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In memoriam



Dr Peter J. Stafford (1961-2009)

It is my sad task to inform the membership of the death of Dr Peter Stafford in early October 2009. Peter was voted onto NatSCA committee at our Sheffield AGM in April 2007. Due to his illness, he was not able to fully serve NatSCA and so retired in 2009. His knowledge of Botany Collections, Curation and microscopy would have been invaluable to us.

Peter joined the Department of Botany at the Natural History Museum in 1983 as an assistant curator in the British Herbarium and soon became a research assistant in palynology under Dr Steve Blackmore with whom he published 20 papers on pollen flora. Peter served as an scientific co-editor of the Northwest European Pollen Flora from 1997. Peter was recently working on the Pollen aperture variation in Nelumboaceae (with H. Banks and P. Crane of the Royal Botanic Gardens, Kew) and on Floristic accounts of selected Mesoamerican legume genera (with B. Klitgaard, NHM). Peter developed a great interest and expertise as a microscopist during his research into pollen. His last job at the NHM was as a curator in flowering plants.

He was awarded an MSc in Biodiversity Conservation at the Durrell Institute at Kent University in Canterbury in 2003 and went on to gain a PhD at the School of Life Sciences, Oxford Brookes University, Oxford in 2006 on the Taxonomic and ecological studies on Middle American snakes; a selection of colubrid genera. His other interest in reptiles gained him international repute, publishing 30 papers and he became editor of the Herpetological Bulletin (British Herpetological Society) from 2000–2009. He wrote a book on Pythons and Boas published in 1986 by T.F.H. Publications, USA, and a couple of Shire Publications on The Adder in 1987 and Lizards of the British Isles in 1989 and in 2000 Snakes published by Smithsonian Institution Press and The Natural History Museum (London). Recently he has been studying the Natural history of the grass snake in southern Britain (with D. Whitby) and the Ecology of the Mesoamerican snake genus *Conopsis* (with R.W. Henderson, Milwaukee Public Museum).

He concentrated on fieldwork in Central America and was able to combine his interests and develop his expertise as a photographer when he was closely involved in the building and running of the NHM's field station at Las Cuevas in Belize. With J.R. Meyer in 1999, he wrote the keynote book, A Guide to the Reptiles of Belize, published by Academic Press.

Peter leaves his wife Marian nee Short and their daughter Anna and we send them our deepest sympathies.

Paul A Brown

Guidelines for Authors

Please follow the below guidelines for submitting articles to NatSCA News. For further information, please contact the Editor: editor@natsca.info

Submitting articles to NatSCA News

NatSCA News is normally published three times per year. Issue deadlines are available on request from the Editor. Articles should be submitted no later than three weeks before the publication deadline.

Papers of relevance to the natural sciences collections or their curation, conference reports, meeting write ups, news and views can all be included and should be sent to the Editor no later than three weeks before the publication deadline.

Bursaries

NatSCA is pleased to receive contributions, but cannot pay for articles submitted. Bursaries can be requested to help cover the costs of attending meetings, seminars or conferences. Successful bursary applicants will be required to write an article for the next NatSCA News as a condition of acceptance. This can be a review of the event attended, or an article about a project you have been working on. Please discuss with the Bursary Committee/Editor beforehand.

Submitting an article; Text

- All articles should include an Abstract briefly summarising the contents of the article, including key findings and up to 5 keywords.
- All articles should be submitted electronically either on disc or by email to the Editor (editor@natsca.info).
- Articles should be sent in PC Word format (**not** the new version of Word 2007). Please contact the Editor if you would like to submit an article in a non-Windows format.
- Please name your files with the first author, year of submission and content, e.g. Smith09Text.
- All text should be in Times New Roman font, at 10 points.
- The names of animal and plant species should be in italics and the authority name given in full for the first time used, thereafter they may be omitted. Scientific names should follow the most recent relevant codes, e.g. ICZN, ICBN. Please ensure that the only citations immediately following taxon names anywhere in the manuscript are those of the naming authority.
- The author will receive a *PDF proof of their article before the issue is sent to the printers. It is the author's responsibility to check that the article is ready for print by the deadline given by the Editor.

Submitting an article; Images

- All images must be sent separately, not embedded in the document. Images should be sent as tiff or jpeg format, and at 300 dpi. Images should be labelled with the name of the first author, year of submission and figure number, e.g. Smith09Fig1, etc.

- All figure captions should be in full and in the main body of the text where you want the images to be placed.
- Images that need to be printed in colour should be discussed with the Editor prior to submission. All images submitted in colour will appear as colour on the final pdf, regardless of whether they are printed in colour in the journal or not.
- If colour preferred, but is not essential to the sense of the article, there is the option for the author to pay for the additional cost of colour printing. NatSCA will always try to print articles in colour when this is necessary.

Submitting an article; References and footnotes

- All references should be given in full at the end of the article using the Harvard referencing system (i.e. author, initials, date, title, reference).
- Footnotes will not be accepted. Include important data within the body of the text or omit.

Further information

- Back Issues of NatSCA News over 12 months old are available free on the NatSCA website (www.natsca.info). The PDFs of the latest issues are updated every April. All PDFs on the website are in full colour where available.
- A full author and subject index is available to browse on the NatSCA website, and is updated every April.
- Opinions expressed in the Newsletter are not necessarily those shared by the NatSCA Committee, the Editor or the membership at large.
- NatSCA reserves the right not to publish an article which may not be suitable, and may require articles to be peer reviewed prior to publication.
- The Editor reserves the right to not include any article if deadlines have not been met, or if the article is not to a satisfactory standard.
- Authors retain copyright to articles, but all material submitted to NatSCA requires the author to ensure they own the copyright to text and images. Non-exclusive copyright is transferred by the author to NatSCA for publication in print, on the web and for use in other media.
- We ask authors to refrain from uploading the *.pdf proof or final, full text version of their papers for internet distribution for one calendar year following publication. Full bibliographic details should accompany the uploaded article, together with a link to the NatSCA website (www.natsca.info)

Authors will receive:

One free colour (if appropriate) *.pdf of the article, or one copy of the journal, or xx reprints (whichever applies).

Erratum

There were a few errors in Issue 17 of NatSCA News. The incorrect caption was given to Figure 2 in the article “*Bringing a herbarium to life at Plymouth City Museum and Art Gallery*” (page 44). The correct caption is with the image below;



Fig. 2. Clowance House, Cornwall, Sir John St Aubyn’s family seat.

Two articles in Issue 17 “*Is there a viable future for herbaria?*” (page 14) and “*The Royal Horticultural Society’s Colour Chart: an everyday tool for use in the herbarium. Its past, present and future.*” (page 75) have been re-printed in this issue. Please reference the two articles as per this issue:

Grayer, S. 2009. Is there a viable future for herbaria? *NatSCA News*. Issue 18. pp. 8-18

Grayer, S. 2009. The Royal Horticultural Society’s Colour Chart: an everyday tool for use in the herbarium. Its past, present and future. *NatSCA News*. Issue 18. pp. 19-26

Editorial

It has been a busy few months for Ed Baker, the NatSCA website Editor. He has updated the website, and the new site is found at www.natsca.info. Please take a look and please feedback to NatSCA any thoughts or suggestions. Ed has written an article on how the changes were made (pg.53). NatSCA is also on Facebook. Search 'Natural Sciences Collections Association' and request to become a member.

Please continue to send in articles and seminar write ups for NatSCA News. Sharing information about conservation, education and our collections through articles in NatSCA News is a fantastic way to inspire new ideas and partnerships. The NatSCA committee have developed some easy to follow guidelines for authors (pg.3).

The next AGM has been booked at Plymouth City Museum and Art Gallery, focusing on public engagement in natural science (see below for details). Booking details will be emailed out to members next month.

NatSCA Annual Conference and AGM, 6th - 7th May 2010

Plymouth City Museum and Art Gallery

'Public Engagement in Natural Science'

The conference will focus on different projects where museums have been engaging diverse audiences in natural history. It will be an opportunity to reflect on the impact of the events run during Darwin year and also to look at new means of communicating with audiences such as Web 2.0 and other initiatives museums are involved in.

Call for papers; please contact Gerry McGowan
(gerard.mcgowan@bradford.gov.uk) and Kate Andrew
(Kandrew@herefordshire.gov.uk)

Contributions for Issue 19, March 2010

All articles, letters, news, adverts and other items for inclusion for the next issue of the NatSCA Newsletter should be sent to the address below by February 14th 2010:

Jan Freedman
Plymouth City Museum and Art Gallery,
Drakes Circus, Plymouth, PL4 8AJ

Email: Editor@natsca.info
Tel: 01752 30 4765

View From The Chair

I recently had a chat to a Geological curator who has worked for both regional and national museums and was interested to discuss the improving relationships between the life sciences and earth sciences museum communities. In a nation where so much time, effort and media coverage is spent in natural science programmes & environmental 'conservation', we can surely argue the case for the continued preservation of our natural history and geology collections' heritage as a database of the past for measuring changes in species distributions to serve research into the effects of global warming and habitat degradation.

With the predicted shrinkage in public funding for the museums sector and for our sector in particular (e.g. the planned restructuring at Bristol Museum which both NatSCA and GCG lobbied to show our concerns and just look how successful the recent exhibition of the donated 'Banksy' artwork has been there to pull in their public), we will, as the MLA recognised Subject Specialist Network and with GCG and ICON, attempt to provide a protection or at least a united common voice for our jobs and our collections. I do not promise any quick fixes but we all must work hard together to ensure a proper, constructive and coordinated argument for the future of our sector for the common good. If you know of a collection at risk then please let us know!

To change the subject, Ed Baker and Mike Sadka have been working on improving our Website (see page 54 for Eds article Website Conservation: A case study on the NatSCA website). We have left our NHM hosted site and have a new domain at <http://natsca.info/> and our new discussion site at www.jiscmail.ac.uk. Ed noticed problems and omissions such as lack of search capability, no publication contents, and linkage issues and has used the new 'scratchpad' technology to revamp our site. We have added a page for the Insect Collection Managers' Group and I wonder whether there are any other groups who do not have a website and who would benefit from having a similar web-page to raise their profile?

Writing from my new desk at the NHM, South Kensington (my eighth home since I started here in 1977). I can report that the Grand Opening of our new Darwin Centre (Phase 2) has happened with Prince William having a close encounter with Jan Beccaloni's tarantula and being informed about our Mosquito DNA research. Part of the complex is the Specimen Preparation Area (SPA) where the public have the chance to speak directly with preparators and scientists whilst they press botanic specimens and prepare insect specimens for the collections and for research. Also the successful move of Botany collections from the Waterhouse building herbaria and Entomology collections from our Wandsworth storage facility into DC2 will be completed by the end of the year.

Paul A Brown, 22.x.2009

Is there a viable future for herbaria in British Museums?

Susan Grayer

Email: hilltim1@sky.com

In one word the answer is yes.

I arrived at this conclusion after studying six herbaria in Britain, ranging in size from two thousand specimens that could be accommodated on two shelves of a cupboard to collections approaching three quarters of a million specimens and requiring considerably more shelving. A variety of museums containing herbarium collections were visited for the purposes of this study: local authority: Bolton Museum and Archive and Southend Museums Service; university: Manchester Museum; national provincial: World Museum Liverpool; independent: Haslemere Educational Museum, and of course my own place of work, the Royal Horticultural Society’s herbarium at Wisley.

What prompted me to investigate herbaria in British museums? One reason was that, although I work in a herbarium, the RHS is not strictly a museum and I was curious to see how herbaria were accommodated and used in the context of a museum. Were they visible? Were they active? Were they acknowledged within the museum itself? Were they in jeopardy and from what sources?



Fig. 1. *Nymphaea* 'Director G.T. Moore' © RHS Herbarium.

Another factor which spurred my curiosity was a seeming lack of coverage in the museums' press regarding herbaria in British museums. It is almost a subject without a literature. As long ago as 1954 Harry Stansfield, the then Keeper of Botany at Liverpool Public Museums, referred to herbaria as the 'Cinderella of the natural sciences collections'¹ and it has been stated that botany 'occupies in general a very subordinate position in British museums'.² My aim is to show that Cinderella deserves to go to the ball. As Linnaeus said, 'A herbarium is better than any illustration; every botanist should make one.'³

The fact that herbaria are not intended for display sets them apart from other museum objects in the most obvious of ways. Leander Wolstenholme more recently commented in *NatSCA News* on the difficulties of displaying the 'undisplayable'.⁴ His conclusions were supported in a subsequent article by Julia Tanner.⁵ This lack of visibility was one of the concerns raised by the 1987 *Biological Collections UK* report, which also highlighted historical neglect, a lack of curatorial expertise and public unawareness as threats facing the herbarium.⁶ The second part of this paper will look at the various ways in which the selected museums have tackled these challenges.

But before looking at the current state of herbaria in British museums, I would like to start by attempting a definition of the term 'herbarium'; this will be followed by a brief history of herbaria. According to the Oxford English Dictionary, a herbarium is 'a collection of dried plants systematically arranged. Also a book or case contrived for keeping such a collection; the room or building in which it is kept'.⁷ The original and highly appropriate name for a herbarium was *hortus siccus*, a dried garden. A herbarium, therefore, is a collection of dried, pressed plants, mounted on paper, on loose sheets or in a bound volume and which may be systematically arranged.

What function does the herbarium perform? Traditionally herbaria performed a reference function, as they still do today. They provided the catalogue and identity of the flora of an area and were and still are used to write field guides or manuals to aid in the identification of plants. For example, the Holmesdale Natural History Society has collections made by J.A. Brewer, including many plants cited in his *Flora of Reigate* (1856) and *Flora of Surrey* (1863). Thus the herbarium is an archive that supports the science of plant taxonomy, that is the science that finds, describes, classifies, identifies, and names plants.

In addition to its traditional role as a reference tool for botanists, the herbarium is increasingly being used by historians, artists, and garden designers. For example, garden designer Lizzie Tulip has been researching the herbarium of Florence Nightingale, the Stovin herbarium, at Middlesbrough Museums & Galleries to coincide with the centenary of Florence Nightingale's death in 2010.⁸

Herbaria have been in existence for hundreds of years. The first herbarium is reputedly to be that of the Italian naturalist, Professor Luca Ghini (1490-1556), who was the first director of the botanical garden at Pisa. He is reported to have collected three hundred specimens and preserved them on paper for the purpose of identification. Ghini introduced 'probably for the first time the technique of pressing and drying plants which could then be attached to cards and filed as a source of reference more reliable than an illustration.'⁹ Thus botanical study could now be conducted all the year round by consulting a collection of dried plants. Ghini also established the practice of field trips as a standard part of the students' training.

In 1530s Italy, at places like Pisa and Padua, it is medicine that is the driving force behind the establishment of herbarium collections; students were taught about the healing properties of plants, animals, and minerals. Unsurprisingly then, the greatest sixteenth century herbalists were physicians. Thus we find the business of self-preservation, and the preservation of the natural world, intimately bound up.

In England the Apothecaries Act of 1815 required all medical students to take an examination in herbal knowledge if they wished to practice as licensed practitioners. Not only were botanists and medical practitioners collecting and amassing their own private herbaria, but people from all walks of life, from local worthies to factory workers, were keen to get out and collect plant specimens for their own herbaria. For example, the wealthy businessmen Charles Bailey and Cosmo Melvill, as well as Leopold Hartly Grindon, who was a working-class man, all ultimately came to donate their collections to the Manchester Museum.

