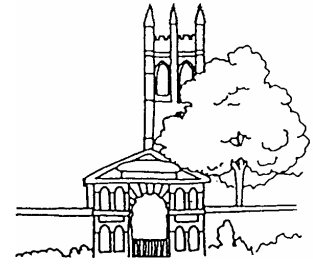


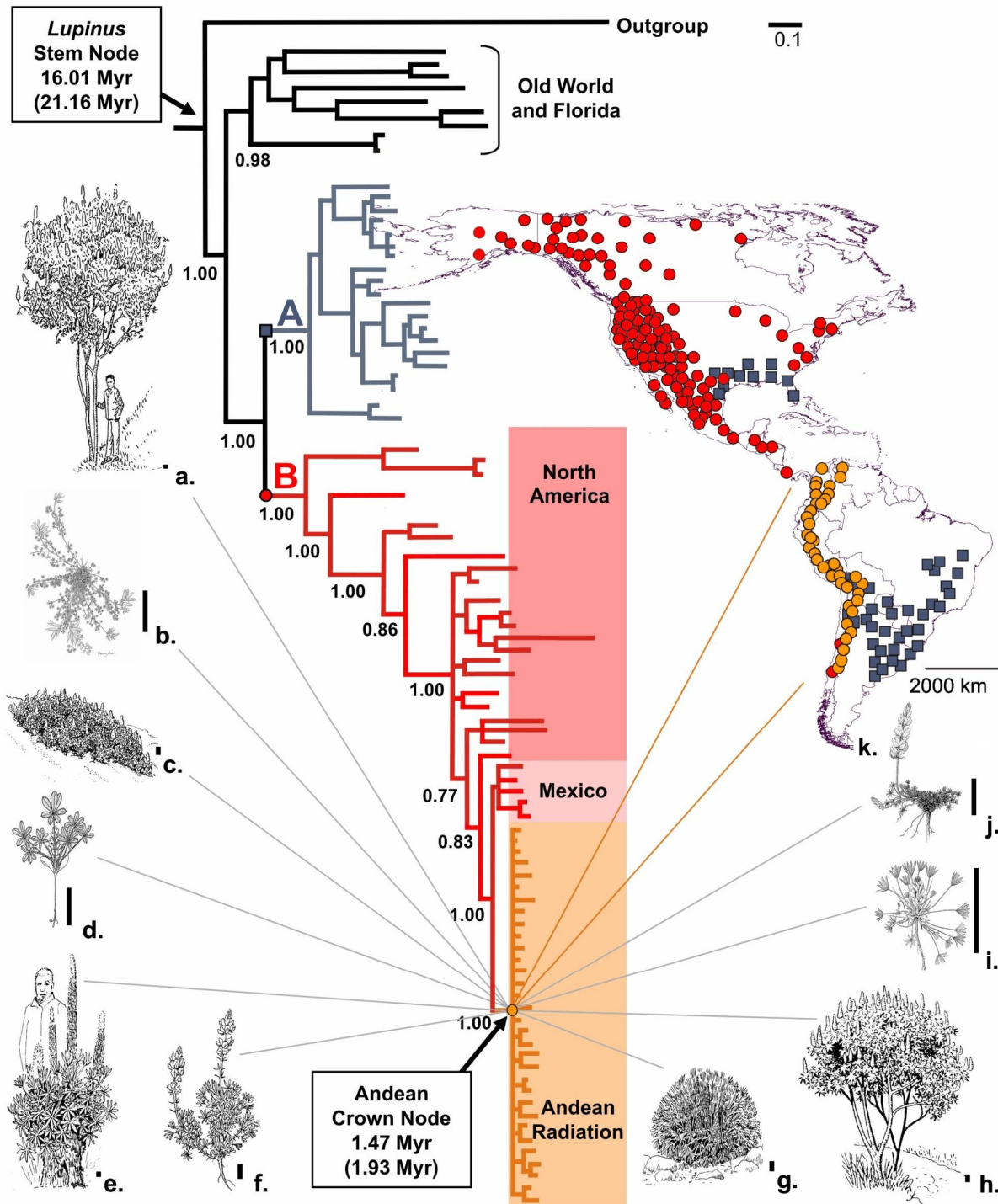
Oxford Plant Systematics



With news from Oxford University Herbaria (OXF and FHO), Department of Plant Sciences, Oxford

OPS 14

April 2007



Editorial

This issue of OPS once again highlights a wide range of activities being carried out under the umbrella of Oxford Plant Systematics. For more information on the people and projects behind OPS see our website at <http://herbaria.plants.ox.ac.uk/>. This issue contains short articles on our two current Darwin funded projects in Trinidad & Tobago and Central Chile. At the time of going to press we have just been awarded funding for a third project concerned with Conservation of the Cerrados of Eastern Bolivia to start later this year.

A highlight in this year's OPS is the article by Rosemary Wise, our botanical artist. Rosemary reveals glimpses of her 42 years in the department since 1965. In these days of assessment using publication metrics such as impact factors and citation indices, I wonder how you could ever capture and truly reflect the enormous and important contribution that Rosemary Wise has made to botany through her botanical illustrations.

Also in this issue Alex Wortley our former PhD student reviews several heavy weight publications from William Hawthorne and various colleagues. Although William Hawthorne's interests are very different from that of Frank White, the former curator of our herbaria, they share an impressive commitment to Africa and have both made substantial contributions to the botany of that continent. John Wood has written a short point of view article on the training of taxonomists, Denis Filer provides an update on BRAHMS activity, PhD students update their progress and Stephen Harris provides an interesting article on Druce and a few words regarding the retirement of the Daubeny herbarium manager Alison Strugnell. Finally, our front cover illustrates a phylogeny of *Lupinus* recently built by Colin Hughes and Ruth Eastwood and published in PNAS. The dated phylogeny shows the fastest plant radiation documented to date. It further shows that this spectacular plant radiation was coincidental with the appearance of these high elevation habitats over 3000 metres that arose with the uplift of the Northern Andes over the last 2-4 Million years. This impressive 'big picture' study comes as a result of detailed monographic research by Colin and Ruth over several years which has made this study possible.

Robert Scotland

Contents

Editorial	
<i>Robert Scotland</i>	2
Staff retirement	
<i>Stephen A. Harris</i>	3
The Oxford Darwin Botanical Survey of Trinidad	
<i>William Hawthorne</i>	3
Oxford University Canopy Biodiversity Expedition to Trinidad	
<i>Edward Mitchard</i>	3
Conservation of endangered coastal biodiversity hotspots of Central Chile	
<i>Stephen A. Harris</i>	4
Student progress	
<i>Tiina Sarkinen</i>	4
<i>Marcelo Simon</i>	5
Abstract of Systematic thesis submitted in 2006	
<i>Ruth J. Eastwood</i>	6
Publications 2006	6
Book reviews	
<i>Alexandra Wortley</i>	6
Point of View : Taxonomists and Parataxonomists – Issues in Training and Neocolonialism	
<i>John Wood</i>	9
Every Picture Tells a Story	
<i>Rosemary Wise</i>	10
Druce and Oxford University Herbaria	
<i>Stephen A. Harris</i>	12
Linnaeus and Oxford	
<i>Serena Marner</i>	13
News from the Herbaria	
Fielding-Druce (OXF)	
<i>Serena Marner</i>	13
Daubeny (FHO)	
<i>Alison Strugnell</i>	14
BRAHMS 2006	
<i>Denis Filer</i>	15

Cover illustration : The Hawaiian silverswords and Macronesian *Echium* provide well-studied examples of island radiations showing accelerated morphological divergence that has been attributed to ecological opportunities provided by depauperate island environments where competitors are fewer. Research by Colin Hughes and Ruth Eastwood on the legume genus *Lupinus* provides a spectacular example of rapid island-like plant radiation following uplift of the Andes. The cover illustration shows a new phylogeny of *Lupinus* published during the year (Hughes, C.E. & Eastwood, R.J. 2006. Island radiation on a continental scale: exceptional rates of plant diversification after uplift of the Andes. *Proceedings of the National Academy of Sciences* **103**: 10334-10339.) <http://www.pnas.org/cgi/content/full/103/27/10334>. This new phylogeny constructed from ITS and *cycloidea* gene sequences shows that Andean species are placed in two separate New World lineages, but that the majority are placed in a well-supported but largely unresolved clade representing the main Andean radiation. The age of this clade is estimated to be around 1.4 million years implying a species diversification rate of 2.49-3.72 species per million years. This exceeds previous estimates for plants, providing the most spectacular example of explosive plant species diversification documented to date. The line drawings illustrate the diverse range of life forms - including small trees, perennial woody shrubs, giant stem rosettes, acualescent rosettes, prostrate herbs and ephemeral annual herbs - of the *Lupinus* species that make up this Andean radiation.

