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2. If the NBN project is to be pursued, then significant changes need to be made to its design and the way it is administered to take into account the weaknesses of the previous bid. These include the poor (as far as I know) degree of consultation with Local Authority structures; the difficulties that the proposed monolithic development process would cause to ineligible existing LRCs; the absence of any direct LRC representation on the consortium; the almost complete lack of discussion about other elements of the bid.

3. The 'Consortium' is obviously a wider organisation with a developmental role and the consortium's bid was obviously much wider than just LRCs. Any continuing consortium-like organisation should continue to have a wider membership and if possible retain a wider remit. However, I think that we should be prepared to *insist* that proper representation is given to LRCs on an equal basis to other partners on any such organisation. The arguments deployed against this, that we do not have any money to put on the table, nor any significant human resources to contribute are insufficient. What we do have is accumulated experience and expertise. We have, indeed we are, the existing system on which any future growth must be founded. The recognition of this fundamental did not seem entirely clear from the NBN documentation.

4. I understand that an LRC advisory sub-group is scheduled to meet on 18th February at which the attendance of A. M. Smout (BRISC) and yourselves is planned. This meeting may be rescheduled in view of the bid's failure, whenever it happens I think the points above should be discussed.

5. The real decisions will be made at the next full consortium meeting whenever that is. Assuming we all agree, then I propose that we attempt to persuade the Consortium immediately to open up that meeting to the rest of us to that and make our case there as well. If we are accepted then all well and good, if rejected, then at least the situation will be clarified.

6. There is a 'window of opportunity' here to salvage the useful aspects of the bid and to try and add to it our own contributions. It means recognising a short if unspecified timescale over the next couple of months and putting our efforts in together as early as possible. BRISC has a small amount of money to help finance any meetings and associated travel. I'm sure the BCG and NFBR are in even better circumstances. We have a worker who could be called on to do any contacting/organising.

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PLANT COLLECTIONS FOR NON-BOTANISTS WORKSHOP PART 2

The following continues the report on the above workshop held at Liverpool Museum on 26th February 1996. This section covers the practical session on non-vascular plants, fungi and economic botany. As already mentioned in the last issue of the Biological Curator these sessions were run on an informal question and answer basis. The write-ups, therefore, are based on information sheets or retrospective reviews by the demonstrators concerned. If you require further information or clarification I am assured that all the demonstrators named here are more than happy to be contacted.

Mike Palmer

CURATION OF FUNGI

Demonstrated by Dr Brian Spooner, Royal Botanic Gardens, Kew.

Fungi represent a special group which is handled in many ways differently from flowering plants. The Kew system has evolved over many years but is not necessarily the only system. It could be altered and adapted to local requirements.

What are fungi?

They are a huge and extremely diverse group of vast ecological and economic importance world-wide and still very poorly known. it is estimated that perhaps only 5% of fungi are yet described and that as many as 1.6 million species exist.

They were previously curated as Cryptogams, including all groups of non-flowering plants, fungi & lichens, myxomycetes, mosses and liverworts. This is an artificial assemblage of unrelated taxa. Fungi are a Kingdom in their own right and this does not include myxomycetes although myxos are traditionally considered as fungi and are usually maintained in mycological herbaria.

Curation

A curatorial system for such a huge group needs to be user-friendly, i.e. species and specimens to be located easily, and to provide information on taxonomy. It is, therefore, useful if related taxa are housed together: this reflects taxonomic opinion and, in practice, can facilitate identifications.

Until recently, Kew based its curation of the fungal herbarium on Saccardo. He compiled, in 25 volumes 1882 - 1931, a descriptive catalogue of all fungi. These were arranged according to an artificial, though practically useful, system based largely on colour and septation of spores, form of fruitbody etc., and each fungus was numbered. The first 11 volumes provide the main compilation complete with index. Later volumes contained new species, each given a new number, i.e. not following on from the numbers previously applied to that group. A recent index to all volumes has been published. Saccardo was continued by Petrak to 1939, then by International Mycological Institute's (IMI) Index of Fungi, ongoing listing all new taxa, and published twice a year.

Kew maintained a system using Saccardo classification and numbers as in vols. 1 - 11. Species described subsequently were maintained in alphabetical sequence as an addenda. This was eventually unwieldy as the addenda was often large, confusing to visitors, and in no way reflecting modern taxonomy. In recent years the herbarium has been recurated and a numbered classification introduced. This has also allowed expansion of the herbarium.