The mid-nineteenth century also saw an explosion in the formation of local botanical societies, which were the origins of many herbaria found in museums today. All the museums in this study were founded in the nineteenth century. Many local floras were also published in the nineteenth century, and Webb and Colman's *Flora Hertfordiensis* of 1848 was described by Dony as being 'as much verse as botany'.¹⁰ This

comment evokes the 1870's herbarium collection of a Miss Lightfoot, which is housed at Haslemere Educational Museum, and in which every pressed plant is accompanied by a poem. It must be admitted that not everybody has been enthusiastic about herbaria: in the twentieth century, the esteemed C.D. Darlington, Professor of Botany at Oxford, believed that herbarium specimens should be burned!

Present

After this rather brief and selective tour of the past I would like to return to the present. I found museums and their curators who cared for their collections and indeed were devoted to them. I have chosen three broad themes to illustrate the various ways in which herbaria are playing an active role in the life of the contemporary museum. The themes chosen are: scientific function; display; new developments.

Scientific function

There was plenty of evidence that the herbaria in this study retained a scientific function.

This was certainly the case at the Royal Horticultural Society's garden at Wisley which houses a collection of approximately eighty thousand specimens. (Fig. 2) In 1964 the Council of the RHS decided to formalise the remit of the RHS Herbarium by declaring it to be a dedicated horticultural herbarium. As one of the world's few specialist horticultural herbaria, Wisley is a vital horticultural reference tool for both RHS botanists (who use it daily) and visiting researchers.



Fig. 2. RHS Herbarium, Wisley © RHS Herbarium.

Despite being small, compared with Kew's six to seven million specimens, Wisley does have an international reputation, especially when it comes to the practice of maintaining nomenclatural standards.¹¹ These are the equivalent of type specimens, but for named cultivars (cultivated varieties). A nomenclatural standard is the herbarium specimen or illustration of a cultivar which forms a permanent record of the distinguishing characteristics of that cultivar. Whilst the concept of standard specimens was first proposed in 1959 it was only in 1998 that the practice of designating standards really took off as far as the RHS was concerned with the appointment of one full-time member of staff dedicated to this research project. The RHS Herbarium is the world's foremost institution in this respect. The herbarium has over 5,000 nomenclatural standards.



Fig. 3. Standard portfolio for *Lavandula angustifolia* 'Hidcote' © RHS Herbarium.

The herbarium specimen is the nomenclatural standard. Information on the label gives the name, description, location and date of collection. Supporting information in the portfolio includes: a photographic transparency showing form and colour, features lost when the plant is pressed; first place of publication, in this instance a nursery catalogue and other supporting literature. All standard specimens are placed in green-edged folders.

Another traditional function of the herbarium is that of supporting the publication of a local flora. Botany staff have been working on an updated Wisley Flora to be published in 2010 to mark the centenary of the first Wisley Flora. Voucher specimens have been collected.

The herbarium at Southend Museums Service is small, comprising some two thousand specimens. There is no dedicated botanist as such but the Museums & Galleries Manager, John Skinner, is a trained botanist, and as he proudly told me David Bellamy was his lecturer at Durham University. The focus of this collection is local (Essex) flora. It is this curator's interest that keeps the Southend herbarium alive and vibrant. He is also a keen lichenologist and mycologist and as such the museum has a good collection of these. The Museums and Galleries Manager has good relationships with the vice county recorder and local botanists who contribute to the herbarium. The earliest herbarium specimens date to the 1820s and are formed from the collection of Christopher Parsons (1807-1882), a gentleman farmer, who recorded all the common plants of his time. Many of these three hundred and sixty-nine specimens are now agricultural rarities and are of significance for their historical interest such as *Agrostemma githago*, corn cockle. (Fig. 4). The museum has a recreation of a Victorian naturalist's study loosely based on Christopher Parsons. (Fig. 5)

Display

When visited all of the museums studied had herbarium specimens on display in the public galleries. For example, at Manchester herbarium specimens collected in the nineteenth century from Lindow Common were used in ‘Lindow Man: A Bog Body Exhibition’. These included sphagnum moss, *Sphagnum cuspidatum* and bog rosemary, *Andromeda polifolia*.

At Bolton Museum the natural history galleries were peppered with invitations to the public to visit the herbarium. Incidentally Bolton Museum’s first curator was William Midgeley, who made his first pressing at the precocious age of four.

An interesting and unusual feature at Haslemere Educational Museum is the presence of a flower table, which features numerous examples of living plants. This occupies a prominent position opposite the reception desk, and has been a feature of the museum since 1893. (Figs. 6 & 7)

Fig. 4. *Agrostemma githago*, corn cockle, collected by Christopher Parsons, 1825 © John Skinner, Southend Museums Service.



Fig. 5. A Victorian naturalists study, Central Museum, Southend-on-Sea © John Skinner, Southend Museums Service.



Fig. 6. The flower table, Haslemere Museum, early twentieth century. © Haslemere Educational Museum.



Fig. 7. The flower table, Haslemere Museum © Haslemere Educational Museum.

New Developments

All of the museums visited found that artists were being inspired by the herbarium collections. As the editor of *Museum Practice*, Javier Pes comments, ‘Artists’ interventions are all the rage, especially in non-art museums.’¹²

A novel and imaginative way in which the work of the herbarium has been brought to a wider audience has been through the appointment of an artist in residence in the Liverpool Botanical Collection. Jyll Bradley’s appointment has been made possible by Liverpool’s status as European Capital of Culture in 2008.

Bradley's work is, as she states, 'often concerned with 'worlds' that are going through difficult periods of self-reflection. These are places and institutions which superficially seem outmoded, but which in fact are very much alive, albeit desirous of re-invention.'¹³ The Fragrant Project, as the artist entitles her on-going work with plants, is interdisciplinary, mixed media and site specific.¹⁴ Bradley sees Liverpool's botanical history as one of dispersal, given that the collections (herbarium, library and garden) have been dispersed and are now in three separate locations. The artist felt that the herbarium was the dried memory of the original garden. She perceived that through herbarium specimens a direct link to the past may be established via connections made with human handwriting and the plant. Each sheet is a story waiting to be told.¹⁵

There is no doubt that Bradley's work has raised the profile of the collections at Liverpool.¹⁶ People are now forming links between the dried and living gardens: for the very first time gardeners from the Liverpool Corporation have been to the herbarium. A major product of the residency was the show garden, 'Mr Roscoe's Garden', which won a silver medal at the Royal Horticultural Society's Chelsea Flower Show in 2008. (Fig 8) The garden celebrated the life and work of William Roscoe, founder of Liverpool's botanic garden, and the plants came from the Liverpool Botanic Gardens collection. Several herbarium specimens were also included in the display. After leaving Chelsea, the garden gained yet a wider audience by touring to the Bluecoat (an art gallery in Liverpool), and then the Tatton and Southport flower shows.



Fig. 8. Mr Roscoe's Garden, RHS Chelsea Flower Show, 2008 © RHS Shows.

The culmination of Bradley's work was the publication of a book on her research, and also an installation entitled, 'The Botanic Garden' held at the Walker Art Gallery, Liverpool. This installation consisted of five large panoramic images, the recreation of a virtual garden. One of the images shows herbarium staff preparing herbarium specimens. The artist likens the images to gardens of the mind.¹⁷

Manchester Museum has had a research programme with Arts Council funding for artists, the Alchemy Project, which has given artists access to the museum's and university's collections, 'placing particular emphasis on the articulation of research and the creation of new work.'¹⁸ As Leander Wolstenholme says, 'We have more artists coming in than we do botanical researchers.'¹⁹ This was demonstrated by the fact that on the day I visited two artists were working with the collections, but no scientists.

One of these artists was Gaenor Deacon. In addition to pencil drawings of herbarium specimens selected by the curator, she also wrote a blog about her activities in the herbarium. She tells how she stood outside the herbarium on the Oxford Road, taking photographs and handed out handmade invitations to the herbarium to passers-by. (Fig. 9) She blogs, 'I am taking the connection between the herbarium and the local community one step further by physically presenting the public with an invitation to the herbarium. Perhaps I am fulfilling the collecting process by collecting people to visit the herbarium.' Sadly, she found that the term herbarium was not understood, and that people simply did not know what it was or what it did. Although nobody took up the offer of visiting the herbarium at such short notice the herbarium is certainly accessible and welcomes visitors.

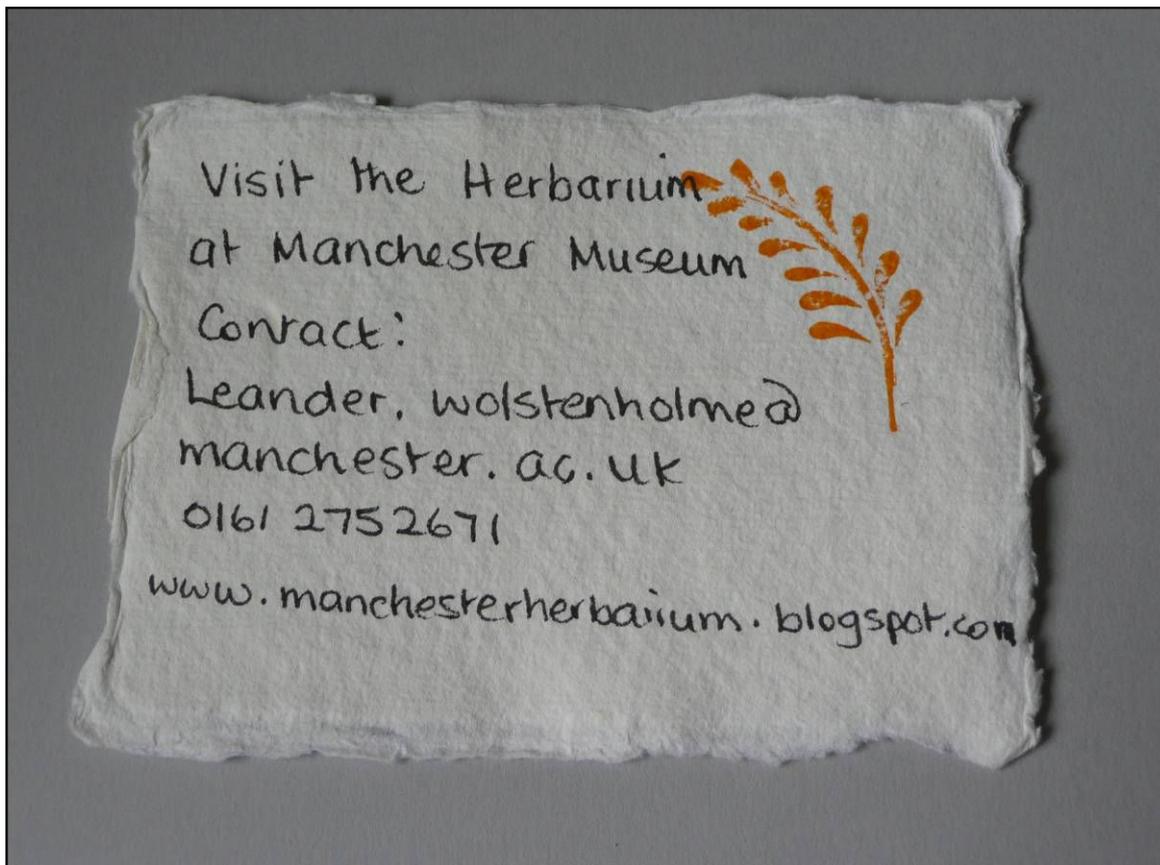


Fig. 9. Handmade invitation to the herbarium, Manchester Museum – Gaenor Deacon © Gaenor Deacon.

Patricia Francis at Bolton Museum finds informal learning sessions involving groups with no botanical knowledge or notion of what a herbarium is to be an effective way of promoting the herbarium. She finds that in these sessions it is helpful to approach the subject of collections from a social history perspective i.e. the people behind the collections and the times in which they lived, rather than from a purely plant perspective. For example, a herbarium specimen is rendered far more interesting if we learn that it was collected by a local shoemaker; where and how did he live, and what happened to him?

A further development is the significance herbaria can play in the study and observation of climate change. As the Keeper of the Herbarium at the British Museum (Natural History) has recently said:

'We used to think of British botany as something that was pretty much done and dusted, but now with climate change these [herbarium specimens] are becoming incredibly important. Among other things they offer an invaluable time series. You can mine them for flowering cycles, carbon content, density of stomata on leaves which changes according to the amount of CO₂ in the air - all of that.'²⁰

As Miller-Rushing and others concluded in 2006, ‘Analysis of such collections [herbaria] should dramatically increase our understanding of how climate change affects biological systems at many previously unexamined localities and for a wide range of species.’²¹ A plant flowering significantly earlier or later than in the past might well point to climate change but this change can only be observed if there is a record of the past. For example, Karen Robbirt comments that the estimated 2.5 billion herbarium specimens worldwide are ‘a largely untapped resource at present, but one which may prove invaluable to conservation science.’²² Robbirt’s PhD study ‘aims to evaluate the long-term changes in flowering time over a period of more than 200 hundred years for a range of species of British orchid, based on more than 2000 herbarium records.’²³ So far analysis of such herbarium data is suggesting that some orchids are flowering significantly earlier.²⁴ With ever-increasing concerns about the effects of climate change the role of the herbarium has never been more relevant.

Of course effective acquisitions policies are crucial if herbaria are to continue recording environmental change. Several of the museums visited had labyrinthine acquisition policies, making additions to the collections extremely difficult. This is obviously a concern.

Attitudes towards specimen collection are still ambivalent, being seen both as quaintly old-fashioned and destructive. However, as Clive Stace reassures, ‘only a small part of the plant is needed for diagnostic purposes, and rarely are underground parts essential.’²⁵ Herbarium specimens provide a vital record of plant identity and distribution over a period of time, and act a bit like an electronic tag in the modern criminal justice system: what is the plant, where has it been, and where is it now. The military orchid (*Orchis militaris*) is a good example of the importance of curating herbarium specimens. (Fig.10)

It was recorded in old floras as occurring in Kent but the majority of modern floras dismissed these records as misidentified lady orchids. However, the Bolton herbarium has a specimen of this rare plant from Kent, what turns out to be the first Kent record, spotted by Patricia and verified by Francis Rose. It dates from 1836 and is a Joseph Woods specimen. ‘Checking identifications and distribution data against museum collections’, Pettitt argues, ‘is essential for groups that present difficulty in identification.’²⁶



Fig. 10. *Orchis militaris*, the military orchid, Bolton Museum © Bolton Museum & Archive Service.

At Bolton primary school children conducted an ecological project in which they examined the Thomas Greenlees collection. This project won the National 2007 Rolls-Royce Science Prize. At Haslemere a more hands-on approach was adopted involving garden backpacks containing a flower identification sheet and magnifying glass. The internet is also proving an increasingly valuable tool, enabling the public not only to access the herbarium collections, but also to interact with them in ways such as cataloguing. The internet may well be the solution to the problem of 'displaying the undisplayable'; it is certainly bringing the contents of the herbarium to a wider audience.

What has become clear is that, in the future, herbaria must provide more than they did in the past. As the *Collections for the Future* report insists, 'Museums must take steps to ensure that more of their collections are used.'²⁹ Their traditional role as a reference tool, vital though that still is, is no longer enough by itself. Museums have recognised this and are in a superbly strong position to bring the role of the herbarium to a wider public and by doing so ensure a viable future.

Acknowledgements

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The Royal Horticultural Society's Colour Chart: an everyday tool for use in the herbarium. Its past, present and future.