Staff retirement

Alison Strugnell retired in December 2006 after nearly 21 years working in the Daubeny herbarium (see page 14). During Alison's time working in the collections major changes have occurred, for example, formalisation of herbarium transactions, introduction of computerised collection management, eradication of specimen backlogs and refurbishment of the herbaria. Alison made major contributions to all of these activities; indeed it is difficult to imagine how some of these could have happened without Alison's involvement. Often working to tight, changing deadlines Alison undertook these tasks with alacrity. Alison was also responsible for incoming loans, and her helpfulness and knowledge of the Daubeny herbarium and other herbaria made her an ideal first point of contact for many students being introduced to the 'mysteries' of herbaria. Alison made an often unsung contribution to numerous projects and publications, yet one of the most significant pieces of scientific work completed by Alison, in her own right, was a Checklist of the flora of Mount Mulanje, Malawi.

Many researchers outside Oxford will have had contact with Alison through loans and dealing with requests for information. I am sure that they would agree with me that Alison was ever helpful and efficient. Personally, I shall greatly miss working with Alison. Indeed, the whole Department are going to miss having Alison around. We wish her all the best for a long, happy retirement.

Stephen A. Harris

The Oxford Darwin Botanical Survey of Trinidad

The Oxford-Darwin initiative project in Trinidad and Tobago involves collaborative links with the University of the West Indies at St. Augustine, the Forest Department and the Asa Wright Centre. Apart from the development of a field guide and analysis of plot data, we are involved in a Rapid Botanic Survey (RBS) of the islands' vegetation, all in association with the National Herbarium.

The aim of the national RBS is to provide a more detailed and up-to-date picture of the distribution of plant resources than is possible with herbarium data or forestry permanent sample plot data alone. However, in the final data analysis, data from all of these sources will be drawn upon.

Yasmin Comeau has been busily putting the finishing touches to her renovated herbarium, whilst the RBS has got off to a good start. By the end of 2007, Shobha



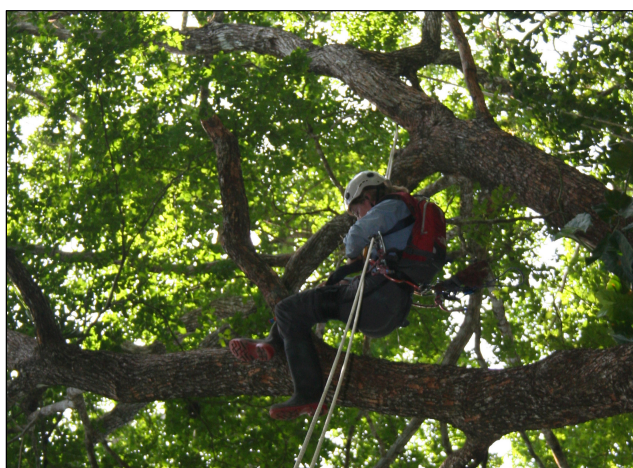
Maharaj, supervisor of the fieldwork, and her able team of foresters and occasional volunteers had managed to survey all vascular plant species at more than 60 points. William Hawthorne has been out to train the team initially, and to help with determinations of the thousands of sterile specimens in December 2006. Stephen Harris and Nick Brown are also visiting to help and advise.

Initial impressions are that in one year of field visits almost all indigenous species - represented in the herbarium collection accumulated from over 150 years - have been recollected. Sometimes they have been found in new sites. It remains to be seen over the coming year how many - if any - new records our RBS trawl manages to pick up.

After another few months' field work, and supported by the digitisation of the herbarium into BRAHMS, Yasmin Comeau and the Darwin team should be well equipped to produce a highly informative and practical 'conservation-biased' checklist to the whole Trinidad and Tobago flora, including maps of local hotspots and other floristic patterns derived from the RBS analysis, and highlighting rarities and priorities for conservation.

William Hawthorne

Oxford University Canopy Biodiversity Expedition to Trinidad



A rainforest expedition to Trinidad took place between 11th August and 25th September 2006. This was organised by Oxford University students, and formed part of a developing collaboration between the Plant Sciences Department of Oxford University and the National Herbarium of Trinidad and Tobago. Its aims were:

1. To produce baseline data about epiphyte diversity in Trinidad's forests, and more specifically to determine the influence of edge effects on the epiphyte community of these forests.

2. To compare the above with the distribution of Lepidoptera.

3. To increase the awareness of the importance of the forest ecosystem and the problems caused by its rapid deforestation and degradation both to local Trinidadians and to other interested parties, and to collaborate with local researchers to produce mutual benefits.

The method changed on arrival to a study of edge effects rather than altitude, as there had been too much rain to allow for climbing at the higher altitudes. Epiphytes were collected from three sites, one in each of the Northern, Central and Southern ranges. In each site epiphytes were collected from the canopies of five trees at the edge, five 100 metres into the forest, and five 300 metres in. The trees were climbed using the double rope technique, which the team of six (including one Trinidadian member, who was flown over by the expedition) learnt with the Global Canopy Programme in Wytham Woods. Butterflies were also collected using baited traps set in both the canopy and on the ground in all the same sites as epiphytes were collected.

A large amount of baseline data was collected, including over six hundred epiphyte specimens and nearly one hundred butterflies, all of which were donated to the collaborators in Trinidad. The epiphyte study showed that the epiphyte flora of the country is markedly different and more diverse in the Southern forest than the Central and Northern forests at low altitudes, and that there is some evidence of significant edge effects creating differences in epiphyte community composition up to

300 meters into the forest, and the butterfly data largely backed up these conclusions.

Thanks are due to the following major sponsors who made this expedition possible:

The Royal Geographical Society; the Gumby Corporation; Pembroke College, Oxford; St John's College, Oxford; The

Mike Soper Bursary Fund; The Albert Reckitt Trust; A.A. Paton Fund (Oxford University Expeditions Council); and the Oxford University Society.

Edward Mitchard,
Pembroke College, Oxford

Conservation of endangered coastal biodiversity hotspots of Central Chile

Conservation and conservation-related research in Maule, and the Chilean Mediterranean vegetation zone as a whole, is scarce and dispersed. This Darwin Initiative-funded project builds on the CONAMA-coordinated Regional Biodiversity Strategy and focuses on the coastal Maulino ecosystems which, despite their international biodiversity significance, are under-represented in existing policy frameworks, conservation strategies and protected area networks. Furthermore, essential biological information on many of the endangered/endemic species and rare ecosystems of coastal Maule is lacking. For example, the biological quality of forest patches is poorly known, as are the population dynamics of endangered species. The project will enhance biological understanding of Maule and its species, providing a sound scientific basis for conservation planning and management.

This collaboration among researchers from the University of Oxford (David Boshier, Stephen Harris, William Hawthorne, Tonya Lander) and the University of Talca, CODEFF, CONAMA and CONAF is aimed at developing a Conservation and Sustainable Management Strategy (CSMS) for the Maule region's coastal forest and building the technical and educational capacity and policy framework for the CSMS's implementation. The landscape-oriented conservation approach adopted in this project will take account of the population dynamics of endangered species and their habitats in geographically explicit manners and establish a monitoring system for the Maulino-forest conservation strategy. The research will focus on the genetic viability of a model endangered species (*Gomortega keule*) in fragmented forests and the Rapid Botanical Survey (RBS) and Bio-quality Assessment of Maule's forest remnants.

The CSMS developed during this project will be supported by education programmes and policy frameworks to ensure its effective implementation. Since 90% of the region's forest is privately owned, implementation of the project results will depend on the participation of large forestry companies and small land owners. The forest companies involved are committed to integrating and implementing the CSMS in their environmental management systems,

whilst small-forest owners will be encouraged to adopt the conservation and management strategies through multi-stakeholder consultation processes. In addition, project partners are committed to providing extension and education materials and technical assistance to all forest owners.