Other systems

Alphabetical arrangements of all taxa within major groups are used by many major herbaria, including IMI. Specimens are easier to locate but no indication of taxonomic relationships is given and related species cannot be readily found.

Anamorphs:

Fungi often have two or more spore-producing stages. They are classified by their sexual stage (teleomorph), but often have one or more asexual stages (anamorphs). At Kew these are maintained in a separate sequence, as many anamorphic fungi are not linked to teleomorphs. In some herbaria anamorphs are kept under teleomorph names, but this is inconvenient and gives a misleading picture of what teleomorph material is available.

Kew system

Our classification is based on modern taxonomic opinion, modified where necessary. It is a numbered hierarchical classification so that each genus can be easily located and related taxa are together. This is indexed with an alphabetical list of genera, on computer and as a printout which is constantly updated as new taxa are accessed or to reflect taxonomic changes. Species are stored in alphabetical sequence within the genera as it is usually impossible for fungi to arrange them in systematic order as they are too poorly understood. In ascomycetes genera are also stored alphabetically within their families as again they are too poorly understood to create at present a meaningful systematic sequence.

This system currently recognises 95 orders, 400 families and over 7000 genera.

Additional taxa:

New species are placed into the alphabetical sequence. Unnamed species are placed at the end of the genus. New genera or families being introduced to the system will need a number and a letter appended unless the entire sequence is re-numbered.

Sub-sequences

Geographical:

For species with a wide distribution this is a valuable subdivision so that distribution can be readily determined, and individual collections from certain areas more readily located. This can be done for all if required, but many are restricted in distribution or represented by few collections so that it may not be practically useful.

Hosts:

For plant parasites in particular it is important to have a host-based sequence. This allows rapid identification of fungi, many of which are extremely host-specific, and host data can be readily extracted. This can link also with a geographical arrangement. This system is of particular value for rusts and smuts, and powdery mildews, which are commonly host specific. This should be linked with a species index so that species can be rapidly located. It is also useful for large and difficult genera such as Mollisia as a help for identification and to understand host ranges of species. Can be done in general terms such as 'spp. on herbaceous dicot. stems', 'spp. on dicot. leaves', 'spp. on graminicolous hosts', 'spp. on non-graminicolous monocots.' etc.

LICHENS

Demonstrated by Patricia Francis, Keeper of Natural History, Bolton Museum and Art Gallery

A wide variety of specimens were displayed :

1) Recently collected field specimens with field notes.

2) Recently curated specimens stored in pre-cut, ready-to-fold packets (fragment packets) with printed data labels.

All papers used being acid-free.

3) Historical specimens from the herbarium prepared in a variety of ways :

a) Specimens glued directly onto small herbarium sheets

b) Specimens in paper packets

c) Specimens in paper packets, the packets glued onto small herbarium sheets

d) Specimens glued onto postcard sized card mounts

e) Specimens glued onto smaller sized card mounts

The historical specimens were previously stored in taxonomic order in card binders tied with ribbon, each binder holding up to 75 specimens. The binders were then sequentially stored in card boxes.

This method of storage made it very difficult and time-consuming to find individual specimens. It was also problematical trying to add recently collected material to the collection.

A new storage solution was needed to improve access to the collection. The historical specimens are being progressively redetermined and when they return to the museum are being stored using the following methods :

A piece of acid-free card is cut to the maximum size of the mounted specimen. A new data label is attached to the front of the card and all the specimen data are repeated on this label. The card then protects both the specimen and old mount from abrasion when the whole is slid into a marginally larger sized plastic bag. The new data label can then be read clearly through the plastic. The end of the bag remains open to prevent condensation. Using this method the specimens can be stored vertically in metal drawers of office index cabinets.

Particularly bulky specimens or very delicate specimens not suited to the above storage method are stored in individual acid-free boxes with clear acetate lids.

The specimens are arranged in alphabetic order by genus name as in Purvis, O.W., Coppins, B.J. & James, P.W. (1993) *Checklist of Lichens of Great Britain & Ireland*, British Lichen Society.

Many of these newly-curated, historical specimens were also displayed.

BRYOPHYTES

Demonstrated by John Lowell (text by Dr Sean Edwards), The Manchester Museum.

Brief Notes for Use in Collecting and Examining Bryophytes.

- THE GREATEST THREAT TO RARE OR UNUSUAL PLANTS IS THE ACQUISITIVE BOTANIST. If you must collect, then always collect with a guilty conscience, and remember that a small tuft of moss may contain hundreds of plants.
- Select good representatives of the species. Look and think before just grabbing a handful. Look for:

  ripe fruit,

  sex organs (maybe on separate plants if dioecious),

  gemmae (foliar, or rhizoidal in soil),

  variation in habit.