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Introduction

Keeping with the 2009 conference theme of natural history collections, their past, present and future, I thought members may be interested to learn of the *Royal Horticultural Society's (RHS) Colour Chart*.

Colour is an important criterion in the description and identification of cultivated plant varieties (cultivars). In fact it is frequently the only distinguishing feature between one cultivar and another; it is therefore a significant diagnostic character. The *RHS Colour Chart* is a tool that horticulturalists can use to describe colour and it is, for horticulturalists, the standard reference for colour identifications. As J.H. Wanscher wrote in 1953, 'In horticulture there is a natural need for exact, but also simple colour descriptions'.¹ RHS staff, mainly in the Botany and Trials departments, use it for descriptions of plants, for example those that have been given RHS awards from RHS trials and RHS specialist plant committees, in particular those awarded the (Award of Garden Merit) AGM, plants widely available to the general public.



Fig. 1. *Horticultural Colour Chart* (1939) & *RHS Colour Chart, fifth edition* (2007) ©RHS Herbarium.

Such descriptions are not only published in horticultural publications but importantly form part of the description that accompanies the herbarium specimen. Wells pointed out in 1966 that 'such useful and often necessary information is too often omitted'.² When consulting herbarium specimens living colour is invariably lost and it is the colour chart that forms a pivotal role in the descriptive label that accompanies the dried pressed plant. The colour chart is invaluable when describing a range of plants in the same colour range. For example lavenders, *Lavandula angustifolia* 'Elizabeth' is (88A) whilst *Lavandula angustifolia* 'Joan Head' is (83A).

The colour chart has evolved and endeavoured to put colour description on a more objective, scientific and systematic basis. It should be noted that, ‘colour is a sensation, experienced subjectively by each individual’.³ In fact the history of colour abounds in subjectivities.

The past

Colour charts have, as Paclt states, been around for centuries: the first record of a colour chart to describe plants and animals dates from 1686.⁴ Whilst Brent Elliott, Historian to the RHS, pointed out in 1993, ‘that the poverty of precise colour terms for use in describing plants led to the creation of colour charts for gardeners’.⁵ Elliott observes that RHS trials were arranged by colour as far back as the 1860s, and that finding a method of describing whole trials filled with cultivars, all of the ‘same’ colour, was difficult.⁶ With many thousands of words to describe colour, language was still not sufficient to definitively describe and identify each unique taxon. However, there appears to have been a lack of urgency on the part of the RHS when it came to the creation of a colour chart. It was only in 1905 that France produced the *Répertoire des Couleurs* published by the French Chrysanthemum Society, followed in 1908 by Klincksieck and Valette’s *Code des Couleurs*. As Elliott notes the RHS acted as the distribution agent for the latter.⁷

Twenty years or so later these early and foreign-produced colour charts had become increasingly difficult to obtain and as Elliott noted the colours in these publications seemed to have deteriorated over the years.⁸ The British Colour Council (BCC) produced a *Dictionary of Colour Standards* (1934) for use in the textile industry and it was this that prompted the RHS to approach the BCC with a view to using colour in a horticultural context. As Robert Wilson of the BCC declared, ‘The need for standardized colour terms for horticultural use requires no emphasis, without them accurate description is impossible’.⁹ It is this rationalisation of colour, a quest to establish a universal template of colour useful to the horticultural industry, which underpins the colour chart.

The first volume of the *Horticultural Colour Chart (HCC)* appeared in 1939, the second volume in 1941. (Fig.2) Since then all plants that have received awards from the RHS have colour chart references in their award descriptions. The aim of the *HCC*, as with all subsequent RHS colour charts, has been to provide a standard reference for the colours of flowers, fruits and leaves.

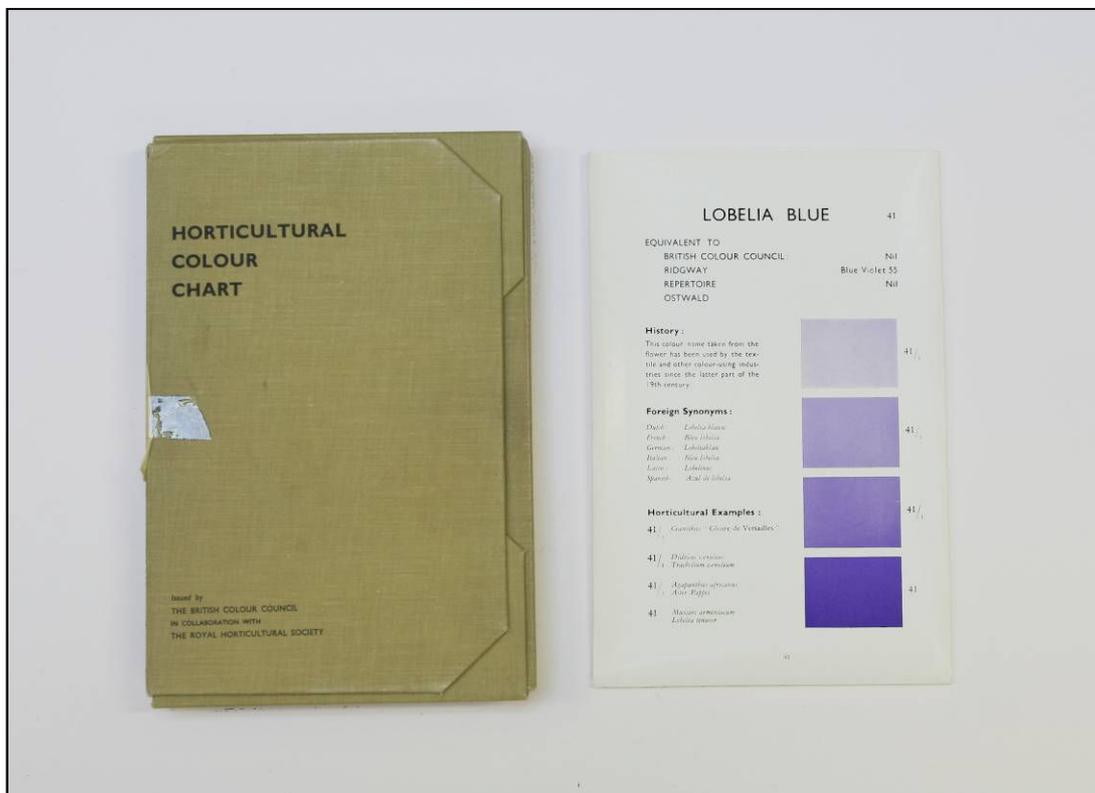


Fig. 2. Horticultural Colour Chart (1939) © RHS Herbarium.

The two volumes were issued on loose sheets in boxed cases and contained two hundred sheets, eight hundred colours in total, with each plate containing a single colour term in English, Latin and five other languages, with three hues attached to the lead colour. With the second volume 'complete ... it is believed to fulfil the object ... of providing a "colour guide to the garden"'¹⁰ and was also a 'much desired standardization of colour description.'¹¹

Sheets were paginated from 1 to 100. In the top right-hand corner a number in bold type referred to the position in the spectrum range of the hue shown on the sheet. The first sixty-four sheets were of full hues. The bottom colour on each sheet was the full hue and bore the full hue number with 1, 2 and 3 being graduated tints of the full hue. The remaining sheets in Volume One and all in Volume Two were lighter tints or darker shades or greyed hues of the full hues.¹² Each plate was headed with an evocatively descriptive name. Specific plants were attached to specific colours as being an example of an exact match. A history of the colour was also provided. For example, Victoria Violet 738 was described as 'a predominant colour of the Victorian era, especially in dress about 1868-1870', the horticultural example for Victoria Violet being *Rhynchoglossum zeylanica*. Doge Purple 732, on the other hand, was described as 'a colour name associated with the Republic of Venice during the Renaissance', the plant identified as an example being *Primula* 'Wanda'. But whilst each sheet of colours had cultivated plants given as examples, Bunyard explained that 'the chart is not a dictionary of flower colours, but a guide for matching and description'.¹³ It was hoped that the *HCC* 'would ensure acceptance of standard descriptions of colour for all plants so that anyone reading the reference would carry away a fairly clear picture of the colour'.¹⁴

By 1964 supplies of the *HCC* were low. A committee led by Sir George Taylor, Director of RBG Kew, concluded after assessing the available colour charts, that they were inadequate for horticultural purposes and that a new chart needed to be published.¹⁵ The colours also did not seem to keep pace with the brilliance of the colours of the new cultivars being produced!¹⁶ Shortcomings with the *HCC* had also been noted: the specific names for each sheet were felt to be unsuitable or cumbersome for a horticultural context; the colour names were not only too many but deemed to be incomprehensible to non-artists. The numbering system was complicated. The *HCC* was printed by a half-tone screen process and this often resulted in many colours being practically the same and indistinguishable from one another. For example, I have difficulty distinguishing between Rose madder 23/3, Tyrian Rose 24/3, Rose Bengal 25/3 and Solferino Purple 26/3. An additional observation was that the green, yellow and bronze colours were lacking in the *HCC*.

A new *RHS Colour Chart (RHSCC)* was issued in 1966. Eight hundred and eight colour sample patches were produced to match plant colours, 'chiefly flowers'.¹⁷ Instead of loose sheets, the new colour chart was arranged into four fans. These four fans were labelled one to four and consisted of broad colour groups: Yellow-Red, Red-Purple-Blue, Blue-Green and the greyed groups. The sheets were arranged in colour groups beginning with yellow, and progressing through the spectrum: yellow, orange, red, purple, violet, blue, green and back to yellow. Groups in between are formed by adding the name of the next colour in the sequence such as yellow, yellow-orange, orange, orange-red, red.¹⁸ These simple colour groups with number codes suffixed with a letter from A to D replaced the poetic names of the *HCC*. As the user guide and subsequent user guides state: 'the group names are given for reference, and are not intended for use as colour names'.¹⁹ Each leaf had four patches of colour in lessening degrees of intensity. Another innovation of the '66 chart was that the colours ran to the edge of the fan, making it easier to match the flower to a colour. Interestingly it was reported that 'there was some argument in favour of a hole in the middle of the colour patch so that it could be laid over the flower petal but the final decision was against this'.²⁰ Portholes or viewing holes were to appear twenty years later in the 1986 *RHSCC*. These viewing holes, through which part of the flower may be placed, give a far more accurate match, in my experience, than placing the material adjacent to the fan.²¹

A table of cross-references was included in the 1966 colour chart comparing the new chart with the *HCC*, the *British Colour Council Dictionary of Colour Standards*, the *Nickerson Color Fan* and the Commission Internationale de L'Eclairage (C.I.E.). For example, the colour 45D in the new chart was said to be the equivalent of Blood Red 820/2 in the *HCC*.²² In 1984 the American Rhododendron Society produced *A Contribution Towards Standardization of Color Names in Horticulture* to co-ordinate references with other colour systems used, supplying a table of equivalents between the *RHS Colour Chart*, the *Munsell Colour Chart* and Universal Colour Language (UCL). Here the *RHS* Yellow Group 5A is described as brilliant greenish yellow according to UCL.²³

commented on and suggested improvements to the fifth edition of 2007 comprised entirely RHS botany staff who were regular, if not obsessive users of the colour chart.

The 2007 edition, being the fifth, (there was a fourth edition published in 2001) has twelve new colours and a total of eight hundred and ninety-two colours.



Fig. 4. *RHS Colour Chart*, fifth edition (2007) © RHS Herbarium.

The *RHSCC* is not without its critics. Recent studies, such as Griesbach and Austin, find the *RHSCC* lacking when compared with the one thousand five hundred and fifty colours of the Munsell Colour Chart.²⁷ Criticism also comes from Bob Brown who is dismissive of the *RHSCC*²⁸ but his arguments are squashed by Peter Barnes who sees Brown's criticisms or failings of the *RHSCC* as ones of use in uncontrolled conditions.²⁹

It should be noted that the use of the *RHSCC* is not confined to the horticultural sphere: it has been used by Moorfields Eye Hospital, for eye colour, food and textile manufacturers and also a banana exporter. The chart has also been used to record the colour of a stock of love birds in a Nigerian breeding station!³⁰ Even more bizarrely, a husband purchased a copy for his wife who was to use it when buying her clothes!³¹

The Future

There is a trend towards on-line colour charting. The Azalea Society of America has produced an on-line version of the *RHSCC*, which gives 'approximations of the colors in the *RHSCC*, along with the corresponding Universal Color Language numbers and names'.³² Niki Simpson, a botanical artist, discusses how she has implemented colour keys based on the *RHSCC* in her digital botanical art.³³ 'Paper colour charts are not yet obsolete, although they may become so at some point soon', warns Briony Fer.³⁴ Personally, I think the colour chart just improves with each edition.

Conclusion

In 2009 the *RHSCC* is used by herbarium staff and botanists to record colour in virtually all the plants that come into the herbarium, regardless of whether they have been given awards or not. Colour is an invaluable reference point which botanists can use to successfully identify plants. The *RHSCC* is, for example,



Fig. 5. The five editions of the *RHS Colour Chart* © RHS Herbarium.

used and recognised on an international platform by offices concerned with the legal protection of plants, notably those in Europe, America and Australia. It is also used by international cultivar registration authorities and is 'thus the key to thousands of published descriptions'.³⁵ An effective colour chart such as the *RHSCC* diminishes the dangers of subjectivity, and enables the user to provide an accurate record of colour to accompany a dried, pressed plant long after the living colour has been lost. The colour chart is an invaluable tool for all those involved in horticulture, be they amateur or professional.

Acknowledgments:

I would like to thank Dr Brent Elliott, Historian, RHS Lindley Library, for commenting on this paper and also to the NatSCA Bursary Committee for awarding me a bursary to attend the 2009 NatSCA conference in Leeds.

A few guidance notes on using the *RHS Colour Chart*:

Try and use natural north light and endeavour to stick to the same area whenever you are using the *RHS Colour Chart*.

Open up the four fans and familiarise yourself with the range of colours available before attempting to match with the plant sample. This will give you a good feel for the range of colours. For example you will notice that not all the green are in Fan 3: some, the grey-green ones, are in Fan 4.

When using the fans place the particular part of the plant you attempting to colour chart under the porthole of the selected colour. This gives a far more accurate match, in my experience, than placing the material adjacent to the fan.

Do not worry if you are unable to find an exact match; instead, annotate the chosen reference colour, for example: *Aquilegia vulgaris* subsp. *stellata* 'Blue Fountain' buds greyed purple (mix of N92D-90A); *Geranium phaeum* 'Little Boy' flowers dark dusky purple (slightly redder than 79A).

Endeavour to add a colour before the colour chart number for example red (59A). It gives people not familiar with the coding an idea of the colour. RHS Botany staff often refer to *A contribution Toward Standardization of Color Names in Horticulture* by R.D. Huse & K.L. Kelly (The American Rhododendron Society, 1984).



Fig. 6. Using the RHS Colour Chart to describe *Eleagnus multiflora* © RHS Herbarium.

It is quite exhausting colour charting plants so do not attempt too many at once or you will become overwhelmed. Colour fatigue soon sets in.

Always note the edition of the colour chart you are using and put this at the end of your description.

Replace the fans in the box when finished with as the colours could fade if left out in the light.

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Excel for Data cleaning

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Introduction

Every day museum collections catalogues swell with an increasing number of computerised records. However for some reason or other the data we have been plugging away so arduously will have to come out eventually. The problem is that this might not be in the appropriate format for whatever future purpose the data has, and it is not always possible to predict the format of data retrieval needed in the future.