The project's main contribution to the conservation of Chilean coastal forests will be a systematic approach to conservation in the Maule Region, filling critical gaps in knowledge and generating a participatory planning process aimed at balancing biodiversity needs with the prevalent social and economic realities of the area.

Stephen A. Harris

Student progress

Tiina Sarkinen (D.Phil., 1st year).

Systematics of *Amicia* (Leguminosae, Papilionoideae) and Plant Diversification and Endemism in Andean Seasonally Dry Tropical Forests. Supervised by Dr Colin Hughes (Oxford) and Dr Toby Pennington (Royal Botanic Garden Edinburgh). Osk. Huttusen Säätiö and Helsingin Sanomain 100-vuotisjuhlasäätiö scholarships.



Amicia zygomeris

Levels of plant species diversity and temporal and spatial patterns of species diversification remain poorly understood especially in the tropics where the greatest accumulations of extant plant species occur. This is nowhere more apparent than in the Neotropics where regions such as the tropical Andes represent some of the hottest biodiversity hotspots on the planet. Recent studies have shown that molecular plant phylogenies can be used to infer the history of plant diversification, but there are very few existing well-sampled phylogenies that can be used to investigate diversification of Andean plant groups.

The seasonally dry tropical forest biome (SDTF) is a good example of Neotropical species diversity; these dry forests have generally lower species diversity than humid forests but differ in having extremely high levels of endemism. The biome occupies a markedly disjunct distribution within the Neotropics, with isolated patches of forest

scattered from northern Mexico south to Argentina. Past and present human disturbance have fragmented SDTF even further, and SDTF is currently considered one of the most endangered ecosystems in the Neotropics. Botanical inventories and preliminary phylogenetic studies have shown that these disjunct dry forest areas around Central and South America are floristically and phylogenetically closely linked, suggesting that SDTF may have occupied a wider and more continuous distribution in the Neotropics during drier climatic periods in the past. Together, the disjunct distribution and high levels of endemism raise intriguing questions about the evolutionary history and biogeography of the SDTF biome. During my D.Phil., I aim to study plant diversification patterns and endemism in the dry inter-Andean valley SDTFs to better understand whether species diversification and high levels of endemism in these isolated valleys has been driven mainly by vicariant isolation or dispersal events, and how fragmented ecosystems and species diversification interact.

The dry inter-Andean valleys remain poorly known botanically compared to other Neotropical SDTFs with many new plant taxa (both species and genera) discovered in the inter-Andean dry valleys of Peru and Bolivia in recent years. Current data suggest that levels of plant endemism between the isolated valleys varies considerably; further data are needed to establish this. Certain genera such as *Tecoma* Juss. (Bignoniaceae; 12 species) and *Ruprechtia* C.A.Mey (Polygonaceae; 38 species) have one or more valley-specific endemics in Peru and Bolivia, and can be used as exemplar taxa to study diversification patterns in Andean SDTFs. *Amicia* Kunth (Leguminosae, Papilionoideae; ca. 7 species) with a smaller number of more widespread but still disjunct species presents a contrasting distribution pattern. By building well-resolved and densely sampled phylogenies for these three exemplar taxa, I aim to investigate the tempo and scale of Andean SDTF diversification, and the factors driving speciation. As there are very few well-sampled phylogenies for Andean dry forest plants, these data will provide new insights into the evolutionary history of these SDTFs. Both *Tecoma* and *Ruprechtia* have been revised recently by John Wood (Oxford) and Colin Pendry (Royal Botanic Garden Edinburgh) respectively, but, as no previous taxonomic account exists for *Amicia*, part of my D.Phil. project is to revise the genus prior to molecular work.

I have started off my D.Phil project looking at delimitation of the species of *Amicia*. Field work is planned for March-May 2007 in Argentina, Bolivia and Peru, to collect specimens and silica-dried leaf samples of *Amicia*, *Tecoma* and *Ruprechtia*. Preliminary laboratory work using DNA from recent herbarium specimens from FHO

and Kew has been carried out to screen DNA sequence regions for levels of genetic variation amongst *Amicia* species. After returning from my field work in May I will start generating sequence data, and hope to get some results by August.

Marcelo Simon (D.Phil., 2nd year).

Ecological setting and the evolution of Neotropical plants: origins and diversification of the Cerrado flora.

Supervised by Colin Hughes (Oxford) and Stephen Harris (Oxford). Clarendon scholarship and EMBRAPA.



Mimosa tequilana

Background: The underlying causes of differences in species-richness among biomes and the processes that have prompted accumulation of high species diversity in some areas remain poorly understood. My work aims to address these questions in relation to patterns of plant diversity in the Neotropics. Recent insights into these questions have come from dated molecular phylogenies for small subsets of lineages that make up particular biomes, shedding new light on the timing and rates of diversification and prompting new hypotheses about the historical assembly of Neotropical species diversity. In my D.Phil project, I'm particularly interested in the origins and evolution of the Cerrado, a floristically diverse and endemic-rich savannah biome that covers more than two million km² of Central Brazil and part of Bolivia. It has been suggested that the Cerrado may have originated as recently as four million years ago, coinciding with the emergence of inflammable C4 grasses as a dominant element in this ecosystem and the consequent appearance of fire as a natural element. To date there are very few phylogenies for Cerrado plant groups that can be used to test this hypothesis, and I am aiming to fill this gap using the genus *Mimosa* as my study group.

Mimosa is a large genus in the legume family with some 530 species, distributed mainly in the Neotropics with around 40 species occurring in the Old World. *Mimosa* is an ideal group to test this hypothesis since it is remarkably rich in fire-adapted narrow endemics in the Cerrado, but at the same time also highly diverse in other major Neotropical habitats such as seasonally dry

tropical forest and rain forest, providing a good basis for comparisons. I am also interested in investigating the relationships of the Old World species of *Mimosa*. This pattern of geographic disjunction, with ca. 490 Neotropical species contrasting with just a handful of species in continental Africa and Asia and 31 species in Madagascar, raises intriguing questions: How do the Old World species relate to the Neotropical species? When did these species originate? Do the Old World species form a monophyletic group? Could this disjunction be explained by vicariance attributed to continental history, or is it the result of long distance dispersal?

Field work : The central goal of my project is to build a molecular phylogeny for *Mimosa*. In order to address the questions outlined above, good taxon sampling is vital. Assembling representative material for a group with more than 500 species is a major challenge. In some cases herbarium material can be used, but does not always yield high quality DNA. Thus, it is necessary to make field trips to collect leaves dried in silica-gel, which is the main source of plant material I'm using in my molecular analysis. I have made two field trips during the first year of my D.Phil.

The first expedition was in collaboration with the NERC-funded project "*In search of beta-rhizobia: exploring the symbionts of Mimosa in Brazil*", which aims to gain a better understanding of the symbionts associated with *Mimosa* and especially the unusual beta rhizobia that have been found to fix nitrogen in *Mimosa*. We collected in two parts of Brazil: the semi-arid caatinga region of NE Brazil in Bahia (with great support from Luciano de Queiroz, from the Universidade Estadual de Feira de Santana), and the cerrados of Goiás and Distrito Federal. This was a very productive trip with material of 73 species collected, illustrating the amazing diversity of *Mimosa* found in these open vegetation types in Brazil, and especially in the high altitudes of the Chapada dos Veadeiros in northern Goiás.

My second field trip was to Mexico, another important centre of diversity for *Mimosa*, with around 100 species. Travelling in Mexico is a fascinating experience; in a single day driving you can see contrasting vegetation types, from semi desertic formations to temperate forests of *Quercus* and *Pinus* and coastal wet forests, quite different from the areas where we collected in Brazil. One of the highlights of this trip was a visit to the town of Tequila in Jalisco, where I found plants of the curious *Mimosa tequilana* growing surrounded by fields of agave, the source of the most famous product from that region to which we were treated to a free tasting. During one month and an exhausting 6500 km travelled all over the country, I was able to collect 40 Mexican mimosas, which was a great achievement. Such a significant trawl would

not have been possible without the collaboration of Rosaura Grether, an expert on *Mimosa* at the Universidad Autónoma Metropolitana in Mexico City, whose willingness and vast experience contributed critically to the success of this expedition. This field trip was supported by grants from the Systematics Association and Wolfson College.

