the other. As a negative pressure develops the silicon gasket expands and thus lets air in, whilst an increases in pressure will allow vapour to escape. The valve will not react to small temperature fluctuations and removes the need to store fluid collections at constant temperatures in order to avoid temperature changes. At Leiden they are still using phenoxetol with which glass jars cannot be sealed with the impervious tixophalt sealant. A silicon sealant has to be used which is more permeable and can hence lead to the formation of a negative pressure which can cause the glass lids to crack. The use of a two way valve can prevent this.

Richard Rabeler (University of Michigan Herbarium) described the problems facing a small college herbarium with the loss of it's curator. Often in such situations the replacement of the curator is unlikely. Three options can be considered:

1. Donate or sell the collection: simplest option but assumes that there is no interest in maintaining or using the collection, but may be best if there is no curator. It is important to consider whether to loan or donate the collection rather than place on permanent loan.
2. Donate or sell historical collection: this retains the teaching specimens but the 'curatorially expensive' specimens are cared for elsewhere. Ethics need to be considered, and involves separating the collection.
3. Retain entire collection: often the case even in the absence of a curator where the collection tends to be used to say 'we have it' rather than utilise it.

Gretchen Anderson (The Science Museum of Minnesota) described the use of conservators in 'visible labs' as a means of raising public awareness. However the plexiglas lab which has been setup has no facilities such as water or fumigation and is thus limited in the activities that can be shown, appearing to be mainly a workspace for general collection management activities which is mainly manned by volunteers (cf. the visible lab set up at NHM for the work Adrian Doyle et al carried out on the plesiosaurs). However it does allow contact between the public and behind the scenes activities.

The theme of fluid collections was continued by Lisa Palmer (Smithsonian Institution) who discussed the importance the type of storage container and how this may affects fluid quality. A survey of a whole variety of container types was carried out. Overall it was found that there was little difference in glass jars. Most differences appear to relate to container volume, particularly the fluid to specimen ratios. Plastic containers were found to be generally not

suitable for long term storage with ethanol based fluid collections. In general, when compared with glass containers, the fluid pH was lower as was the ethanol concentration and the volume levels. Often the possibility of a reaction between the container and the fluid. It was noted that the greatest variable in this study relates to collection management, and demonstrates the need to set standards and not rely on folklore.

Janet Waddington (Royal Ontario Museum) talked about the problem of a white efflorescence which has been observed on calcitic echinoderm and some bivalve fossils from the Silurian. The fossils are stored in wooden draws of oak or plywood with many variants in finish. In an attempt to find the cause of this efflorescence a modified form of Oddy testing (a method for detecting the effects of corrosive chemicals by monitoring the tarnishing of metal coupons, usually silver, copper and lead) was carried out. This involved hanging metal coupons in the cabinets to see if there was any pattern in the specimens which have been affected. The controls coupons, which were outside the cabinets, showed more corrosion than those in the cabinets, showing a buffering effect from atmospheric pollution. Some of the affected fossil was then clean and placed in sealed jars to carry out an Oddy test, but again no corrosive chemicals were indicated. Temperature and humidity measurements showed that the cabinets were also buffering the fossils from environmental effects. Samples of the efflorescence were then examined under a variety of analytical tools: XRD, FTIR and XRMA. This found gypsum, calcium formate and a whole range of calcium sulphate hydrates. No correlation between the wood type and the efflorescence could be found. Overall no conclusion to the cause of the efflorescence could be found though it is thought possible that the cause could relate to a one off event such as a past period of very high humidity, though attempts to replicate such conditions have yet to produce results.

Staying on the subject of efflorescence, David Von Endt (Smithsonian Institute) revisited Byne's disease, raising some interesting questions. Byne's disease forms on mollusc shells as a result of volatile acids released from wood leaving a white efflorescence on the shells and essentially consists of a calcium formate - acetate complex. The research induced the effect on oyster shells (calcite), cowry (aragonite), and bone (calcium phosphate) at 80°C in the presence of pure formic acetic and formic acids, a 50/50 mixture of each and a 75/25 mixture of each. In addition various materials were tested at 80°C in the absence and presence of water and various levels of oxygen enrichment for their ability to induce Byne's disease: oak; pine; poplar; masonite; paper trays; cork; cotton. By taking air samples from the reaction vessels and using mass spectrometry the chemical changes were examined. It was found that in the dried state the paper trays; cotton; and poplar released very little formic acid, whilst the other materials tested released high concentrations. When water, and oxygen, was added the formic acid produced increased considerably in all cases (oak produced the highest concentrations) except the cotton wool. With acetic acid, very little was produced by the materials either in the dry or wet state, although the addition of oxygen did increase production, though not to the levels that were expected. Overall, only cotton wool did not induce Byne's disease on

the shell material. However in only one case was the calcium formate - acetate double salt found, which was considered to be the main component of Byne's disease. The efflorescence was found to be composed primarily of calcium formate and calcium acetate, and another related but previously undescribed mineral. SEM studies also noticed the presence of micro-organisms on some of the shell samples, which may suggest another mechanism for the formation of the efflorescence.

The conference finished with a series of talks related to computers and the utilising of databases which essentially consisted of people showing their various systems.

The morning of the second day also saw an amusing 'interlude' billed as 'Video presentation: A different kind of science and conservation at the academy'. In the first clip the video shows the catching of a new species in Yellowstone National Park - a "Barney". The next clip showed Earle Spamer and Ned Gilmore of the Academy looking very serious and sitting in immaculate lab coats being interviewed on the Canadian 'Discovery' Channel about the discovery of this new species, "Barney" (-a cuddly purple dinosaur) and how they tracked its movement to a shopping mall by following press reports! How a straight face was kept whilst being interviewed.....

Overall a good conference which was worth attending, even if it meant having to check out numerous American bars and late night diners!

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Report on the Second World Congress on the Care and Preservation of Natural History Collections, University of Cambridge, 20-24 August 1996.

Delegates to the Congress began to arrive on Tuesday afternoon and evening with lectures commencing first thing on Wednesday morning and running until Saturday. Lectures throughout the conference were held in a large lecture theatre close to the Zoology Museum, while poster sessions, tea breaks, workshops and lunches were on the other side of the road in the Department of Earth Sciences.

A small but very useful trade fair was available throughout the meeting. The number and quality of the posters presented was impressive, sensibly poster authors were asked to indicate times that they would be available to discuss their posters during tea & lunch breaks. This area was an important opportunity to meet other delegates and start conversations that were continued later in the pubs, where many of the more fascinating interactions took place.

Approximately 280 delegates from around the world were registered and while the Natural History Museum was well represented there were only a relatively small proportion of delegates from UK local authority museums.