With an increasing push for online public access to our databases, the implications for data quality and format are forcing many of us to rethink the way in which our data is organised. These events reveal how inappropriate or convoluted the data can be: bizarre relics from a previous system, misplaced capital letters, lack of common names, reversed dates, cryptic locality details and jumbled up initials are but some of the extravagant conventions that are hiding in collections databases. Data clean-up, therefore, can look like a horrifically monotonous if not impossible task.

Whether or not museum staff pride themselves in logical or repetitive tasks, the fact is that a computer will do them better. If you find yourself amending records in such a fashion then it is possible a bit of computer code will do the job for you. I was not aware of the full potential of Microsoft Excel when a year ago I was given the task of cleaning an entire set of natural history records prior to a data migration. I hope that the following article may reveal a few tricks that could save countless hours spent amending database entries.

Extracting Data

The first step is to get the data out of a database and into Excel by exporting the set of records to be cleaned. Most museum databases seem to display a single record at a time and do not allow space for manipulating or formatting data. Excel is designed to handle long lists of data, making it easy to spot erroneous entries in a column, and make bulk amendments with the trial and error approach accommodated using the undo facility. It should be possible to export only the fields that you want cleaned into excel. Exporting records creates a copy of the selected data which can then be opened and edited in Excel. This will display each exported record as a new horizontal row in a spreadsheet, with the field names as headings at the top of each column (Fig. 1). To facilitate import of the data back into a database it is vital that each record has a unique code that is not altered, to match back up with the original records – in most cases the accession number should perform this function. The entire dataset will be visible by scrolling down the worksheet. The resulting list of data can then be scrutinised for inaccuracies and formatted in specific ways using excel tools.

Basic Excel tools

In addition to being a number crunching program, Excel is very clever with what it can do with text, for example it 'knows' when you are repetitively entering in a term and will autocomplete terms for you, it can convert terms to Upper, Lower and Proper case and allows the usual Copy, Paste and Undo operations. Although it sounds trivial, being able to conjure up a drop down list of all the terms used in a field for your whole data set is extremely useful when cleaning data, and is more than many simple databases are capable of. I have found using the basic Excel tools in combination to be far more quick and reliable than cleaning raw data within a database one record at a time. It is a relatively simple matter to spot and change mistakes with these tools and then to import the cleaned data back into the collections database.

Advanced Excel Tools

Excel can perform more complex operations by inputting specially formatted code into the formula bar for each cell. Although somewhat off-putting (and beyond the scope of this article to fully explain) the code works like a simple language, allowing you to come up with novel functions and amend records in complex logical ways. If the task you need to be done can be written out in a logical statement, i.e. 'if x, do y', Excel will search for a term that matches your criteria x (Table 1), and then perform your specified function y (Table 1).

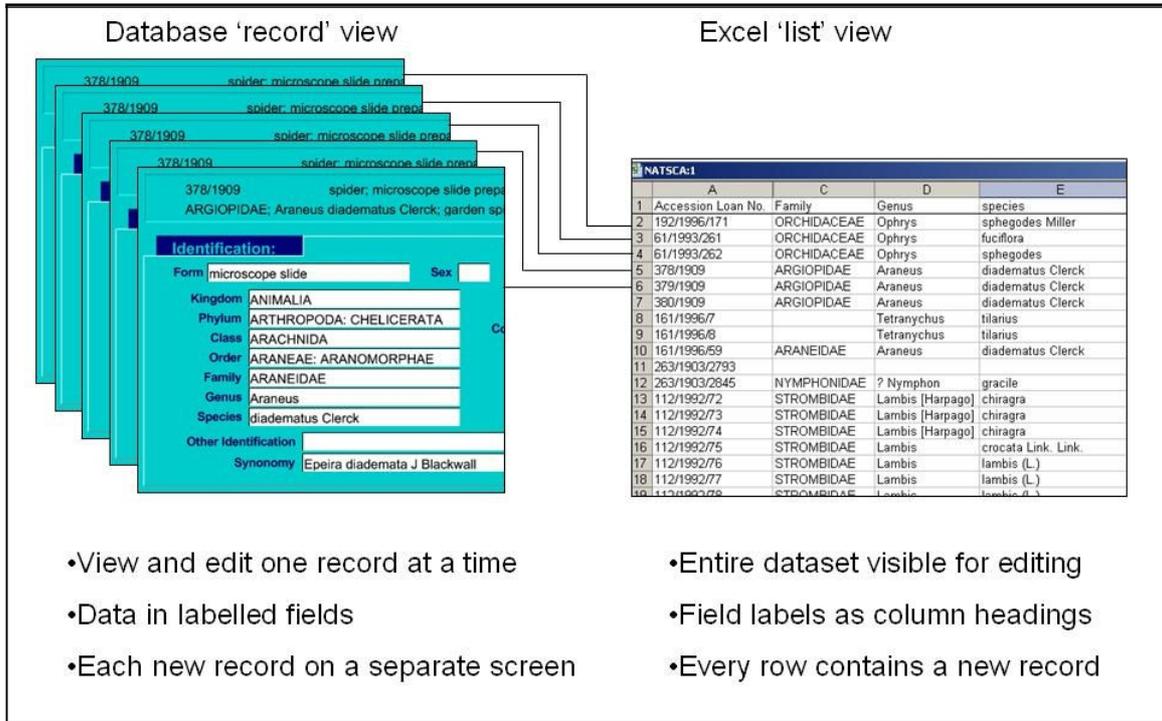


Fig. 1. Database view of records vs. Excel view of records

Table 1. Some examples of basic operations and the associated code.

Example criteria "if x...."	Code For use in place of phrase "if x...."
Contains phrase x (case sensitive)	=ISNUMBER(FIND("x",A1))
does not contain the phrase x	=NOT(ISNUMBER(SEARCH("x",A1)))
contains either phrase x or y	=OR(ISNUMBER(SEARCH("x",A1)),ISNUMBER(SEARCH("y",A1)))
contains both x and y	=AND(ISNUMBER(SEARCH("x",A1)),ISNUMBER(SEARCH("y",A1)))

Table 2: Logic statements using example criteria

Task “...do y”	Logic “if x do y, if not x leave blank”
Change the case of specific phrases Code for above task:	If cell A1 contains the letters idae (as in taxonomic rank=family), convert to upper case. =IF(ISNUMBER(SEARCH("*idae",A1)),UPPER(A1), "")
Join specific phrases Code for above task:	If cell A contains only the phrase 'var.'(as in botanical variety), join data in cells A1 and B1 =IF(A1="var.",CONCATENATE(A1," ",B1), "")
Expand abbreviations, such as Authorities Code for above task:	If cell A is either 'Lin', 'L.' or 'Linne', change to 'Linnaeus' =IF(OR(ISNUMBER(SEARCH("Lin",A1)),ISNUMBER(SEARCH("L.",A1)), ISNUMBER(SEARCH("Linne",A1))),"Linnaeus", "")

Table 2 illustrates some logic statements using example criteria. **Fig 2.** below shows the basic format of the logic code: commas separate both criteria and the operations to perform if the criteria are true, or if they are false.

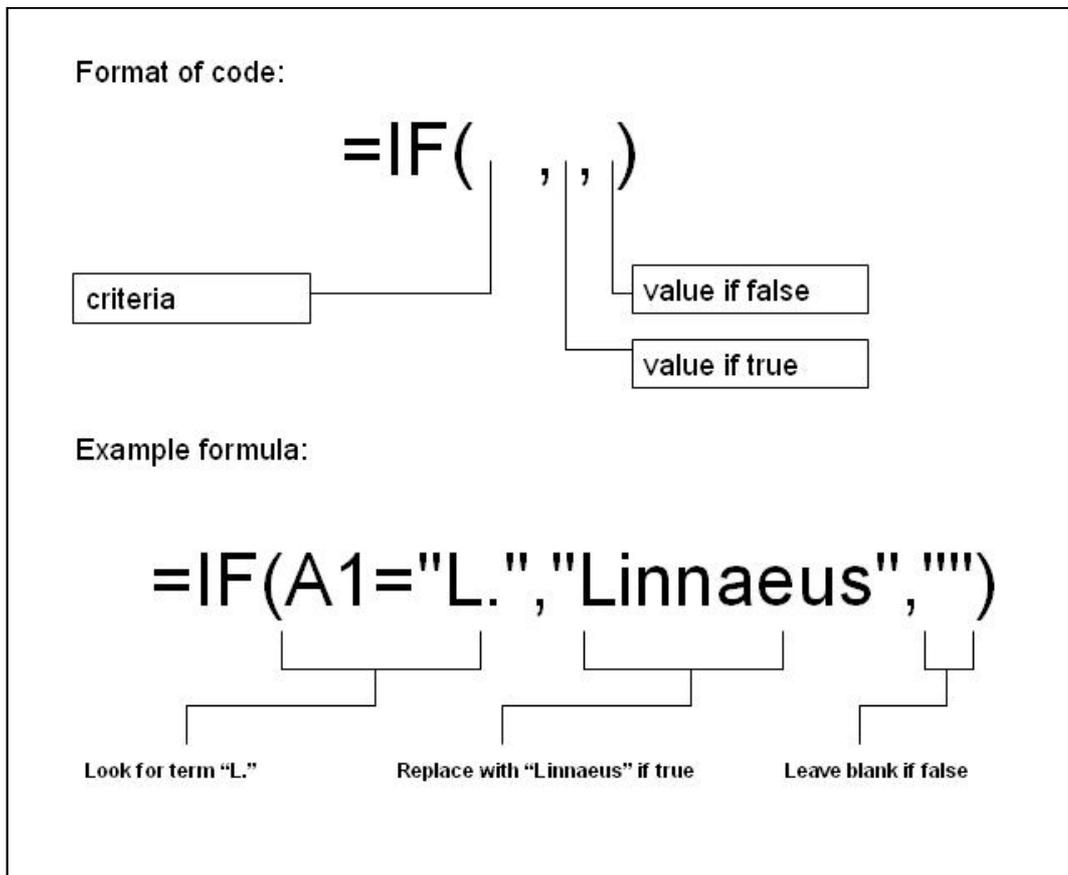


Fig. 2. Format of the logic code

Creating a data cleaning tool

On first glance it may seem that manually finding and replacing a single phrase with “Linnaeus” is a more simple task than getting to grips with Excel code, but when you have multiple terms to sort and 10,000 records to clean the time saved is significant: Multiple criteria and functions can be nested within brackets for complex conditional formatting, and you can be quite creative in the sort of functions you want to do. Once you have written the code in a cell in a new column, all you do is drag down to the bottom of the sheet and excel will automatically process each record – this is the same procedure as using the autofill function and excel will ‘know’ when you want it to move onto the next record and update the code accordingly.

Needless to say, it can get complicated, but the key is to recognise which data problems could be better tackled in Excel than flicking through database records. The current version of Excel will do about 65,000 records at a time. There are also many ways to protect cells, formulas and columns in a worksheet from accidental editing; this opens up the possibility of creating a data cleaning tool for other staff to use, without them ever coming into contact with an Excel formula (once you have put in the hard work in creating it!).

Summary

I put this into practise recently when records were due to be made available online for our public to browse. We did not until then have a designated “Common Name” field for our specimens and common names were tacked onto the end of a long scientific name in the “Full Name” field. This would not have been a very user friendly way of displaying our data and the only way around this seemed to be to create a new field and manually copy and paste common names from the end of the Full Name text string into the new empty field in the collections database. Using the “Text to columns” function in Excel, as well as a few other tricks outlined in this article I was able to export all of the scientific names and create an algorithm to split them up automatically. Given a string of data such as “Anas platyrhynchos (Linnaeus): ANATIDAE: mallard”, the algorithm splits up the genus, species, authority, family and common names into separate fields which can then be re-imported into a taxonomic hierarchy within a database. I had to delve a bit deeper into Excel to automate the process but now our museum has an automatic tool for splitting scientific names where they occur into their separate parts. If this “scientific name parser” sounds like it would come in handy to others then please feel free to contact me – it is still in the development stage but could be tailored to suit other specific data cleaning problems.

Appendix – Useful Excel Functions for data cleaning

Autofill: Used to fill a range of cells with a series of identical values. Use this to quickly populate many records with identical data by clicking on the small black square icon and dragging down. You can also use this to automatically fill in a changing series of values, such as dates.

Autocomplete: Excel learns which entries you are filling in and so will complete a value after the first few letters are entered, speeding up data entry.

Data sorting: Whilst checking a particular field, you can sort the column alphabetically. This is a good way to spot typos as records with similar values are grouped together. Use “Expand Selection” to keep all other data associated with each record together.

Autofilter: This tool gives a glance at the distribution of data; any typos will show up here and can be selected and eliminated. Probably the most useful list processing tool, you can filter an entire sheet to show just a few particular terms for editing at any one time. You can also filter multiple terms at once to be more selective about which records you are editing, e.g. if you only want to edit records with containing data on a specific collector. Make sure to reset the auto filter when done to reveal the whole dataset again.

Date functions: Convert numerical dates to text and vice versa, select how many digits for the year and convert American to English formats. All that is required is to input the Excel code to format the data:

Freeze panes: Keeps the column headings visible when you scroll down a very long list.

Validate: Set data entry controls—convert numerical dates to text, only allows specific terms.

Text to columns: A problem that I had was fields in which multiple terms were entered in a string, separated by semi colons. Excel can split these terms into separate fields automatically, based on whichever ‘separator’ is used. So ,for example, a field in which multiple taxonomic terms have been entered can be split into separate columns in Excel and imported back into their proper fields in the database.

Restoration of a Galapagos tortoise at Norwich Castle Museum and Art Gallery

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Introduction

This article outlines the conservation of a giant tortoise specimen at Norwich Castle Museum and Art Gallery. The specimen was chosen because this specimen was suitable for two projects of the Norwich Castle Museum: the “Darwin 200” event, organized in collaboration with the Sainsbury Centre for Visual Arts, and the new display planned for the Natural History gallery, at the Castle.

At first sight, this specimen could have discouraged the most audacious, as it appeared to be in a terrible condition (Fig. 1). However, its old age and interesting history make the story behind this specimen all the more interesting, and all the more reason to conserve it for future generations.



Fig. 1. Galapagos tortoise before conservation.

History of the Tortoise

This tortoise comes from the Galapagos Islands, where once whaling ships used to stop to stock up with giant tortoises for food. Indeed, they taste good, can feed several men and survive for 6 months without food or water. Stacked on their back, they were unobtrusive guests onboard ships.

This lucky creature, managed to reach England alive. James Clarke, a man native of Great Yarmouth, presented it to the museum in 1844; but it is not known how he obtained it. The tortoise spent a short time in the museum's garden. Museum records show that the tortoise food bill for 1844 was 11s.1d. and that the animal preserver's bill was £5. In 1845, the tortoise food bills were not mentioned, but the animal preserver's bill was £11.16s.6d. It seems unlikely that this tortoise survived the winter.

The tortoise is undoubtedly a giant tortoise from the Galapagos Islands; unfortunately the specimen is too old, too damaged and too badly stuffed to identify its island of origin precisely. Charles Darwin himself could have studied this very specimen when he visited the archipelago aboard the *Beagle* in September 1835. There, he observed that in wet islands, tortoises eat the grass and bushes near the ground, whereas in dry islands they have to reach the high leaves of the trees. As a result from the environmental conditions, dry islands tortoises have developed a special feature; their carapaces are highly bent above the shoulders so their necks can be stretched to their maximum to reach the vital leaves. Using these observations, we can tell that this tortoise comes from a wet island; and the concave plastron (the ventral part of the carapace), it shows that it is a male.