Searching for species of such a diverse plant group in the field can be very exciting, as well as sometimes frustrating. Depending on the site, one can sometimes find more than ten different species of *Mimosa* in a single day without too much effort. However, on other days despite persistent searching, no species may be found. Fortunately, these days are rare.

An essential part of my project comprises collecting, photographing, identifying and naming plants. These may sound very elementary tasks, but documenting plant diversity is of fundamental importance to our understanding of patterns of plant biogeography and evolution, and underpins conservation assessment. Occasionally one is rewarded with a nice surprise in the field, such as finding new species. As a result of my recent field trips, I'm in the process of describing three new endemic species of *Mimosa* from the highlands of Central Brazil, a definite hot-spot for *Mimosa* diversity and endemism.

Preliminary results and next steps : So far I have assembled seed and silica-dried leaf samples for DNA extraction of around 200 species (40% of the genus) spanning 80% of the recognized infrageneric groups. While the geographic coverage of these samples is concentrated in Central and Northeast Brazil, Mexico, Bolivia, Peru, and Madagascar, I also have material of a few species from the Amazon, Continental Africa and Asia. During this first part of my D.Phil I have assembled a preliminary phylogeny based on DNA sequences of the *trnD-trnT* chloroplast region which includes 84 species of *Mimosa* and 23 outgroups. This preliminary tree shows some interesting results. For example, the analysis identified a strongly-supported monophyletic clade representing ca. 50 mainly Cerrado endemic species. The position of this clade on the tree and its low internal sequence divergence, may support the hypothesis of a recent origin of the Cerrado, that possibly involved rapid and successful adaptive radiation of an endemic-rich fire-tolerant flora.

Much work remains to be done to see if this is the case, but these results are encouraging and helping me to plan the next steps in my D.Phil research and particularly to design an efficient strategy for character and taxon sampling for this large genus. My intention is to use fossils to build a time calibrated tree to estimate the divergence time of this species-rich Cerrado clade to see if it is as recent as the topology of the tree suggests.

Abstract of systematic thesis submitted in 2006

The following D.Phil. thesis was submitted and successfully defended in 2006:

Systematics of Andean *Lupinus* L. and the origin of *L. mutabilis* Sweet Ruth J. Eastwood St Cross College

This thesis contributes to the central goals of systematics - the inventory of species, building the tree of life and understanding evolutionary processes - through a descriptive taxonomic study, molecular phylogenetic analysis and morphological survey of the genus *Lupinus* L.

Lupinus comprises ca. 290 annual and perennial species placed in the Genistoid clade of the Papilionoid legumes. In the study three new DNA sequence datasets are used to reconstruct species relationships. The new phylogeny is used to investigate character evolution, species diversification, domestication and as the basis for a new infrageneric classification.

Approaches to plant species-level phylogeny reconstruction and criteria for selecting DNA sequence loci are evaluated from a theoretical standpoint, and experimental work to develop hypervariable nuclear DNA sequence loci presented.

The comparative morphology of *Lupinus* species is investigated and presented. This includes studies of seed coats, cotyledons, leaves, and chromosomes. Optimisation of these data onto the 3-locus phylogeny reveals congruence between chromosome number and geography and shows that non-digitate leaves have evolved twice independently within *Lupinus*.

Evolutionary rates analysis is used to estimate divergence times for clades and to investigate the tempo of species diversification. Notably, a strongly supported clade representing ca. 81 Andean species is estimated to be 1.18-1.76 Myr, implying a diversification rate of 2.49-3.72 species per Myr. This exceeds previous estimates for plants providing the most spectacular example of explosive plant species diversification documented to date.

Lupin species have been independently domesticated as grain legume crops in the Old and New Worlds. The origins of the Andean domesticate, *L. mutabilis*, are investigated. Lack of resolution amongst the Andean species, attributable to exceptionally rapid species diversification, meant that the progenitor(s) of *L. mutabilis* could not be firmly established. However, four Andean species are tentatively identified as closely related to *L. mutabilis* based on morphology. A taxonomic account of these species is presented.

Finally, a new infrageneric classification based on morphological diagnosability and monophyly is proposed.

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Hughes, C.E. & **Eastwood, R.J.** (2006). Island radiation on a continental scale: exceptional rates of plant diversification after uplift of the Andes. *Proceedings of the National Academy of Sciences* **103**: 10334-10339.

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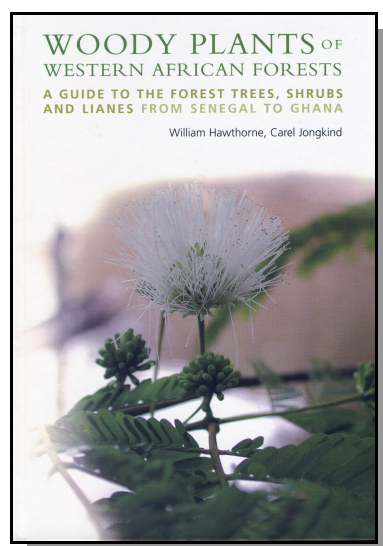
Book reviews

Woody Plants of Western African Forests: A Guide to the Forest Trees, Shrubs and Lianes from Senegal to Ghana by **William Hawthorne** and **Carel Jongkind**. Pp. 1023. Royal Botanic Gardens, Kew, 2006. ISBN 1 84246 089 7.

Photoguide for the Forest Trees of Ghana: A Tree-Spotter's Field Guide for Identifying the Largest Trees by **William Hawthorne** and **Ntim Gyakari**. Pp. 432. Oxford Forestry Institute, 2006. ISBN 0 85074 1645.

Plant Identification: Creating User-friendly Field Guides for Biodiversity Management by **Anna Lawrence** and **William Hawthorne**. Pp. 256. Earthscan, 2006. ISBN 1 84407 079 4.

I have just spent a month sitting in a small wooden hut in a dusty town in the Republic of Congo, identifying 5,000 sterile specimens of trees from the surrounding forest. During that short time, my cherished, pristine copy of *Woody Plants of Western African Forests* became decidedly dirty, sticky, dog-eared and covered in coffee-stains, biscuit-crumbs and inky thumb-prints. Even so, my colleagues begged me to leave it behind when I left. These facts are testament to how valuable the book proved



to be – even in a country more than 1,000 miles from the area it aims to cover.

The scarcity of usable field guides has long been recognised as an impediment to biological research in the tropics. This problem is worse in the Old World than the New, worse in West Africa than East, and very much worse when it comes to identifying sterile material rather than that in flower or fruit. *Woody Plants* goes a long way towards redressing this balance. Like its companion, *Biodiversity of West African Forests* (Poorter et al. 2005), the work is magnificent in scope, richly informative and beautiful to look at. It is one of three books published last year written by the Department of Plant Science's Dr. William Hawthorne, who has been researching plant diversity and writing field guides in West Africa since the 1980s. His co-author, Carel Jongkind at Wageningen University in The Netherlands, is also a botanist with more than twenty years' experience of African plants.

The set of over 2,000 species covered by this book is defined by life form (woody plants), habitat (forest) and geography (western Africa; i.e. everything west of the Togo mountains, encompassing Ghana, Côte d'Ivoire, Liberia, Sierra Leone, Guinea, Guinea Bissau, Gambia and Senegal). However, the authors have been generous and inclusive within these limits, including borderline woody species and large herbs such as Marantaceae, as well as roadside and scrubland species occasionally found in forest.