  But just take, for example, a couple of selected capsules, if sparsely fruiting.
- Place each collection separately in its own collecting vessel (plastic bag, tin, or folded newspaper if not too moist), and add your collector's number indelibly to each collection. Make notes against corresponding number in field note-book, which must always be retained. DO NOT RELY UPON MEMORY. Collector's numbers, e.g. Fred Smith 243 should form one sequence only, for your lifetime, to prevent any ambiguity.
- Air-dry collections as soon as possible (but never separate from numbers), and then transfer to herbarium packets. These can be bought, or made from folded acid-free paper, but even manila envelopes will do. Keep to uniform size for filing (many bryologists use a shoe-box herbarium!). Immediately transfer collector's number, plus other data, to packet, leaving space for plant name (if not known) along top edge for easy access.
- EXAMINATION. Most air-dried bryophytes moisten out very well for examination. A little wetting agent (e.g. detergent) may help, and heat is needed only for the most recalcitrant material. Take only the smallest amount (just part of a shoot) for examination, and place in a water-drop on microscope slide.
- Return moistened material (blotting dry is sufficient for small fragments) in a separate packet rather than replacing it with the main bulk in the original packet. Conventionally, triangular packets are used for this so that examined material is readily distinguished.
- Leaves are best removed by pulling downwards with fine forceps. Make as complete a dissection as possible (e.g. sections if necessary) before examining microscopically. Note that stem and branch leaves may differ. Place leaves (both ways up) and sections etc. in small (don't flood) drop of water on a clean slide, and gently cover with cover-slip. A bit of careful preparation saves messing about later when half way through the identification key.
- Do make notes and illustrations. Always mark notes with collector's name and collection number for specimen, to save further unnecessary dissection. Some people make notes etc. on index cards that can be kept with packets. If you use a note book, keep notes on different collections clearly separated.
- Packets are conveniently stored in drawers like a card index. Many herbaria have only traditional cupboard space in which case packets can be glued on standard-sized herbarium sheets and kept in folders (like flowering plants), typically 8 - 20 packets per sheet.

GUIDELINES FOR PRESSING ALGAE

Demonstrated by Rob Huxley, Head of Curation Division, Dept.Botany (text by Rob Huxley & Jenny Moore, Curator of Algae) N.H.M. London.

Equipment

- Archival-quality rigid mounting paper - cut up to appropriate sizes
- Shallow dish (c. 8cm depth) e.g. photographic developing tray
- Non-woven gauze like fabric e.g. fine muslin, old tights and stockings, medical gauze
- Metal gauze sheet
- Plant press with drying paper and corrugates
- Small soft paint brush, mounted needle, forceps, pencil

Method

1. Dried herbarium specimens can be made from liquid preserved or freshly collected material. Float the individual specimens in a shallow tray containing about 4 cm depth of water (preferably sea water for marine algae).
2. Cut mounting paper to size and annotate one corner (use pencil or waterproof Indian-ink) with enough data to distinguish the specimen. A reference number or date and locality should be sufficient.
3. Slide the paper into the water under the specimen and gradually raise (one end first) the sheet supporting the specimen and allowing the water to run off. Arrange the fronds and branches with small paint brush as draining takes place (using perforated metal sheet to support the paper as it emerges if necessary). Leave some branches clumped together to allow easier removal for subsequent examination. Clumped material suffers less damage than that pressed directly onto the paper.
4. After excess water has drained away, place the sheet on several thicknesses of drying paper (or newspaper) in a plant press, covering the plant with the fine gauze. This material will prevent the specimen from sticking to the upper sheet of drying paper.
5. Several specimens can be placed side by side on the drying paper, provided that they do not overlap. Lay several sheets of drying paper over one layer of specimens before starting another layer.
6. Repeat procedures 1-5 until the press is full, inserting a corrugate between the drying paper at regular intervals to ensure ventilation. The average full press should have about six ventilation levels.

7. Fasten straps around press frames reasonably, but not excessively, tightly. Ideal drying is in a stream of warm air, if this is available. A box heated by a couple of light bulbs will provide enough heat. **Excess heat may effect the material's usefulness for chemical analysis.**
8. Replace all drying paper after 1-2 days and again after 5 days. (First change may need to be earlier if drying conditions are poor). At any change, remove completely dry specimens and refasten straps. If a second press is available, it is useful to have the almost dry material in a different press. **Never remove nylon fabric until specimen is entirely dry and removed from press.**
9. Dried specimens are ready for mounting onto herbarium sheets in the usual way. Extra gluing and strapping of branches may be necessary.