Inside a Giant Tortoise

In 1844, a Galapagos tortoise was a rarity in Europe and the museum of Norwich was surely pleased to get one. Few people in the country had ever seen a wild giant tortoise and apparently the taxidermist was not one of them (it is true that accurate references were difficult to find).

Anatomically the specimen is rough: colours are wrong and the rear legs are far too plump. Technically, the mounting is crude: nearly 30% of the skin is missing, which maybe caused by putrefaction, a careless skinning or an aggressive tanning. The internal structure is made of four planks roughly fixed with thick wires and the neck was supported with an external wire fixed to the carapace (Fig. 2).



Fig. 2. Inside of the carapace.

Even if the taxidermist was not used to this kind of giant reptile, he proceeded traditionally. First, he opened the plastron, and then he detached the skin from the flesh and removed the guts, flesh and bones. The skin could have been chemically treated in order to preserve it; but was more likely simply dried. The taxidermist then “mounted” the specimen by building an internal manikin, sewing the skin, wrapping the wires and packing the legs with a combination of grass, wood shavings, feathers, string. Finally, before closing the plastron with wires, he spread a clay-like paste inside the carapace. This material was tested for arsenic and found to contain more than 3mg p. litre.

The specimens’ shell plates were nailed on the bony carapace, cracks and junctions were filled with white putty and concealed the missing pieces of skin by gluing on large patches of paper and fabric. The tortoise would have looked like a coloured patchwork at this stage, so it was completely painted or varnished to make the colour more uniform.

A careful observation and solubilisation tests, helped to identify the glue of the patches and the paint covering the skin as animal glue, the carapace varnish as natural resin and the putty as a traditional mixture of animal glue, whiting (calcium carbonate CaCO₃) and cotton wool.

Identifying areas for conservation

All the parts of the tortoise were damaged, but to different degrees.

- The internal structure or framework was loose and could not support the weight of the tortoise any longer.
- The stuffing was almost totally missing in the rear legs and loose in the neck and the front left leg.
- The skin was the most damaged part of the specimen. It was very dry and brittle, torn and missing in many places. The patches probably induced most of these tears by pulling on the fragile skin when drying and in responding to humidity changes in a different way.
- The skin itself had also shrunk and the different layers had split causing the loss of scales and hollow areas between the dermis and the epidermis, mainly located on the front legs.
- The shell plates were distorted and torn in some places. They had moved in reaction to the surrounding humidity and temperature; and being irregularly nailed, they suffered severe stress and tears in some places.
- The animal glue covering the skin and the natural resin used to varnish the shells had darkened. The thick coat of darkened varnish concealed the shades and the fine design of the shells. It was removed with a commercial basic paint-stripper carefully rinsed after use.

Remedial conservation

In order to avoid further damage, the large patches of fabric and paper were taken off with water compresses. This process revealed large pieces of the tortoise's skin which had not been seen for over 150 years.

Some of the nails fixing the shells were removed allowing a general flattening of the carapace. Fish glue was injected under the distorted shell plates and dried with retaining straps. One lateral shell plate, particularly distorted, needed to be immersed several times in hot water (about 40°C for 10 minutes) to be relaxed and gradually put back in shape with clamps. A perfectly shaped carapace would have involved dismantling all the plates, so the junctions, cracks and minor gaps between the shell plates were filled using a mixture of PVA glue, paper pulp (1part) and whiting (1part). This method will allow flexibility to follow the movement of the shell plates without cracking.

The plastron was opened by removing the wires and cracked mastic sealing the junction. The access to the inside of the specimen was very useful in many stages of the restoration and, above all, made the containment of the arsenic possible. It was decided that the arsenic would stay in place but sealed in a resin to prevent the toxic powder from dispersing. The arsenic paste was not cohesive; so to be sure that the resin adhered and that the two layers did not separate, the arsenic paste was consolidated with an acrylic resin (5% Paraloid® B72 in acetone). Then, an epoxy resin (chosen for its non-reversibility and its dimensional stability) was spread on the paste and the framework. The resin helped to strengthen the framework, and fibre-glass soaked with resin was wrapped around the weakest point, the base of the neck.

Access to the inside of the giant tortoise was also extremely useful for the reconstruction of the fleshy parts. In order to avoid stress on the fragile skin, it was decided to build an internal manikin on which the skin

would be glued. The structure of the manikin was built with wire mesh on a base of Plastazote® foam and covered with epoxy putty modelled to fit the pieces of skin. In order to remain reversible, the operation set in two stages: first the putty was modelled and hardened, and then the skin was glued on the surface with PVA glue. The epoxy putty showing through holes in the skin was textured and painted to match. The missing scales were replaced using the same epoxy putty, modelled to fill the gaps and then glued with PVA. To fill the hollow areas of the front legs a creamy mixture (5% gelatine and CaCO_3), which sets as a gel quickly, was injected. Finally, all the mastics were painted to match the dark-brown colour of the tortoise skin with a mixture of reversible acrylic resin (5% Paraloid® B72 in acetone) and pigments (Figs. 3-5).

Fig. 3. The rear legs before an conservation work on the specimen.



Fig. 4. Remedial conservation on the specimen in progress.



Fig. 4. Remedial conservation on the specimen complete.



Future Research

During the conservation project, we retained a sample of the specimen's muscle, with the aim to send it for analysis and thereby establish exactly which island the tortoise came from. No attempt was made to correct the overstuffing because it is historical. Sealing the arsenic, strengthening the structure of the specimen and documenting all the procedures along the way, have vastly improved the safety of this specimen for future research and display.

Acknowledgments

I am a fourth-year student at the Institut national du patrimoine (National Institute of Heritage), and I worked on this specimen during my six-month internship at the Norwich Castle Museum and Art Gallery. I would like to thank Vanessa Trevelyan, Head of Museums, for giving me the opportunity to work as an intern in the Natural History department of the Norwich Castle Museum and Art Gallery. I thank Dr Tony Irwin, Natural History curator, for his attentive management and the team of the Natural History department for its help.

UK Suppliers

Arsenic test - Merckoquant®, Arsenic test kit, 0,02 to 3mg p. litre, Merck®.
 Paint stripper - peel-off Ronstrip® by Ronseal®.
 Epoxy resin - Resin research – epoxy system – 2000 epoxy resin/2100F fast hardener by Seabase®.
 Epoxy putty - Apoxie® sculpt by Aves®.
 PVA glue - PVA M218 reversible, bookbinding quality by Charwood books®.
 Gelatine - 100% pork skin gelatine, platinum grade by Super cook select®.
 Acrylic resin - Acrylic adhesive B72 by HMG product®.

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SPNHC Conference, Leiden, July 2009 – Bridging Continents.

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With my interest in fluid preservation of biological collections, a visit to Leiden was important. The hosting LUMC (Leids Universitair Medisch Centrum) houses some of the anatomy specimens from the early anatomists including Rau, Albinus and Ruysch. The latter name may be familiar to some since he even wrote a book on preserving biological specimens back in 1710 entitled *Thesaurus Animalium* and which contains some fine illustrations of lead glass jars with deep conical punts and containing specimens, more to amaze than to be of scientific interest and decorated with fine Florentine paper and topped with a fanciful display of dried specimens on the lid (Fig 1). Ruysch frequently used a small child's arm and hand as a prop to hold or support some of his specimens. Although this may seem abhorrent to some these days, in 17th century Holland, where infant mortality was just as high as the rest of Europe, then these 'props' would have been plentiful. Preserved in alcohol (Spirits of Wine), these have stood the test of time, although many have been lost or irretrievably damaged over a 300 year time-span.

Added to this, the City of Leiden itself is steeped in history, slightly odoriferous canals (in July), beautiful bridges and buildings and windmills, this was too good to miss. Rush hour in Leiden means that you have to be careful crossing a road or you will cause a pile-up of many cyclists. By the station the bicycle park was enormous together with a heap of abandoned and often bent bicycles awaiting disposal or recycling (no pun!)

The Conference, entitled *Bridging Continents*, was very ably hosted in the Hippocrates Building and we were treated to yummy, handmade and wafer thin biscuits in tea-breaks and a chance to view trade stands which included many of the more recently-developed museum data cataloguing systems including EMU (Electronic Museum) and a stand of Dixon glass museum jars with some of their more recent developments and which attracted much interest. Dries van Dam's own Alcomon company was also represented explaining how his coloured plastic discs help to monitor alcohol self-dilution through evaporation in museum jars.

The schedule was tightly-packed and there was little time (but just enough) for the all-important chatting, networking, advising and getting information. Arriving by 8am was hard due to European time (07.00 back home!)

We were warmly welcomed by René Dekker of the organising committee and Bert Geerken, Director of the Leiden Natural History Museum - Naturalis, also Ric Rabler on behalf of SPNHC and Pancras Hogendoorn who chairs the Museums Commission, LUMC.

During these I was made aware of many European organisations dedicated to advancing curation and curatorial techniques and a host of acronyms!

Peter Tindemans – is a consultant for the Board of the Netherlands Centre for Biodiversity, or NCB, which is the central organisation that includes the Zoological Museum in Amsterdam, the Leiden University National herbarium and at Wageningen in collaboration with the Central Institute for Fungal Cultures as well as the Naturalis Museum. The NCB functions include research into DNA and its applications: ecosystem monitoring, conservation (nature) and forensics. The NCB receives an annual government grant of €5M and, as it expands with new conservation facilities, it is hoped that their headquarters will open in 2014.

Wouter Los – of the University of Amsterdam next gave a historical overview of the origins of natural history collections, such as the Teylers Museum in Haarlem. He said that the UK held the greatest concentration of natural history-related museums in Europe. He also mentioned a great many related organisations in

taxonomy and bar-coding of DNA sequencing. This and other related talks gave an awareness of just how many organisations there are dedicated to the advancement of curation and curatorial technology.

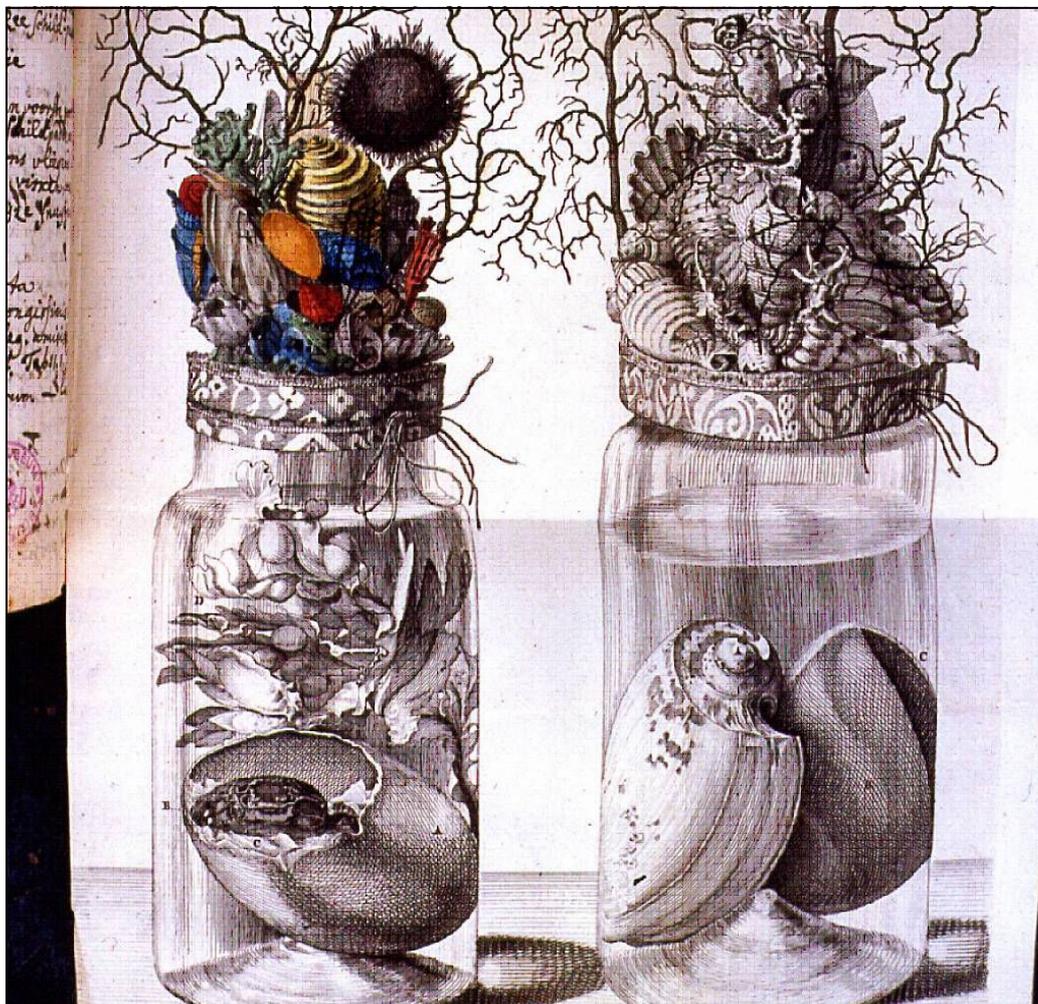


Fig. 1. Two of Ruysch's preparations – note the conical punts of these jars and the fancy papered tops with a mini-display of dried specimens. Unfortunately there may be none of this type of decorated preparation still in existence.

A light but tasty lunch was given us at the nearby Pesthuis (Plague House) restaurant – an adjunct to the Naturalis Museum, complete with an antique and unbreachable door!

That afternoon I was consulted about pH ranges in NH fluid collections and the reasons behind fluctuations and how to deal with them, problems of gradual hydrolysis for preservatives with pH ranges over 7.5 and also protein interaction with formalin buffers and the allied problems of colloidal-linked salt production.

I also talked with Klaus Wechsler who is developing a technique for etching labels onto glass containers and improving on van Cleave and Ross's 1947 rehydration technique for dried-out wet specimens and carrying out the process more gradually. Certainly the results looked impressive and I look forward to seeing the completed work written up (likely in *Collection Forum*).

The main talks centred around the new databasing software and collections management programmes, also the new work on SYNETHSYS and EDIT programmes, addressed largely by staff from the London Natural History Museum in the first half and then a follow-on about adapting herbaria to 21st century challenges,

networking DNA tissue banks, destructive sampling for DNA sequencing and a talk about STERNA building bridges between Europe's NH collections.

After this we were whisked away on buses to nearby Wassenaar and a beach house (not hut!) and a delicious barbecue, courtesy of our hosts. The wind blew and against leaden skies many of us bravely dipped our toes and watched the kite surfers skilfully criss-crossing over the waves, avoiding collisions and occasionally being lifted several metres out of the water!

The next day we had concurrently-running technical sessions (such a packed programme!)

David Smith – of the Natural History Museum, London, has continued Adrian Doyle's pest and beetle migration monitoring work using the (Ke)EMu system. He gave us facts and figures relating to catches throughout the museum, hotspots and their reasons for being so. Somehow, silverfish were not considered to be a pest which this listener found curious as I have seen their grazing damage inflicted on dried algal specimens.

G Jackson Tanner of the Smithsonian Institution showed us how they use disc-shaped robotic vacuum cleaners that rove through storage areas at staff inactive times but have problems with batteries that only run for up to 2 hours.

David Pinniger with Karen Roux, Clare Valentine and Alison Paul told us about the Thermolignum process by gradually raising the temperature within a chamber (usually a converted pantechicon) to 52° C, they can kill any resident pests in all sorts of objects without causing stress to a variety of media of which such objects are composed. Poly-bagging specimens will act as a buffer zone when freezing specimens but this is not required for Thermolignum. He talked about such art works as dried shrimps that had attracted many pests within a short period, that were satisfactorily treated and how DNA is unaffected by the process.