Described as a "pragmatic flora," *Woody Plants* is designed to be accessed formally, through dichotomous keys, or more casually by browsing. Its organisation is designed to facilitate the latter: although it is broadly grouped into families, these are ordered by leaf-form (dicots start at the simple-leaved Annonaceae, pass through opposite-leaved groups and end with the compound-leaved legumes; ferns and monocotyledons bring up the rear). Where possible, closely-related

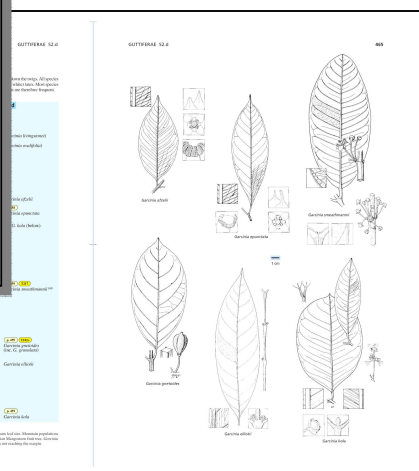
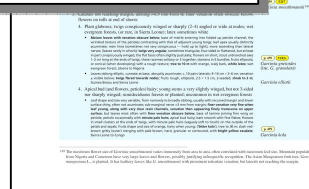
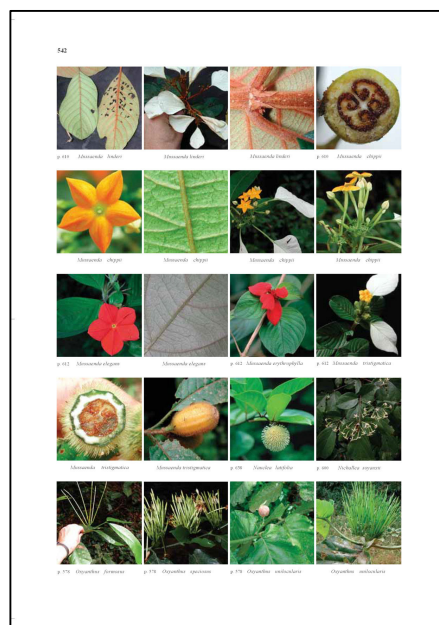
families have also been placed close to each other in the book. Depending on your point of view, this pragmatic approach either gives the best of both worlds, or serves to frustrate both the hard-core taxonomist and the non-specialist "browser". Even once a standard method for translating phylogenetic trees into a linear sequence is agreed (if ever), there will always be plenty of room for disagreement here. Either way, the comprehensive index to genera and species, as well as a quick-reference list of families inside the front cover, make it easy and quick to find what one is looking for despite the size of the work.

Although the system for numbering keys, sections and groups is rather cumbersome it has been developed and refined through many previous publications (e.g. Hawthorne 1990) and is easy to navigate once one gets used to it. The keys make no assumption of prior knowledge – starting with "I have a specimen... What should I do now?" – and draw the reader gradually into the nitty-gritty of identification, providing explanations of the characters used at each step. Once arrived at a "family" group a short description confirms whether one is in the right area, and a page or more of photographs and illustrations also gives a good idea of whether or not you need to retrace your steps. The species keys and descriptions are detailed but include only those characters necessary to make an identification. This saves space and enables one to focus on the important characters, but

does often mean that the two parts of a key couplet are not direct alternatives. On occasion, the authors' incredible familiarity with these plants results in rather convoluted key couplets with subsidiary clauses that left me feeling a little out of my depth (e.g. "leaves >7cm wide, or if smaller then not strongly glaucous or finest veins finely scalariform (or at least plant not matching ...)"). For the most part, however, the keys are clear, and the descriptions leave the reader in little doubt when they have achieved the correct identification. There is a strong and very welcome emphasis on leaf, bark, slash and scent characters, a limited reliance on jargon, and the authors are not afraid to use novel descriptive language to get their point across: "stipules with a leafy upper portion but no lower kidney shaped bit" (*Gilbertiodendron ivorense*); "latex rapidly forming into rubbery balls" (*Funtumia elastica*); "leaf base ... inner margin rounded (like cow horns)" (*Kolobopetalum leonense*).

Pictures are, for many people, the starting point for using a field guide. In this case, the detailed plates also provide the definitive confirmation of identifications made using the text. The beautiful illustrations, by experienced botanical illustrators Rosemary Wise and Marjolein Spitteler, are as inclusive or exclusive as necessary, with detailed enlargements, sketches of crown or bole shape, and cartoons of a pencil, person or elephant's behind to give scale. In addition to the drawings, the book features over 3,000 colour photographs, the majority taken by Dr. Hawthorne himself. The photographs – of crown, bole, bark, slash, leaves, fruit and flowers – are mostly provided in banks at the beginning of each family or group, making them easy to flick through for a quick identification.

Photographic plates also form the backbone of the "Cross-cutting groups" chapter towards the end of the book. This section provides a novel means to identify

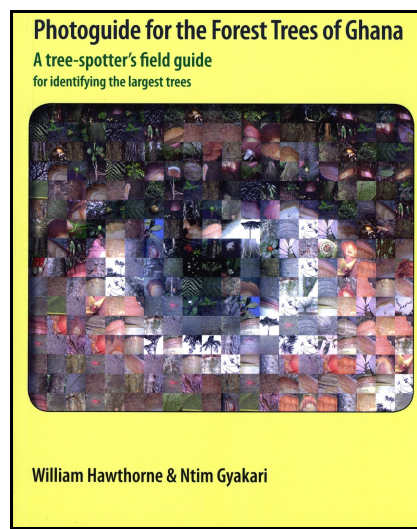


Above are example pages from *Woody Plants of Western African Forests*

species across all taxonomic groups by listing and providing keys to those species having certain distinctive characters, such as crown shape, stilt roots, spines, coloured latex or a fibrous slash. The majority of these cross-cutting groups focus on slash characters, for which the colour photographs are the key to identification. As with any field-guide, a little forward investment of time is needed here – the reader has to get to know the characters covered in order to use the cross-cutting chapter effectively – but once that familiarity is achieved they provide a very handy quick-reference route to many of the species covered. The introduction, “how to use” sections and glossary are also clear, interesting and well worth taking the time to read before using the book. Nomenclatural discussion is kept to a minimum and confined to footnotes, so as not to detract from the business of identification but to be easily and immediately available if needed.

During my work in Congo, *Woody Plants* was seized, used and enjoyed by taxonomists, ecologists, conservationists and students. As word spreads, it is fast becoming the technical bible of all those working on, or in, the forests of tropical West Africa and beyond.

At over 1,000 pages and weighing in at 3 kg *Woody Plants* is a “field guide” in only the very broadest sense. For users in Ghana, at least, Dr. Hawthorne’s second publication of 2006 is mercifully more portable.



Although less than one-quarter of the size and weight of the first volume, the *Photoguide for the Forest Trees of Ghana* covers 326 species and provides colour photographs and line-drawings for every one. Written with the experienced Ghanaian botanist Ntim Gyakari, it thus provides a comprehensive, portable identification manual for all the larger forest trees of Ghana. Aimed at “tree-spotters” with little previous experience, this book focuses on bole and bark characters, which for many large trees may be all that is available from

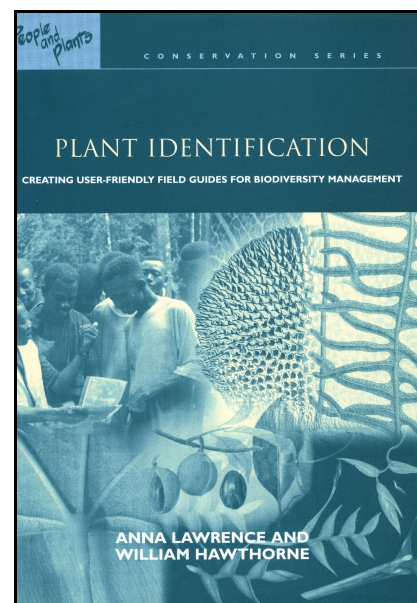
the ground. The arrangement is unashamedly character-based, with species arranged according to the characters of their bark slash only. Each species receives a double-page spread of text and images, with a slash photograph consistently placed in the upper right-hand corner. This makes for very easy, rapid browsing by slash but allows for more detailed verification of identifications using subsidiary text and pictures as required.

Each species’ page in the *Photoguide* is edged by an information-rich side-bar, with symbols representing slash colour, texture and scent, exudate colour and consistency, spines, leaf arrangement and leaf-form. The symbols take a bit of getting used to, but provide an easy reference for those who don’t want to, or can’t, read the text. As befits a photoguide, the photographs, particularly those of slashes, are wonderfully informative and the colours perfectly reproduced. Rosemary Wise’s drawings provide additional characters. There are no keys but the text is clear and to the point, focusing on the characters needed for identification. Usefully, the names, distinguishing features and page references of similar species are also provided. Species are indexed by scientific and local name; conservation ratings are also indicated in the index, although not in the main body text.

The *Photoguide* is designed as a low-cost pocket guide, but the authors’ extensive experience with field guides and Ghanaian trees, and comprehensive archive of photographs and illustrations ensure it is much more than that: a high-quality and very useful resource for tree-spotters of all backgrounds.