Liquid preserved material

- Small specimens and collections representative of one habitat type at one locality are often better liquid preserved than pressed. Polythene bottles are the best containers for collection and transit, but make sure screw tops are correctly and tightly fastened.

SLIDE MOUNTING DIATOMS

Demonstrated by Karen Webb, Curator of Diatoms, N.H.M. London

Make sure that the pH of the cleaned sample is neutral by testing it with litmus paper. If the sample is acidic, wash it with distilled water again.

For a strewn slide, use a clean drinking straw onto a clean coverslip. This strew either can be air dried in a dust free place, or on a warm hot plate. Make sure that the hot plate is only warm, if the sample boils it may cause spitting and loss of specimen.

Place a drop of Naphrax in the centre of a clean slide and place the strewn coverslip upside-down on top of the drop. In a fume cabinet, gently warm the slide either on a warm hot plate or over a small spirit burner. Take care not to heat the slide too much or the mountant will boil furiously, causing the coverslip to crash up and down on the specimens, possibly breaking them. Also, if the slide itself gets too hot it will explode!

When all of the Toluene has been driven off the slide will set hard as it cools. The length of time that this takes depends on the amount of Naphrax on the slide and the temperature at which you are curing it.

For a selected slide, cast the strew with a clean drinking straw onto a piece of mica. Dry in the same way as a strewn coverslip.

Under a binocular microscope, using either a pigs eyelash mounted on a dowel, a drawn glass filament, or a micro-manipulator, pick clean specimens up from the mica and transfer them to a clean piece of mica with a grid scratched on it. This will enable you to "shape-sort" the diatoms and also to find them again when you come to mount them.

When you have selected enough specimens, put the grid to one side, in a dust free place.

Take a clean slide and place an ink spot in the middle, make sure you turn the slide over so that the spot is on the bottom of the slide.

Take a clean coverslip and place it on a clean slide with a drop of water to hold it in place. Put the slide on a ringing table and spin the table to make sure that the coverslip is central. Load a tiny brush with Indian ink (any colour), spin the table and introduce the brush to the coverslip gently; keep the brush on the coverslip until a perfect circle has been drawn with the ink. This will take a while to perfect; be patient, you should be able to get good results after a couple of attempts. Once you have mastered the technique, you will never forget how to do it! Place the coverslip to one side to dry.

Place the spotted slide under the microscope and focus on the spot, pull the focus so that you are now looking at the top surface of the slide. With a small paint brush, place a tiny amount of diatom adhesive on the slide over the ink spot to ensure it is in the centre. If you are using gum tragacanth, leave it to dry. If you are using diatom adhesive, try to remove as much as possible with a paintbrush, keeping the area as dust free as possible (you only need the tiniest amount).

By whichever method you are using, pick up the diatoms from the mica grid and place them in the arrangement you wish, in the adhesive. You may find it best to get all of the specimens safely onto the slide before you start to move them around.

Once you have the diatoms where you want them, cure the adhesive.

Gum tragacanth

Gently "huff" on the slide (as if steaming glasses to clean them). Your warm, moist breath will adhere the specimens to the slide.

Diatom adhesive

Gently warm the slide over the spirit burner, when the adhesive cures it will send off a small puff of blue-grey smoke. Leave the slide to cool.

Place a small amount of Naphrax on the ringed side of the coverslip and turn the slip upside down onto the slide, sandwiching the mountant between the slide and the coverslip. Cure the Naphrax in the usual way, either over a spirit burner or on a warm hotplate. Leave the slide to cool.

Slide Mounting Samples of Large Algae

Karo is the brand name of a water soluble corn syrup, which is used for mounting permanent slides of small pieces of algae for examination under the microscope. It is available from the larger specialist food shops or in the USA or Canada.

To prepare the specimen for mounting, a small sample of it should be taken, washed in sea water or freshwater and kept wet until ready for mounting.

The Karo should be diluted to a 50:50 solution with tap water and a few drops of formalin which is added to prevent fungal attack of the preparation.

Place a small amount of the mountant on a clean microscope slide and put the sample into it. Gently lower a clean coverslip onto the slide and leave to air dry.

As the Karo mountant dries, it will shrink away from the edges of the coverslip, bleed more solution under the coverslip with a clean Pasteur pipette.