Louise Bacon presented her talk about the Horniman's purchase of a portable X-ray fluoroscope for detecting toxic (heavy metal salt, also methyl bromide and ethylene oxide) residues in taxidermy specimens to a depth of 20-30 microns. So far, she and her team have carried out 1.178K analyses out of c. 3K display specimens using swabs taken from 5 different parts of the body. They also found instances of wadding containing arsenic or mercuric chloride (from Gardner's preservative) inside the skull of a taxidermy specimen and even traces of lead from (presumably) lead arsenate. Louise is trying to find other instances where this toxic reagent has been used in collections. Felicity Bolton (presently at Melbourne Museum), Monika Harter and Georgina Garrett co-authored this project.

The latter part of the morning was spent in another concurrent session about preservation methods. Maureen Flannery of the California Academy of Sciences, with John Dumbacher, has been monitoring marine mammal strandings along the West coast of the USA and the preparation of their skeletons if required. She outlined details of the preparation area's epoxy-coated floor, its ventilation system and salt and fresh water availability, the salt water being piped directly from the ocean c. 3.5 miles away since they use saltwater maceration to clean the skeletons. From Delta Designs Ltd they have installed a dermestid colony cabinet and they have plans for a degreasing tank with a pulley system.

Ingela Holmberg from the Stockholm NH Museum spoke about her project, with Monica Åkerlund, about methodology documentation relating to preventive conservation. This was a presentation combining typical storage versus damage issues as object numbers increase within a finite storage area and the need for more off-site storage.

Birger Neuhaus (and Martin Aberhan) from the Berlin Natural History Museum took the stand to tell us about the 2.2M wet specimens that the museum has in charge, some up to 200 years old, and of the old East Wing building fabric damaged in WW2 at last being repaired. He talked about the usual problems of preventing evaporation from ground glass jars and improving the quality from soda to boro-silicate. He also mentioned jars sealed with Picein – a sealant derived from pine resin and one which I have not yet tried. He said that these jars were difficult to open but that the fluid levels in such jars were generally very good. Following some advice from SPNHC members and the 'Kick-off' workshops in 2008 and 2009, the collection was progressing well and using the Paar DMA 35N meter for measuring preserving fluid specific gravities and the Alcomon indicator system devised by Dries van Dam. He also mentioned about archiving old/fragile labels and using labels only inside jars.

William Keel and a team from the Smithsonian Institution showed how they had been recycling alcohol using a special machine with a charcoal filtration system, that could clean large quantities of alcohol and discard much contaminating waste leached from specimens over years. This sounded like a good idea but was concluded to be not very cost effective even in the longer term due to the man hours required. When questioned about lipid removal he replied that some lipid was still in solution but that should help to equilibrate lipid levels in the IMS, so that more lipid might be removed from specimens due to alcohol solvency. (Theoretically, this should reduce lipid removal from specimens as caused by alcohol solvency. I am not quite sure about - for such an equilibrium to be reached, the alcohol would have to semi-saturate with lipid.)

Isabel Rey (with Beatriz Dorda) told us about managing the DNA collections at the Madrid Museo Nacional de Ciencias Naturales (MNCN) which is divided into a dry FTA card collection, freeze-dried, one stored in 70-96% alcohol and a frozen collection held at -80°C. The tissue samples (only) were stored in silica, with ethylene-diamino-tetra-acetic acid (EDTA) buffering, and in alcohol gave similar good results as the dry and freeze-dried samples.

Dirk Neumann of the Zoologische Staatssammlung in Munich then told us about the problems of having methyl ethyl ketone (MEK) as a contaminant in preservation grade alcohol and how this was a false economy since the MEK has been found to bleach specimens, erode (and polymerise) plastics, corrode acrylic and cause stress in soda glass. He outlined similarly-alarming contaminants in other countries including camphor (leads to browning of specimens), isopropanol (which can denature proteins) and petroleum ether and which all lead to breakdown of polymeric chains in the plastics used to form jar lids. Jar lids lined with poly-ethylene seem to resist this breakdown so far and he hopes that these lids may last for a further 20 years before needing renewal. He has been campaigning for the removal of MEK for some time but it is not yet an important enough political issue! We wish him luck with this!

During a break, 'Dries van Dam kindly showed me the specimens in the Anatomy Museum, the works of Johannes Rau (1668-1719), Siegfried Albinus (1697-1770) and Frederik Ruysch (1638-1731); also the amazing catalogue of anatomical specimens, compiled by Edward and Gerard Sandifort. Although, as I have said, not so many of the specimens and dissections survive, many still do and were sold to Frederick the Great for 30,000 Guilders and some are now in the collections of the Museum of the Academy of Sciences in St Petersburg. In the LUMC museum the original cabinets, figured in one of the old anatomy books, are still in use. Nightmarish aborted fetuses and babies, bloated and contorted organs – a mass of antique human genetic mishap and suffering is displayed, perhaps not for the squeamish, but that such a fragile collection has survived for such a long time is amazing. The displays have been modernised with the lead glass jars placed on a 3-D spiral ladder systems.

The afternoon was devoted to (not enough time) examining the many poster sessions, delivered on lap-tops. While the talks continued about collection movement, I spent my time examining some more of the posters.

Posters.

Many of these centred on various softwares for collecting, collating and dispensing collections data including EMu.

From a more personal interest John Ososky digitally demonstrated a technique for composting a whale's head for easier extraction of the skull over 2 weeks using hay and elephant dung (horse dung would be as good). The result was a clean and odour-free skull with part of its lipid content removed due to the heating up (to 70°C) of the compost heap by bacterial action.

Jovita Yesilyurt showed a method for protecting bulkier specimens of coralline algae by enveloping them with lens cloth (tissue) and making card supports to prevent crushing.

Rodrigo Pellegrini showed me how palaeontological specimens with pyrite decay can be treated using beeswax which drives off the bound water in the pyrite salt molecule! He admitted that the technique was not totally reversible and should only be used as a last resort to arrest the chemical decay if no other treatment was available but better than losing any specimens.

Vicky Purewal outlined her work on analysing heavy metal deposits on herbarium sheets and the fact that mercuric chloride was also used as a fixative in Kew mix fluid.

Felipe Dominguez gave some relevant figures, following an international herbarium questionnaire, relating the techniques for attaching herbarium specimens together with some pragmatic suggestions as to their efficacy and ease of use. From those that participated (48%) he found that 52% used some glue and 52% use straps, 23% stitch, 13% stitch and strap and 5% keep loose. Strapping was deemed to be the safest since it is easily reversible, partial gluing came second whereas total gluing was found to be the least practical due to irreversibility even though the specimen would be kept safe over time.

Marion Kotrba from the Zoologische Staatssammlung in Munich has been monitoring pH ranges and changes in fluid-preserved zoological collections and we discussed hydrolysis problems in fluids that exceed pH 7.5.

I then returned to the lecture hall in time to hear Walt Crimm talk about the Smithsonian Institution’s fluid-preserved collection storage facilities. How he had to write ‘tough’ specifications for what he required so that at least he would get something decent! Explosion-proof lighting being one of them.

Simon Whitaker and Carol Diebel who have redeveloped a wet collection strategy in New Zealand showed slides from 2004 and how their storage facilities progressed in that time and included a caged compactor system.

Gregory Watkins-Colwell (et al.) talked about the vast and unsorted Verrill slide collection at Yale University’s Peabody Museum. The different methods of slide mounting were just one of many problems, sorting dirty labels, broken slides were others but they reaped the reward of discovering the long-lost type specimen of *Schistosoma haematobium*. To date they have processed 54,448 slides but only 1-2% needed repair.

Following a rapid tea break we heard Marieke Hendriksen and Hieke Huisstra talk about the later ‘Famous Five’ Leiden anatomists of the 18th century (Ruysch was earlier): Rau and Albinus and also van Doeveren, Bonn and Brugmans, how they strove to produce anatomical specimens within strict protocols to discover the perfect body. This also related, theologically, to God’s creation of the perfect man and woman. The specimens were prepared primarily to educate the public but as more advances were made in science, medicine and anatomy, so the more complex field of Comparative Anatomy evolved and the collection became only available to *bona-fide* persons, students of anatomy and medicine.

Rebecca Peters and Maureen Flannery of Chicago’s renowned Field Museum talked about the ‘goldfish bowl’ idea of showing working members of staff to the public and how popular this had become with parties either side of the glass. Scientific participants signed onto a calendar to book the area. They found that a docent was often required to field public questions, particularly those of a repetitive nature, to reduce disruption to the workers.

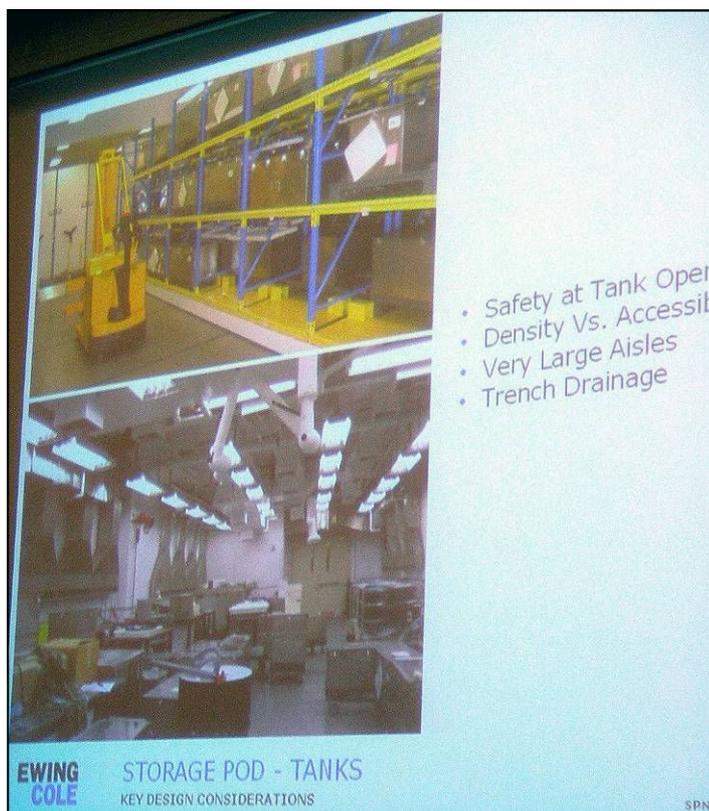


Fig. 2. A view of the Smithsonian Institution’s new fluid-preserved collection storage facilities.



Fig. 3. Five year improvements in storage at the Museum of New Zealand.

Julianne Snider with John Simmons gave a most interesting talk about the perception of nature such as the appearance of monsters in ancient biological *Thesauria* and bestiaries centring around the renowned collector and natural historian Albertus Seba. We were shown dehydrated specimens from Olaus Worm (1588 – 1655), the renowned portrait of Seba in 1734 that prefaces his Cabinet of Natural Curiosities and holding a snake preserved in a jar of (likely) spirits of wine (alcohol), Aldrovandus’s dragon of 1572 which was later named by Linnaeus as *Draco volans* and *D. blandfordi*, the flying dragons (lizards). Albrecht Durer’s rhinoceros of 1515, with its odd adaptations from Germanic armour of the period, and which was copied by many until 1766 when Buffon’s life drawing of a rhino was published. They mentioned a thumbnail history of specimen preservation: the use of brine c. 5th century AD, superseded by vinegar c. 1000 AD, then Spirits of Wine in 1662, dry cabinet skins in 1694 and eventually to formalin in 1893.

Lori Benson concluded the day with a talk about the large scale de-accessioning at the 70 year old Texas Memorial Museum entitled “Breaking up is hard to do”! How the TMM evolved into the TNSC (Texas Natural Science Centre – note the dropping of the M word!) between 1997 and 2002 and the ensuing problems with de-accessioning about 25K objects following its new collections policy.

The evening banquet was held at the old arsenal (Het Arsenaal) a 4-square building, surrounded by canals and now devoted to oriental language courses and culture. We enjoyed a multi-cultural supper and many drinks and then gave ourselves over to some fairly uninhibited dancing (typical of museum-ites!) later into the night but not too late for this person as I needed a clear head for the morning!

Discussion Group 9. I had the pleasure of being the moderator for a discussion group concerning the proposed EU ban on the use of formalin in museum collections. Already formalin has been removed as a preservative in much of the cosmetic industry and it seems that the EU is considering taking this ban further.

This naturally has made those who manage and collect material for fluid-preserved collections, including myself, rather twitchy. The meeting was shown how the removal of formalin as a primary fixative would be disastrous. Although this could be seen as preaching to the converted it made them aware of the impending problem and how this might be resolved. A brief write-up of the findings and some updates will be published in the next SPNHC Newsletter.

The afternoon was devoted to more digital documentation talks or an interactive organised by Rob Waller and Agnes Brokerhof about the dilemmas faced by collections managers with the all too familiar shrinking budgets and staffing levels. In the worst-case scenarios how can you pragmatically view the disposal of a large and important (much-used) collection of specimens versus the disposal of a small collection of types &c, giving us more awareness of the actual value of collection modules. I attended the latter part of this as it had slight relevance to my work programme following a much-needed half an hour to have a quick look at the Natural History Museum known as Naturalis.

Naturalis Museum. The entrance starts via the Pesthuis and then proceeded over the road on a specially-designed enclosed walkway above the traffic connecting to the public galleries. The walkway is lined with touchable Rhinoceroses and during my brief visit I saw these being climbed upon by children and having their ears experimentally pulled (Fig. 4).



Fig. 4. Walkway over the road from the Pesthuis entrance to the Naturalis Museum.

The main galleries were a rather dark and conservation-lit series of cases and specimens, a few of which were available to be touched and typically showed signs of some rough handling. The museum uses real specimens including many wet specimens - really good and refreshing to see (Fig. 5).



Fig. 5. Actual specimens in display jars bravely and impressively displayed in the Naturalis invertebrate gallery.

The botanical section made use of treated herbarium-style specimens, some especially collected for display and adhered to sheets of glass so that both sides could be viewed. Taxidermy vertebrates were displayed openly but out of reach and to give a sense of realism. I found the swimming seal, suspended from the ceiling, fairly close to a cluster of bats, effective even though it gave a slight illusion of flying!



Fig. 5. The mammal display crowned by the swimming seal overhead.

During my brief visit and despite the low-level of lighting, required for actual specimens, I was delighted by the displays which combined reality with current display techniques, plenty of information (my Dutch just managed!) and discreet. One could see that these displays were very popular, especially with younger visitors.

LUMC Anatomy Museum. We were kindly shown around the anatomy museum by the Curator who outlined the work and creations of Ruysch *et al.*, their collective work displaying the unpleasant conditions brought about by the necrotic Noma virus, DNA misplacements within the body and the folio-sized Sandifort catalogue. Dries van Dam then took us to his workshop, showing us his machine for cutting circular glass lids and some jars of varying ages from the collection. He also told us of his jar sealant using micro-crystalline wax mixed with rubber solution so that it has some flexibility.

In all, the conference was really good. I found it most informative, if a little rushed, but some new facts and issues about fluid preservation technology made it even more useful for me. Dries and his colleagues are most certainly to be congratulated in producing a most interesting and smoothly run conference.

ICON conference
Conservation in Focus 2010 - CF10
Cardiff University 25- 26th March 2010

Icon has agreed the themes for next year's Conservation in Focus two day conference in Cardiff. On the first day of the Icon conference will be plenary sessions for all ICON members and the second day will allow ICON Groups to host half day events.