Finally, for those inspired by these books, or seeking to explore the complexities of the work that goes on behind the scenes in producing field guides, Dr. Hawthorne has also co-edited a manual to field guide preparation, *Plant Identification*. Written from a broad perspective, this manual covers the whole gamut of field guides, from the basic to the highly technical. It helps the reader to choose the most appropriate style of guide for their situation, then details the processes necessary to achieve it. The plates, illustrating examples of the different types of field guide with which the authors have been involved, are crucial to the discussion, and bring the descriptions to life far more than could ever be achieved with just text.

With contributions from taxonomists, ecologists, development-workers, economists, graphic communicators and more, *Plant Identification* covers every conceivable stage from identifying the need to evaluating the success of a finished field guide, including basic information on databasing, illustration, character-choice and publishing. It makes extensive use of case-studies which, as well as bringing the information in the manual to life, contain highly relevant facts and figures – such as



how many digital photographs can be taken in a day, or how much a target audience might be willing to pay for different types of guides. As a budding field guide writer myself, the most useful section was that on testing, which I hope to put into practice when I return to Congo with my own prototype field guide to test.

With its broad, ambitious scope this manual does risk putting-off some potential groups of readers due to the large amount of unfamiliar subject matter there is to wade through. From my point of view as a botanist, I struggled with those parts of the book covering political, social and economic aspects. But by judicious use of boxes, summaries and flow-charts the authors still managed to introduce me to some of the principles of these chapters, of which I would otherwise have remained blissfully ignorant. On the whole, I think everyone will find something of interest here, and realise that there is more to consider in writing a field guide than they perhaps realised. My hope is that along the way the botanists will be introduced to economics, the development-workers to taxonomy, and the graphic designers to ecological principles!

Although the three books discussed here were all published in the course of a single year – an incredible achievement in itself – they represent the fruits of a dedicated and successful career by a remarkable botanist and communicator. I hope there will be many more to come.

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Alexandra Wortley

Royal Botanic Garden Edinburgh, March 2007

Point of View: Taxonomists and Parataxonomists - Issues in Training and Neo-colonialism

The persistent decline in the number of taxonomists in the biological sciences is frequently discussed in the popular scientific press and the implications are bemoaned in numerous reports. Quite clearly incompetent taxonomy can severely curtail the accuracy and, consequently, the value of any biological research where correct identification of species is important. The lack of taxonomic skills is particularly acute in tropical biology and is a major obstacle in biodiversity and conservation work. Simply put, if we don't know what the species are, we can't decide on conservation priorities either in terms of habitat or of individual taxa. It was in response to this "taxonomic impediment" that the Global Taxonomy initiative was agreed as part of the International Convention on Biodiversity but there is as yet little evidence of any far-reaching change.

One solution to the shortage of taxonomists appears to lie in the use of parataxonomists. As originally conceived by Janzen (1992) and others, this simply meant the selection of individuals from local communities for use in collecting and identifying plants. Species were sorted into "morphospecies", which may or may not coincide with scientifically recognised species. The reliability of this approach has been criticised by Krell (2004) and, although it has been defended as a means of empowering local communities, I feel that it has the opposite effect as it perpetuates their isolation from accepted scientific practice. Some would argue that parataxonomy was never intended to replace orthodox taxonomy but whether because of the connotations of the word "parataxonomy" or for whatever other reason, it seems always to be discussed within the context of the acute shortage of traditional taxonomists (e.g. Beattie 1997, Krell 2004). Moreover it appears to offer a cheap, politically correct and thus desirable option for funding agencies with obvious, unfortunate consequences for the training of real taxonomists.

There is another, somewhat similar and equally unsatisfactory solution to the

problem. This is the use of minimally trained "field workers" (my term). These are usually biology students or recent graduates, national park wardens or others with some biology training or conservation involvement. They usually receive a short period of training followed by longer "on the job" training, where they go to the field or identify their specimens with the help of the trainer. Pay is usually low and employment is limited to the duration of a particular project or even a shorter period. The employer is usually an NGO or a non-national institution which has no commitment to the long-term employment of the individual. There is no expectation that the field worker will continue with this work except perhaps on another occasion when their skills are needed by another project. I can see no difference between this kind of parataxonomist and the "native collector", used so extensively by colonial botanists in India, Malaysia, Indonesia and elsewhere in the nineteenth century. Some of these "native collectors" made valuable collections, but I don't recall any who developed into substantial taxonomists in their own right.

I find the solutions to the crisis in taxonomy outlined in the previous paragraphs objectionable for many reasons. In the first place they are not so much training in taxonomy as training in collecting and specimen processing. Clearly the parataxonomist or field worker may be taught basic skills to enable him to assign specimens to major families or even the more important genera but his main task is the accumulation of specimens for the institution or organisation which is financing the project. I fear it is nothing more than a neo-colonial response to the crisis in taxonomy which leaves "taxonomic power" in the hands of major institutions, usually expatriate, where real science and the true taxonomists are based. I am sure that there must be a few individuals who have developed into true taxonomists through these processes and who continue working long after the end of the project where they were trained but they are certainly few in number.

The malign effects are not limited to the failure to train taxonomists. Many tropical herbaria are being filled by large numbers of specimens of poor quality. An inevitable result is that scarce resources are wasted on mounting poorly selected and poorly preserved specimens, which serve as unsatisfactory reference collections of limited use in taxonomic research, particularly if they are not assigned to recognised species. Specimens are usually collected in alcohol and lose diagnostic features and are unsuitable for molecular studies. A person with a true taxonomic interest is much more likely to collect unusual, interesting and representative specimens than someone who is not deeply involved in taxonomic work.

Parataxonomy and similar initiatives are, in fact, representative of a number of contemporary "taxonomic" initiatives which are not really taxonomy at all. A very good example is data-basing. Many leading institutions and funding agents are investing large sums of money into data-basing projects in the name of "support for taxonomy". I agree that the end result will be a useful tool for plant taxonomists just as the development of digital photography has been, but data basing provides no training in taxonomy and will do nothing to solve the shortage of taxonomists.

If parataxonomic training is not the answer, what is? Should taxonomy be taught as part of university biology degree courses? Most first degrees in biology contain a taxonomy element but it generally has low status and is increasingly being replaced by modules in molecular systematics, itself a minor element in most courses. I doubt anyone in Britain would claim that their BA or BSc courses trained taxonomists. What about Masters level courses? In Britain there are three of these and student numbers are low. However, they have a good claim to offer the kind of training needed but who would choose to study taxonomy in the first place if there is little or no training in first degree courses?

A superficial glance at taxonomy and taxonomists suggests that it is an interest, a skill, even a passion, which someone is apparently born with. It can be developed, refined, trained, improved but without the initial spark of interest, there is little hope that it will develop strongly. It is perhaps analogous to creative writing. Universities do offer degrees in creative writing but the great majority of creative writers have had no training as such. They develop their skills through practice, opportunity and the encouragement of other writers. They rarely, perhaps never, work in total isolation but benefit from contact with other writers. A degree in language or literature may hone their skills but will not teach their basic craft. Success is measured in terms of acceptance by their peers and the public and the volume of sales of their books. Failure to earn money will lead most to abandon their craft for something more commercially remunerative. The parallels for taxonomists are obvious. Biology degrees improve but do not create taxonomists. Recognition and payment encourage taxonomists to keep working. Kew owes an immense debt to the 19th century botanist, George Bentham, untrained but arguably the most productive plant taxonomist ever. Nor is that a nineteenth century phenomenon. Outstanding examples from the 20th century include Rupert Barneby at New York or Peter Sell at Cambridge. In Bolivia today, the most productive plant taxonomist in terms of publication has no formal training.

What should the biological institutions and funding agents do, both in this country and, more especially in the developing world?

The answer does not lie in training parataxonomists nor in offering degrees in taxonomy. In my opinion it lies in identifying self-motivated people with pre-existing interest in taxonomy and investing money and training in this small number who show high motivation and potential ability in taxonomy. Given our limited resources in terms of training, money and facilities, botanical institutions, funding agencies and other interested parties need to identify these individuals and funnel their support and money in their direction.