The Karo will eventually set hard over a number of days. There may be a problem with the introduction of air bubbles into the mountant when the extra mountant is bled under the coverslip. This appears to be unavoidable because we have not found a way of preventing it.

When the mountant is set, wipe any excess mountant away from the coverslip with a damp tissue.

Mounting of Pollen Samples

The pollen sample should first be cleaned (details available) and suspended in 50% glycerol solution, in a centrifuge tube.

Centrifuge the sample at approximately 3000 rpm for 3 minutes and decant off the liquid.

Mix glycerine jelly with a small amount of phenol.

Take a subsample of the prepared pollen and mix with a small amount of the glycerine jelly. Place the sample on a microscope slide which has been cleaned with alcohol, and put two small pieces of plasticene on the slide, one either side of the sample. Gently warm the sample to melt the glycerine jelly then stir the sample with a needle, to disperse the specimens.

Gently lower a clean coverslip onto the sample so that it is supported by the plasticene. Bleed melted paraffin wax under the coverslip to seal the slide. When the wax has cooled and set, it will support the coverslip and stop it from crushing the specimens, but the plasticene stays in place.

ECONOMIC BOTANY AND TIMBER COLLECTIONS

Demonstrated by Dr A.S. Gunn, Department of Botany, Liverpool Museum, National Museums and Galleries on Merseyside, William Brown Street, Liverpool L3 8EN.

The system of drawers for the storage of economic botany items, including timbers, used at Liverpool was demonstrated. The system, based on engineering type metal cabinets has drawers which can be flexibly sub-divided. The economic botany specimens are stored in the drawer compartments in their original packaging. Plastazote packing wedges are used to prevent items such as glass vials from moving when the drawers are open or closed. Many specimens are held in old glass-topped display boxes which are deteriorating and these are being rehoused into acid-free cardboard boxes. Ideally some of the material could be stored in clear, air-tight plastic boxes but the cost involved prevent this being applied for all the items in the collection at the moment. The possibility of transferring items stored in polythene packets which are beginning to degrade into polyester packets was also discussed.

THE NATURAL HISTORY MUSEUM COLLECTION OF *ORNITHOPTERA* (BIRDWING) BUTTERFLIES (LEPIDOPTERA: PAPILIONIDAE).

by Phillip R. Ackery
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Synopsis

A brief outline is given of the *Ornithoptera* butterflies, with particular attention to The Natural History Museum's collection of these exquisite insects, how this collection was accumulated, and its present state in terms of curation and information recall. A number of individual specimens of special historical interest are highlighted.

The Birdwing Butterflies — an introduction

In the world of butterflies the Birdwings occupy a position comparable with the Birds of Paradise in Ornithology — a combination of history, romance and beauty gives them unrivalled status within the Lepidoptera. They belong to the Swallowtail family, the Papilionidae, a mainly tropical grouping of some 600 often spectacular species. Conventionally, the Birdwings have been divided into three genera, the smallest, *Trogonoptera*, contains just two species, eighteen species belong to *Troides,* while the twelve most dramatic species of all make up *Ornithoptera,* the primary subject of this article.

Ornithoptera ranges from the Moluccas to the Solomons and southwards into Australia (Queensland). With eight species, the island of New Guinea has the richest *Ornithoptera* fauna. Seven species (*alexandrae, rothschildi, goliath, chimaera, tithonus, meridionalis, paradisea*) are found only in the island of New Guinea; another, *O. victoriae,* is endemic to the Solomons (plus Bougainville, which is politically part of Papua New Guinea). The remaining four species belong to the *priamus* complex — *aesacus* from Obi island, *croesus* from the islands of Batjan, Halmahera and Ternate, *urvillianus* from the Bismarck Archipelago (but not New Britain), and *priamus* itself ranging from the Indonesian islands of Seram and Ambon through New Guinea and northern Australia to New Britain.

Why, then, are these butterflies so attractive to the acquisitive collector? Well, they certainly have measurable status as the largest butterflies in the world, and the female of Queen Alexandra's Birdwing, *O. alexandrae,* is the largest of all with a wingspan reaching 260 mm. Females are quite sombre, especially when compared to the males in which either green, gold or blue invariably contrasts against a rich black background. They are surely the most dramatic of all butterflies. The Birdwings also have powerful historical associations, both with classic insect hunters of the 19th and early 20th century, and with the great private collections built up at the same time. And, rarely for insects, some individual specimens have achieved fame as 'museum objects' in their own right. This level of interest has generated a large and exquisitely illustrated literature, notably the early works of Rippon (1889-1907) and Jordan (1908), and more recently