The themes for day one will be

- Evidence based decision making in conservation
- A sustainable future for UK conservation

It is anticipated that papers on the topic of evidence based decision making could encompass a range of themes including: scientific analysis, survey work leading to action; experimental environmental control; review of historical treatments or research leading to an innovative treatment. The issues of a sustainable future for conservation could consider social, environmental or economic sustainability.

Papers could discuss issues such as: the future of conservation training; conservation solutions that are driven by financial constraints; considering environmental factors as a central criterion for conservation decisions or the contribution of conservation to a sustainable community.

Icon is now issuing a call for papers for the first day of the conference. Please submit 200-400 word abstracts of topics for papers to Jane Henderson at HendersonLJ@cardiff.ac.uk

Icon has also agreed a fee structure for the conference which will be:

Speakers - £120
 Early bird ICON member - £150
 ICON member (standard) - £180
 Early bird student member - £100
 Student member (standard) - £120
 Non-member - £250

Bookings will open in October and the *early bird rate will apply until the **end of 2009**. There is also a small sum available for travel bursaries for speakers. The priority for allocating the bursaries will be for speakers that are students, from the private sector or early career professionals.

What do you do with papered insect collections? A new storage system for the Odonata ‘papered’ collection at the Natural History Museum, London.

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Introduction

Insect papered collections have often been considered the least accessible specimens in any Entomology collection. Unset specimens have been placed, into non – archival quality newspaper or blotting paper triangles and square paper envelopes, hopefully with collecting and locality details and then placed chaotically into old cardboard cartons, biscuit tins and shoe boxes of similarly non - archival quality. Initially meant as temporary storage, the specimens might have been forgotten about or put to one side for some future date when time might be devoted to the relaxing and pinning of such specimens (Fig 1).



Fig. 1. Chaotic papered collection.

The Odonata (Dragonfly & Damselfly) papered collection at the Natural History Museum; London is not as described above! and consists of c. 37000 specimens including major donations from J. Cowley BMNH(E) 1968-70, F. Fraser BMNH(E)1963-234 & Richard Gambles BMNH(E)1991-3. Papered Odonata have a reputation for being difficult to relax and set, so the collection has been stored in paper envelopes in metal card file units (Fig 2). The vertically stored envelopes are easy to file and are a self indexed collection, under family, genus and species. Many Odonata collectors ‘paper’ their specimens as setting is time consuming and often takes up much space and they can see the important taxonomic characters without the need to set them. The main negative aspect of ‘papering’ is that the specimens can be prone to being crushed and broken fragments lost.

This collection is arranged in taxonomic order with unidentified accessions placed at the end of the series. This was data-based into our old Entomology Department ‘Paradox’ system and then migrated into the NHM wide KE EMu system.

A collection assessment of the Odonata showed the papered Odonata to be a conservation problem hotspot. The next step was to devise a method of storage using commercially available archival quality materials. Research and product testing led to the use of heat sealed BioQuip ‘Odonata Specimen Envelopes’ which



Fig. 2. Odonata papered collection in index card files.

are made of 1.25mm thick non-static, chemically inert, Polypropylene plastic envelopes 153 mm x 82 mm. (product number 1130DP) with supporting carrier backing card of Perma/Dur® Folder Stock from Preservation Equipment Ltd. We buy sheets of 406 x 508mm of the latter (Product number 750-1620) and cut these into 120 x 80mm rectangles to fit the envelopes. Label paper used is 100% rag from BioQuip with printed script using a Hewlett Packard 1100 LaserJet printer. Within the envelope we have a sandwich consisting of, from front to back, the specimen, the new label, the backing card and old labels. The heat sealer for the Polypropylene envelopes ensures that no fragments will be lost and we use the model supplied by Preservation Equipment Ltd. We had begun to store these into Archival quality buffered and acid free 1300 gm Perma/Dur® 'postcard storage' boxes from Preservation Equipment Ltd (product number 780-4612) in non pest-proof metal cupboards kept near the main collection but not directly associated with it (Figs 3 & 4).

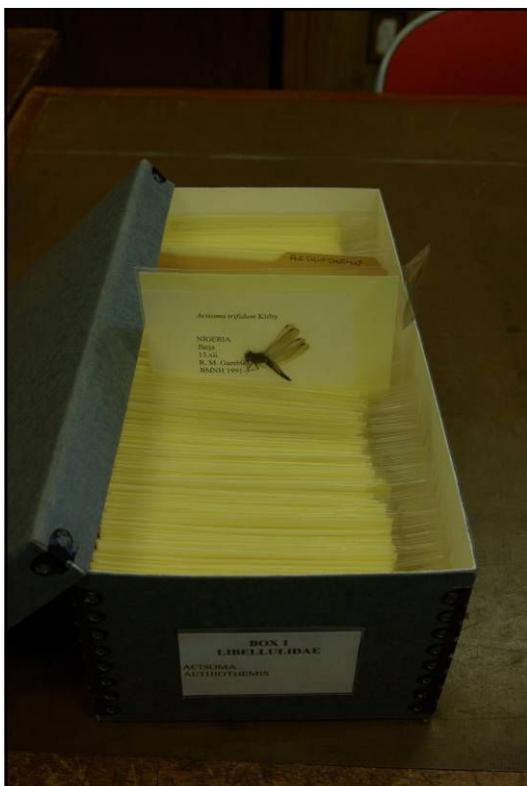


Fig. 3. In 'postcard storage' box.



Fig. 4. Storage in metal cupboard

With a directive to standardise the housing of specimens destined for migration into the new Darwin Centre phase 2 (DC2), the Odonata papered collection index card file units and metal cupboards would not be welcomed, so we looked for a new way of storing the Odonata papered material.

We have been standardising our Entomological collections storage over the past few years from a whole series of drawer sizes from old original constituent collections. There are now three standard sizes: 1. the 'main collection – Hill' sized drawers; 2. the 'accession - moth box' Lepidoptera drawers and 3. the large 'Rothschild' drawers, also used for Lepidoptera. Recently we have also been involved with the design of standard metal cabinets made for us by C & D (Sheet Metal) Engineering Ltd, to house the three families of drawers.

We took the 'main collection Hill' style drawer size and asked Stephenson Blake – Sheffield (part of Harry Spurr Ltd) to make us sample drawers to our design to fit the new cabinets being installed into DC2. The drawer is similar in design to our vertical microscope slide drawer with removable dividers and without a glass lid and having the same external dimension and internal side to side width of 438mm and 420mm front to back between the end panels with slots. The new design differs in having 53 mm high internal removable dividers and end panels which reach the same level as the top of the drawer. The envelopes are stored vertically as they are in the card file drawers and the boxes, the larger old paper envelopes fit in two rows and the new Polypropylene envelopes in three rows across the drawer front to back. The height of the filed envelopes protrude somewhat above the top of the drawer but do not exceed 110mm so that a loaded drawer will easily fit between two C & D type A cabinet drawer runners. Envelopes will not be packed in too densely to avoid crushing the specimens.

The drawers have three slots in the front and back drawer frame for the three 3mm wide removable dividers per drawer. The design includes two wooden outer side packer blocks to keep the envelopes protruding above the drawer from snagging the two empty unused C & D cabinet runners above, at 20mm in from the internal edge on each side (Fig 5).



Fig. 5. The new Papered Odonata collection drawer.

To house the larger old envelopes, we divided the internal width into two compartments with one central divider, the two runs being 193.5mm wide. The spare divider being kept until required, and to house the smaller Polypropylene envelopes, we divided the internal width into three compartments with two dividers at 1/3 and 2/3 across the width, the three runs being 128mm wide. I suggested 3 slots in front and back drawer frame so that the dividers can be shifted as the large old envelopes are replaced with the smaller preferred new Polypropylene ones. We can now house 18 of these new drawers per double backed C & D 'type A' cabinet, keeping every other drawer runner unoccupied.

We ordered 60 drawers to house the whole Odonata papered collection and an additional 30 to store small jars of Diptera material, so the design is useful for other purposes. The narrow width of the front and back of the drawer meant that the drawer knob would only be able to have a shallow hole for glue fixing knob reinforced with an angled fixing nail. However by using more than usual of the PVA glue, the knob should hold firm. Use of these compatible drawers can now enable us to bring together the whole dry Odonata collection in one series, for the first time in the collection's history (Fig 6).



Fig. 6. The new drawer in situ in new C & D Type A cabinet associated with main pinned collection drawer.

Acknowledgements

We wish to thank Howard Mendel (Head of Collections for Entomology at NHM) for helpful discussion and funding the drawer production and Richard Mangle of Stephenson Blake – Sheffield, Harry Spurr Ltd. for developing the samples and the manufacture of our new drawers.

List of suppliers

BioQuip Products, 2321 Gladwick Street, Rancho Dominguez, CA 90220, USA. Webpage at <http://www.bioquip.com/>

C & D (Sheet Metal) Engineering Ltd, Monarch Works, Station Road North, Belvedere, Kent, DA17 6JU. Webpage at <http://www.cdsheetmetal.com/>

Preservation Equipment Ltd, Vincens Road, Diss, Norfolk, IP22 4HQ, website at <http://www.preservationequipment.com/>

Stephenson Blake – Sheffield, part of Harry Spurr Ltd. (132-154 Harvest Lane, Sheffield, S3 8EF. email: rmangle@stephenson-blake.co.uk

Carpet beetle and other insect pest infestation relating to bird re-feathering and repair

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Abstract

A technique is suggested whereby taxidermy specimens of birds that have been severely damaged by pest infestation, can be stabilised and repaired. Feathers, that have been damaged, can also be repaired plus some suggestions for down feather treatment are also proposed. A brief mention of double-freezing and anoxic treatments is also included.

Introduction

The effects of the damp Summers of '07 and '08 have been felt in many ways. Not least is a bumper crop of clothes moths and *Anthrenus* (carpet beetles or CB) infestation outbreaks! Despite good housekeeping, the heritage sector is reporting infestations and re-infestations like no other previous year!

Birds seem to have been particularly on the pest 'hit-list' and much work has already been done to try and repair the damage. Clothes moth outbreaks seemed to be down earlier in the year but more recently they have been observed flying around almost everywhere! Their larval damage is considerably more rapid and more severe than carpet beetle (Fig.1). Clothes moth larvae will eat almost every part of a taxidermy bird, often leaving the conservator insufficient material to repair! Carpet beetle larvae are not quite so voracious and will normally loosen the plumage, feeding primarily on the bird skin before ingesting the harder keratinaceous proteins of the feathers.

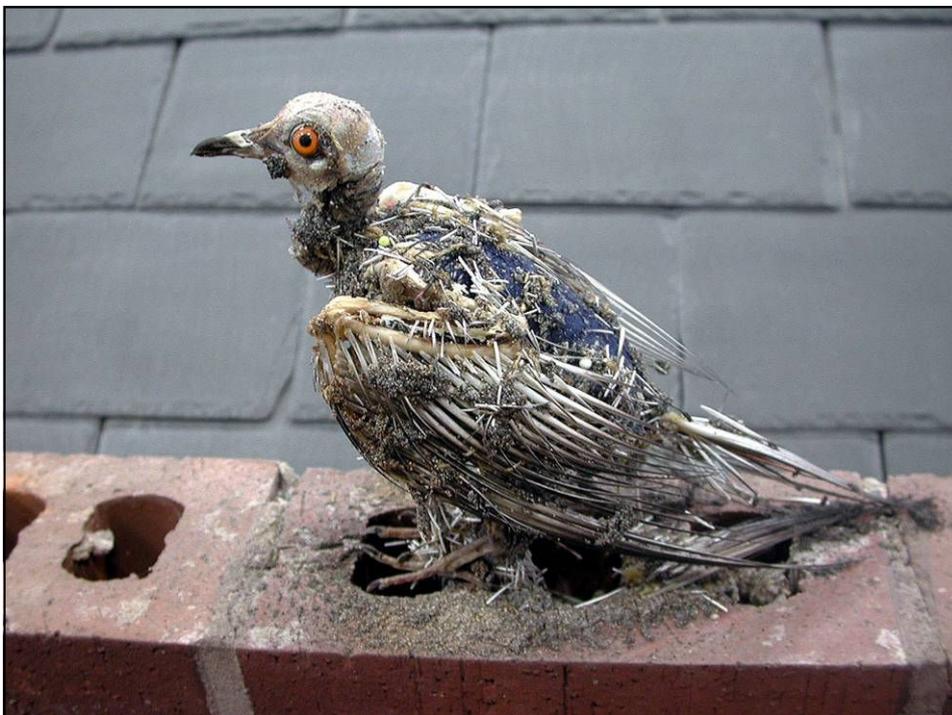


Fig. 1. Taxidermy pigeon having suffered deprecations of clothes moth larvae (*Tineola bisselliella*), not enough left to conserve!

Anthrenus beetles have rather short lives as adults, they feed on nectar from cow parsley (I have observed), mate, then find a suitable natural fibre carpet, taxidermy case, or other source, in which to lay their egg cluster and on which their larvae can feed *ad nauseam*! The beetles' tough exterior and tiny size enables entrance through the tiniest cracks (less than 0.5 mm!) and if they had a lean time as a larva and are subsequently a bit smaller, then the ingress point can be even tighter, although their egg clutch will be smaller (Fig.2). Even a normal egg clutch is so small in size as to require a practised eye to notice it and it can withstand prolonged freezing at -20° C (-30° C will kill it).



Fig. 2. Beetles and larval skins of *Anthrenus verbasci*, the varied carpet beetle, with some half-eaten feathers.

Smaller outbreaks inside cases tend to die out. Either the humidity level is uncomfortably low for the beetles and/or larvae (below 40% RH) for them to live long enough to cause any serious damage or there may be some old preventive product present in the bird's skin.

Early signs of infestation are disruptions to the plumage and the tell-tale little bristly skins that the larvae leave behind as they grow in size (Fig. 3).

The problems of CB-infested birds is that as weakened or shredded feathers drop out, the underlying down layer often becomes mixed into the upper plumage layer causing difficult-to-repair lumps. Most smaller museums can resort to bagging and freezing infested cases but larger cases, that will not fit inside a standard domestic freezer, may be either bagged and left or, I have noted, some presently-banned pesticide has been found and used. Although this may cause some raised eyebrows, providing that the case is suitably hazard-labelled (and dated) and the whole sealed into a poly-bag away from public areas, then the problem is at least, reduced.

Fig. 3. Duck with 'beard' of feathers loosened and damaged by larval *Anthrenus*.



Techniques

Repairing bird skins (and feathers) can be carried out using fine grade Japanese tissue (8gsm grade *Gampi* tissue is ideal). This is fine enough yet with a breaking strain of c. 2Kg, and can be coated with neutral pH PVA as both a liner and adhesive to form a pseudo-skin and to conjoin remaining areas of skin together into a stronger framework. When applying adhesive to finer *Gampi* or other Japanese tissues, always ensure that the glue is thinned out by the action of dragging the tissue through the glue and out the other side until it no longer leaves a trail or by brushing surplus glue off the tissue. If not, then the tissue will curl and can roll itself into a tight scroll. A palette of glass is useful for the dragging technique (Fig. 4).



Fig. 4. Dragging the tissue strip through the glue and way out the other side will prevent it from rolling up (right) – note the glue trails (left & right).