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John Wood

Every Picture Tells a Story

Little did I suspect, when I was offered the post of botanical artist for the Department of Forestry, University of Oxford in 1965 that I would still be here 42 years later after drawing well over 12,000 species! Now that retirement age is approaching I look back over a varied and thoroughly enjoyable career. I also feel sad to think, with the changing face of botany, I will not be replaced, so ending a long tradition of botanical artists in this university. Looking at our beautiful collection of painting in what is now the Department of Plant Sciences, especially those for *Flora Graeca* by Ferdinand Bauer (1760–1826), has constantly inspired me.

Plant drawing and painting has always been a great love, from school days onwards. At University (Fine Arts, Reading) I was a rebel and with the eventual permission of my long-suffering tutor, turned my back on three days a week of life drawing and sat and drew in splendid isolation in the Botany department's greenhouse. He was the one who suggested a career in botanical illustration. How fortunate I was later on to be employed here, after two years of teaching. The late Frank White, curator of what was then the Forest Herbarium (now the Daubeny Herbarium)

was the best supervisor anyone could have, a perfectionist with an eagle eye. Although his own drawing skills were not so good, he knew exactly what he wanted and to see how he checked a finished drawing, millimetre by millimetre against the specimens, was daunting. When teaching, I hear myself automatically echoing his words "I can see that this stem is about a millimetre too wide" and "Look carefully at the venation" or "Do you see the tiny scar where the stipule has fallen?"

Although Frank White could be difficult, he was the fairest supervisor and was very appreciative of a job done well. If there were corrections needed, there would be a little card waiting for me on top of my drawing in the morning with the words "I will explain, F.W.". All the staff received these identical messages, and judging by the pressure and number of zigzags underneath, we could tell what sort of mood he was in! For the first twenty years here, before becoming departmental artist, I drew solely for him, not just for publications but many, many large diagrams for his superb practical classes. Past students could never forget these, when the herbarium was transformed with plants from the botanic garden. Occasionally we had the tropical fruit practical, when we scoured the market and the Asian shops of Cowley Road for him, to find weird and wonderful things and, best of all, got to taste them.

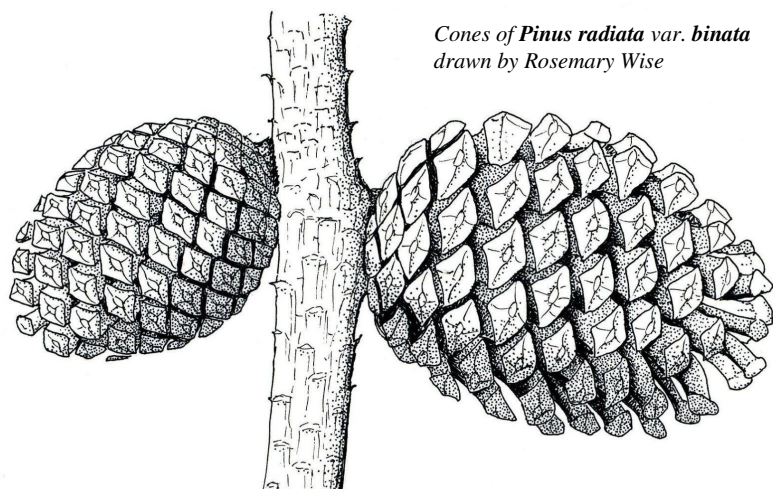
Once Frank said "Rosemary, I am going to buy you an avocado tomorrow" I was surprised but thanked him very much. "Oh no, it isn't really for you, I want you to feed it to your cats." So my kitchen became a lab for a while when initially a complete fruit was offered and I recorded how many of the six took any notice, (one). The next step was to peel it and observe for interest again, (two). The final stage was to mash it and almost before I could put the saucer down the only one really to show interest ate it with great relish while the other five walked away! (Frank wondered if the big cats dispersed wild avocados and this generous man actually bought two avocados, one for the cats and one for me).

Monographic works have occupied a large percentage of my time. Being very much a "legume person" I especially enjoyed drawing the African acacias for the late Richard Barnes, Chris Fagg and Stephen Harris. After exhausting the acacia collections in this country I was sent to explore the herbaria of Nairobi, Lisbon and Uppsala and was able to fill in a lot of the gaps. This project took many years, on and off; when I started there were about 144 recorded species and over 170 by the time I had finished. Other legume monographs have included "*Parkia*" (Helen Fortune Hopkins), "*Leucaena*" and at present "Andean Lupins", (another personal favourite and both projects of Colin Hughes). Drawing species of Meliaceae took up several years (Flora Neotropica

monograph "Meliaceae", Pennington and Styles and "*Aglaia*", Caroline Pannell). Ongoing also is "*Strobilanthes*" for Robert Scotland and John Wood. I don't really enjoy some of these plants quite so much for several reasons. One aspect of illustration that I find especially pleasing is the composition of the plate. Some "Strobes" are rather "weedy" in appearance and however hard I try I cannot make the plate look as full and attractive as I would like. After rehydrating the dried and incredibly filmy flowers, they are a time-consuming nightmare (and of course a challenge) to dissect as they tear so easily! But in this occupation one can only be patient. There were countless pine cones to draw for the "*Pinus*" monograph (Aljos Farjon and the late Brian Styles). These are the best subjects to draw for tightening up drawing techniques, and an exercise I frequently recommend to students. More varied have been the floras, including Frank White's *Evergreen Forest Flora of Malawi* and David Mabberley's *Algarve Plants and Landscape*, the latter being slightly different as for once the drawings were mostly done from living material in the field.

I have lost count of how many D. Phil. theses I have illustrated. I know the very first was "Genera of Meliaceae" for Terry Pennington and, some years ago now, "*Andira*" for his son Toby! I look at the next generation of Penningtons thoughtfully! Occasionally enormous pickled tubers appeared on my desk, some smooth, some knobbly and others covered with dense spines. These were the strange ant plants of Papua New Guinea, drawn for Matthew Jebb (species of *Myrmecodia*, *Hydnophytum* and *Anthorrhiza*, Rubiaceae).

After my children were independent, overseas travel became enriching in many ways. My first experience of tropical botany was in 1985, when, with the assistance of a Churchill Trust Travelling Fellowship, I accompanied the students on the Oxford Biological Expedition to Seychelles. My son, then in his first year at university, took over my job for these 9 weeks during his summer vacation and precisely followed my detailed notes on techniques of illustration. Being so used to drawing from flat, brown herbarium material, I am ashamed to say I didn't immediately recognise the green leaves and colourful fruits of *Chrysobalanus*, a genus of which I had drawn many species for Prof. Sir Gilleen Prance! During this expedition I became aware of the fragile state of the endemic flora of the world's only granitic oceanic islands, many species being on the brink of extinction and very few illustrated. With a lot of discussions and encouragement, especially from Frank White, my holidays for the next decade were spent exploring various islands or climbing up to the mist forests. Eventually all 80 endemics were located and painted. I look back with amusement at the time a taxi driver arrived at our rented



Cones of Pinus radiata var. binata
drawn by Rosemary Wise

accommodation on the island of Praslin in 1985 demanding “Madame, you pack your bag now and come with me”. The warden on Aride Island had radioed the local police station to say “Get Mrs Wise quickly, the *Rothmannia* is in flower.” The sea was extremely choppy and once in the little pirogue I was handed an old helmet and told “You bail out water, the boat leaks”. Another time I dashed over to Aride, hanging onto the sides of the island’s new Zodiac, to paint a recently discovered endemic cucurbit. Knowing it was night-flowering, I went to collect it at first light – and was too late. The following morning I went to the plant in pitch darkness at 5.00 a.m. and started the painting by torchlight. All my spare time at home was taken up writing the text and “*A Fragile Eden*” was published by Princeton University Press in 1998, unfortunately after the death of Frank White.

With a departmental grant I accompanied a Linnaean Society expedition in 1988, following the route taken by Linnaeus on his epic journey to Lapland in 1732 and collected plants for the Fielding-Druce Herbarium. I also painted two plates of plants typical to Kvikkjokk and Abisko, putting *Linna borealis* on each as a tribute to Linnaeus. This was a wonderful trip, up the east coast of Sweden, across to Arctic Norway near Narvik, round the top of the Gulf of Bothnia, down the west coast of Finland to Turku and back across the sea to Stockholm, stopping at places to collect that had been visited by Linnaeus. At the time I didn’t know that this was to be the first of frequent visits to Sweden. Many holidays have been spent drawing Somali plants for Prof. Mats Thulin in the beautiful new herbarium of Uppsala University.