The detached feathers will need to be sorted into body areas and then sub-graded into sizes before re-feathering can commence which involves adhering them one at a time until a complete layer is formed and leaving 30 minutes to one hour to dry between layers. A repetitive and somewhat tedious task but very rewarding. Errors are quickly noted as wrong feathers just will not fit into the plumage sequence. Layering of down feathers can be more difficult and requires some experience to achieve an even surface. The curvature of down plumage is very important to lift the feathers above them and for the correct shape for the bird. If these have been shredded to tiny 'floaty' components it can be advisable to omit some of these unless the bird is rare or important enough and to compensate for omitted down feathers with tissue layers to maintain an even plumage surface. Damaged down feathers need to be brushed with 50:50 acetone:water mixture mixed first and then repaired with Japanese tissue along the shaft. Barbs and barbules may be painstakingly attached with minute amounts of adhesive onto a tissue base to the feather shaft, in order to rebuild the feather, if required. Using a textile steamer can help to straighten out bent, distorted/twisted feathers and can be useful to 'calm' down-feather layers but beware of wetting the (actual) skin surface as this could rehydrate it, giving rise to distortion and even mould growth!

Single or multiple feather insertion is simply carried out by lifting the feather layer above using a spatula and inserting the glue-bearing feather shaft tip inside and then aligning the feather by finger preening. Where the shaft has been partly or totally eaten away but the feather barbs are still interlocked, mount the feather onto a pseudo-shaft of about 25gsm *Kozo* or *Gampi* strip folded over or a flat splinter of wood cut from a cocktail stick. For smaller/more delicate feathers use an unfolded and narrow strip of tissue.

Preventatives

Pest prevention is always complex these days with so many effective products on the 'forbidden list'! Bob Child's *Constrain* product (obtainable via www.historyonics.com) contains permethrin and this will give some lasting preventive effect against re-infestation (up to c. 1 year, sometimes longer in my experience). I used to use a Bayer product called Eulan W or Edolan to great and longer-lasting effect and it could be applied as a 5% solution in propan 2-ol (isopropyl alcohol) and which will not rehydrate the skin. However, the use of Eulan is now regulated and will need checking out before it can be used and the specimen will need to be labelled as having been treated this way, if regulations permit. If a specimen (or case) is not too large then it can either be double-frozen or treated with anoxia.

Double freezing

As mentioned, a single freezing at -30° C over a week will kill all stages of pests but this lower temperature can stress glass. To reduce the problems of glass stress, especially to older taxidermy cases, they must be bagged in polythene before freezing to form a small atmospheric barrier between the glass and the cold atmosphere of the freezer.

They are then left for a week, usually, allowed to warm up to room temperature over 24-48 hours (to allow eggs to hatch once 'winter' is over) then replaced into the freezer once again for a further week to kill the freshly-hatched larvae. Although taxidermy can withstand freezing quite well, older paint layers can be affected by prolonged freezing (over 4 weeks), glass eyes may crack sometimes and keratin may even start to delaminate slightly. For these reasons, many prefer anoxia.

Anoxia

This can either be done by nitrogen displacement (Moore in Waterhouse, 2008) in which lowering oxygen levels will cause infesting insect spiracles to open so that the insects rapidly lose body moisture and die from desiccation. For those who do not have resources to set up an anoxia unit, barrier films such as Marvelseal or Escal can be used (and there are others but these two are presently the most favoured in museum circles).

Specimens are placed in a heat-sealed envelope of this material together with an oxygen scavenger such as Ageless (Mitsubishi Corporation) together with an indicating 'eye' comprising a blue pill that will gradually turn pink as the oxygen levels are depleted down to 0.1% oxygen (it reverts to a blue/purple above 0.5% oxygen). Plastic clips are also available as barrier film sealers and although effective, are not quite as good or long-lasting as heat sealing. There are many websites illustrating this including: <http://www.cwaller.de/english.htm?oxygenmeters.htm~information>

Reference

Moore, S J in Waterhouse, D 2008. Hampshire Museum Service's anoxic treatment regime on a tight budget. *NatSCA News*, 14: 8.

Website Conservation: A Case Study on the NatSCA Website

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Abstract

The NatSCA website has been upgraded to the Scratchpad system, allowing for easier and quicker maintenance and the introduction of several new features. Although this article describes only the NatSCA website, many of the principles and methods used are applicable to many different website projects (atomisation, search, metadata, link rot, reusing data, redirects, best practice).

Need for change

On taking over the NatSCA website I immediately noticed some problems and omissions.

- Lack of search capability
- No data about the contents of publications
- Possibility for large amount of 'link rot'
- Data not atomised (hard to make 'deep links')
- Sustainability (the website was hard to maintain ('conserve') and develop

The Scratchpad system

The Scratchpad project was chosen as the software (and hosting) for the new website. The Scratchpad project (<http://scratchpads.eu>) is a set of tools for making biodiversity data available. Although NatSCA is not solely about biodiversity, the tools developed by the project have proved to be very useful. The new NatSCA site uses the bibliography and taxonomy management tools of the Scratchpad to manage publications (the publication, volume, issue and article tree is managed using the taxonomy tools). The Scratchpad also allows for the definition of custom content types (with custom fields) to enable the easy management of standard pages, job adverts, events, committee member biographies, etc.

Scratchpads are built on the Drupal content management (<http://drupal.org>) system using a MySQL database (both open source projects). The use of a robust relational database and content management system allows for the site to be content rich and easy to use, while simultaneously increasing functionality and reducing the time needed to maintain it. The software and hosting are provided for free. Using open source software means that there is a community of hundreds of developers that are continually providing prompt solutions to problems and developing new functionality.

Identity

The domain name natsca.org was previously used by NatSCA for its website. Due to the details for the domain being lost when it became time to renew ownership, the domain was purchased by another organisation. This meant that the site was only accessible at www.nhm.ac.uk/hosted_sites/NatSCA - hardly an easy address to remember. On moving the content to the Scratchpad server the site temporarily took the address natsca.myspecies.info (sub-domains of myspecies.info being the standard domains used by Scratchpads). The committee then decided to purchase the domain natsca.info. I registered the domain on behalf of the committee and the details needed to renew the domain have been lodged with several members of the committee to prevent this domain being lost.

Search Capability

The new site is fully searchable using standard keyword searches (like you would search on google.com). New content is regularly indexed automatically to speed up the searching process.

Publication data

Article level meta-data has been entered for all NatSCA publications. This allows for searching by author, volume, issue and title. The usefulness of this can be seen by searching for a term such as '*Anthrenus*'. This system could be much improved by the inclusion of keywords and abstracts - although this would be a time

intensive operation. The Scratchpad bibliography module is used to store this data in a way that can be easily indexed by search engines.

An interface for browsing articles by publication, volume and issue has been implemented and can be accessed via the 'Publications' link at <http://natsca.info>. It is also possible to download article meta-data in formats suitable for reference managers such as JabRef and Endnote.

Meta-data is provided for all articles, PDFs are available for each issue of a publication. NatSCA News is released on a rolling system (there is a delay between publication and when PDFs are available for download).

Link rot

Link rot is the process by which links between websites break over time. This is caused by a number of factors; the address of a webpage changing, a webpage being deleted, a website moving to a new domain name.

Moving the site from the nhm.ac.uk domain to natsca.info could have caused a large number of links across the internet to become broken (the situation was further complicated by an intermediate web address of <http://natsca.myspecies.info>). This was prevented by arranging with the NHM IT team to redirect all NatSCA traffic from the old domain to the new one. In this way a visitor to [www.nhm.ac.uk/hosted_sites/NatSCA/\[path to page\]](http://www.nhm.ac.uk/hosted_sites/NatSCA/[path to page]) would be seamlessly transferred to [natsca.info/\[path to page\]](http://natsca.info/[path to page]): by following an 'old' link you will still end up on the correct page.

In the old site there was no real archiving of old content. Whenever possible, content that has become outdated (e.g. past events, information requests, etc.) should stay online. There is always a possibility that someone has linked to that information, and that people may follow that link to the NatSCA website. The new site allows these pages to be kept online even though they are no longer available via the standard site menus. When appropriate a notice will be displayed stating that the content is out of date, and links provided to relevant current content.

Atomising data

The use of defined content types and fields in the new site ensures that the data is stored in a well structured format. This allows data to be searched, sorted and retrieved more easily. Previously all event information was stored as a plain document, with multiple events on the same page. Now each event is stored separately, with separate fields for date, location, etc. To display a list of upcoming events a query is run against the database to extract all content of the event type that start in the future. The individual pages for each event remain after the event as an archive - preventing link rot.

Having separate pages for individual entities also allows for deep linking - you can link to the precise piece of information you need rather than, for example, a list of events, publications or people.

Reusing data

When you view a page on the new website what you see is generated by running a set of queries on the underlying database. By varying the queries run and the way the result is formatted, it is possible to reuse the same data in a number of different ways. In this way it is possible to easily generate RSS feeds from any content type (for example publications or jobs). The site also has the ability to automatically post new content to the NatSCA JISC mailing list if desired. These functions are not yet completely implemented - if you have a particular need for a particular service please e-mail me to prioritise (edward.baker@nhm.ac.uk).

Everything in one place

A search of the web for the Insect Collections Managers Group, (whose web content is hosted by NatSCA) revealed an out of date (circa 1997/8) site as being the number one result in Google. This old site was hosted by the Natural History Museum and after consultation with Mike Sadka we determined that the site was not being maintained and that the content should be transferred to the new site. Once the content was transferred Mike created a redirect from the old content to the new so that http://www.nhm.ac.uk/hosted_sites/uksf/icmg.htm redirects to <http://natsca.info/ICMG>.

The new NatSCA website is still work in progress. Any comments and feedback from NatSCA members are welcome.

NEWS

Notices, Adverts & Meetings

Third International Palaeontological Congress

IPC3, London June 28 to July 3, 2010

See: <http://www.ipc3.org/>

Registration and abstract submission for IPC3 are now open.

Generous sponsorship from the Palaeontological Association has allowed us to keep registration fees low:

Early Bird Full Registration Fee - £195 (after 28 February 2010 - £245)

Early Bird Student Registration Fee - £125 (after 28 February 2010 - £175)

Daily Registration Fee - Full £120 per day

Daily Registration Fee - Student £80 per day

Abstract Submission:

Abstract submission can only be made after registering in full.
Details on how to submit abstracts will be sent with confirmation of booking.
The deadline for abstract submission is 28 February 2010.

For further details, including a full list of symposia and workshops,
or to register, please go to www.ipc3.org

NEWS

Notices, Adverts & Meetings

Cataloguing the correspondence of Sir James Edward Smith MD FLS PLS (1759-1828), founder of the Linnean Society, and assessing conservation requirements to preserve the collection.

The Linnean Society of London is happy to announce a Research Resources in Medical History award from the Wellcome Trust to support the creation of a catalogue and to undertake a conservation survey of the correspondence of its founder and first President, Sir James Edward Smith MD FRS (1759-1828). This scheme supports preservation, cataloguing and digitisation projects for significant medical history collections in UK libraries and archives.

An archivist, Gabrielle St John McAlister, has now been appointed on a part-time basis for nine months to create a new electronic catalogue to ISAD(G) standards as a preliminary step in making this collection available to historians of science and medicine and to botanists. A conservation survey will make recommendations on preservation of this resource. Once the collections are catalogued and conserved, the Society aims to digitise them and make them available online, as has already been done for the correspondence of Linnaeus.

This project marks the 250th anniversary of the birth of Sir James Edward Smith MD FRS, PLS (1759-1828), physician, naturalist, collector, and author of many botanical publications. He founded the Linnean Society of London for the cultivation of the science of natural history and was its first President.

A contemporary of Sir Joseph Banks and other 18th century naturalists, Smith was a prolific writer, doing much to further knowledge of plants and their useful properties and to popularise botany in Britain in the late 18th and early 19th centuries. He maintained a network of over 400 correspondents, many having medical links. A collection of ca. 3400 letters in 26 bound albums was presented to the Society by his widow and additional material now brings the total number of letters at the Linnean Society to ca. 4000 items.

The Smithian Correspondence includes letters from a wide range of people, covering many subjects. Smith was in touch with many significant political and scientific figures of his day, but also received letters from schoolgirls, book-agents, nurserymen and gardeners. Major figures such as Sir Joseph Banks, Erasmus Darwin, Humphrey Davy, Elizabeth Fry, Humphrey Repton and W. Henry Fox Talbot all wrote to him.

The Linnean Society of London is the world's oldest active biological society. Founded in 1788, the Society takes its name from the great Swedish naturalist, Carl Linnaeus (1707-1778) who developed the system of binominal nomenclature. This system today provides the fundamental framework for knowledge of the biota of the Earth, supporting effective conservation measures and the sustainable use of biodiversity. The Society is the custodian of Linnaeus' original library and collections and is creating a digital archive, enabling full global access. It encourages and communicates scientific advances through its three world-class journals, open meetings and website. The Society's Fellowship is international and its Fellows are drawn from all walks of life including professional scientists and amateur naturalists. The Society welcomes anyone interested in natural history, in all its forms. www.linnean.org

The Wellcome Trust is the largest charity in the UK. It funds innovative biomedical research, in the UK and internationally, spending over £600 million each year to support the brightest scientists with the best ideas. The Wellcome Trust supports public debate about biomedical research and its impact on health and wellbeing. <http://www.wellcome.ac.uk>

NEWS

Notices, Adverts & Meetings

Darwin's Westminster life showcased in new display

As a year of activities and events celebrating the 200th Anniversary of the birth of Charles Darwin nears completion, visitors to his final resting place – Westminster Abbey, have had the opportunity to find out more about his life and work through a new display. Compiled as part of the “Charles Darwin, A Genius in the Heart of London” project, co-ordinated by the Linnean Society of London and Westminster Archives and generously funded by the Heritage Lottery Fund, the display focuses on Darwin's life in Westminster both as a member of a number of Learned Societies and as a resident. “Darwin was a member of many Learned Societies in Westminster” said Camilla Bergman, Project Officer. The Geological Society of London, the Linnean Society of London, the Royal Geographical Society (with IBG), the Royal Society and the Zoological Society of London have all contributed to this display which features many different aspects of Darwin's work”.

The display also features artwork and textiles created by young people from Westminster Schools highlighting important elements of Darwin's life, particularly his Voyage on the Beagle and has created a lot of interest from visitors to Westminster Abbey. “We think the exhibition in the Abbey is excellent and lots of people are looking at it” said Canon Jane Hedges. . The display will remain at Westminster Abbey until 27th November before moving to Westminster Archives, the Royal Society and The Linnean Society of London. For details of dates and viewing times please visit the Charles Darwin: A Genius in the Heart of London project website <http://www.darwininlondon.co.uk/index/exhibition-dates/>

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City of Westminster Archives Centre The Archives Centre houses extensive collections relating to Westminster past and present. The collection covers hundreds of years of Westminster's history, with the oldest item dating from 1256. The Archives centre provides a range of public services including: outreach education sessions to schools, adult education, publications for sale, exhibitions, talks, tours of the Archives Centre and an excellent London-wide general reference collection. www.westminster.gov.uk/services/libraries/archives

Heritage Lottery Fund Using money raised through the National Lottery, the Heritage Lottery Fund (HLF) sustains and transforms a wide range of heritage for present and future generations to take part in, learn from and enjoy. From museums, parks and historic places to archaeology, natural environment and cultural traditions, we invest in every part of our diverse heritage. HLF has supported more than 28,800 projects, allocating over £4.3 billion across the UK. For further information please contact Katie Owen, HLF press office, on tel: 020 7591 6102 or email katieo@hlf.org.uk Website: www.hlf.org.uk