Two research fellowships followed, to Christensen Research Institute (near Madang on the north coast of Papua New Guinea) and also bring back many happy memories. I never thought I would see the aforementioned ant plants in situ, clinging on to their host trees. Here were scientists

of all disciplines and field work was a shared experience, from recording songs of wagtails to catching insects after dark, collecting marine species both in shallow water and out at sea and of course, the plant collecting excursions. (Hay and Wise “*Aroids of Papua New Guinea*” and Jebb “*The Edible Barringtonias*” Curtis Botanical Magazine). I produced my first educational poster here (mangrove plants), a prototype idea which has been repeated many times and in many places since.

DFID financed several visits to Malaysia. The first was a challenge, when at very short notice I joined a large collecting expedition into the heart of Borneo! This was my first experience of camping and I was very apprehensive but needlessly so, I soon grew to love jungle life. Not many can claim to have had a pangolin under their hammock! I am sure not many get to illustrate a new species on the same day that it is found, either. A rewarding part of these trips was running a large workshop in the Forest Research Centre in Sepilok, to teach techniques of scientific drawing to local artists who subsequently illustrate the “*Tree Flora of Sabah and Sarawak*” volumes. Training future illustrators is an important part of the job for me and I have been invited to run workshops in many places, including Bolivia, Kenya, Singapore and Australia.

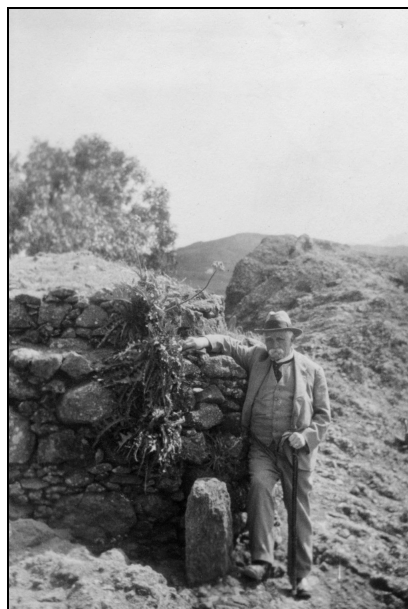
More recently the herbarium has had two Darwin Initiative grants which have required illustrations. I went west for the first time to Grenada with William Hawthorne, to paint, and later to draw, leaves of 100 species for an identification exercise. [See *Oxford Plant Systematics* 8: 10-11 (2000), 9: 14 (2002) and *Plant Identification, Creating Use-Friendly Field Guides for Biodiversity Management* by Anna Lawrence and William Hawthorne (2006), page 8 in this issue]. For the second project, I painted many plants of the spectacular Andean valleys of Bolivia, from which a series of six themed educational posters has resulted (pollination, adapt-

ations, endemics, ornamentals, trees and fruits). I hurriedly learnt basic Spanish knowing that the participants in the two illustration techniques workshops I ran would speak little or no English! I also learnt a lot of the history of the country from John Wood as we travelled in Che Guevara territory. One Bolivian participant, Eliana Cazadilla, visited Oxford for six weeks further training in 2005.

Being part time has meant that I have a freelance career as well. I am grateful that the expertise I have acquired here has resulted in the position of associate staff at the Royal Botanic Gardens, Kew. Besides providing line drawings I have joined four trips in my annual leave as official artist, travelling with members of their staff to what was then Irian Jaya (now Papua), led by Prof. Robert Johns. This area is among the world’s top ten centres of biodiversity. We collected and I painted plants from sea level up to the alpine region just below the Puncak Jaya glacier. Posters were produced depicting plants typical of each of the ten species-rich vegetation zones and given to schools to raise their awareness of the flora. (I have wishful, but maybe not realistic, thoughts of returning there to paint all the spectacular *Rhododendron* species in retirement!). With Terry Pennington I went on two fantastic trips to Peru to paint species from the central rain forest, the flooded forest of the Amazon and the dry forests of the north. These accompanied over 900 line drawings in his book, *Trees of Peru*. We saw Peru as the tourist never would and stayed in the most interesting and out of the way places, and the same can be said for my two departmental trips to Bolivia. New techniques of painting have had to be explored and perfected in the tropics. The high humidity in some locations means that watercolour paint is slow to dry while in hot dry areas it dries far too quickly. (Ferdinand Bauer worked in a different way. He carefully drew his Greek plants in the field, colour-coded them and painted them back here in the comfort of cooler Oxford!). I soon learned from experience never to take ink-filled technical pens on planes and also that my technical pen humidifier has a strange shaped metal plate incorporated into its plastic base which puzzles X-ray machines - I missed a connecting flight once because of this! My drawing board has been propped up against car’s dashboards to record freshly collected material in so many places, from the incredibly windy Cape St. Vincent in Portugal (when the vehicle rocked constantly), under nutmeg trees in Grenada, to the hot dry plains of Kenya and Bolivia, sometimes enduring the aggravation of biting insects. The phrase “Every picture tells a story” is certainly very true in my case, it has been a wonderful and rewarding career.

Rosemary Wise

Druce and Oxford University Herbaria



George Claridge Druce (1850-1932), the illegitimate son of a Northamptonshire housekeeper, rose through an apprenticeship at Philadelphus Jeyes in Northampton to become a retail chemist in the High Street, Oxford in 1879. He retired from business in 1905, and continued to increase his wealth through canny investment and lending money to individuals, companies and Oxford colleges. However, there was more to Druce than merely a local shopkeeper and moneylender, although his background in trade often coloured others' perceptions of him. He was a prominent character in Edwardian Oxford and even got a walk-on part in Beerbohm's *Zuleika Dobson*. As a local Liberal politician, Druce was Sheriff of Oxfordshire in 1897, Mayor in 1900 and an active member of the local council for 39 years. Druce was also active in the Royal Pharmaceutical Society and as a freemason. In botanical circles, Druce is perhaps best known for his imperial rule of the Botanical Exchange Club and as the most prominent British amateur botanist of the first three decades of the 20th century. Within the University of Oxford, Druce is remembered as one of its great benefactors; on his death he left his herbarium and the bulk of his fortune to the University.

Druce began to make use of the University's botanical collections soon after his arrival in Oxford, especially in the preparation of the first edition of his *Flora of Oxfordshire* (1886). The herbarium was much smaller than it is today, comprising the Fielding herbarium, a British herbarium and six pre-1796 herbaria. However, in Druce's own words, these first contacts were dramatic; 'When ... I first saw these volumes ..., they were placed on the top

shelf in what was little more than a loft above the lecture room at the Botanic Garden. There were no facilities for warming, and the place was damp. ... The immense mass of the Morisonian (Bobartian), Dillenian, and Sherardian collections were in loose unarranged sheets, often unmounted. Even the Fielding Herbarium was mostly unnamed and roughly sorted into the different families'. Druce was to transform these collections over the rest of his lifetime.

In 1885, just six years after taking up residence in Oxford, the botanical autodidact Druce had ambitions to become Professor of Botany, and even had the support of the Cambridge Professor of Botany, Charles Babington (1808-1895). Druce did not get the post; it went to Isaac Bayley Balfour (1853-1922), who 'came like a tornado' and left Oxford in 1888 for Edinburgh. Balfour's successor was Sydney Howard Vines (1849-1934). In 1889, Druce appears to have taken on voluntary responsibility for the herbaria and in 1895 was made Special Curator of the Fielding Herbarium, a post for which he was paid an honorarium. Druce got on very well with Vines and they produced two detailed studies of the herbaria of Robert Morison (1620-1683) and Jacob Dillenius (1684-1747). However, it is unclear what control Vines exercised over Druce, other than that of superiority of rank. There seemed to be no formal decision making processes, with Druce acting as complete master over the herbaria, especially in his later years. One must remember that Druce, as a man of private means, was wealthier than most of the university academics and this appears to have caused some resentment within the University.

The evidence of Druce's curatorial activities is to be found throughout the Herbaria today and his characteristic scrawl covers many sheets and folders. It was Druce who undertook the immense task of arranging the Sherardian, Du Bois and Fielding herbaria into their current arrangement according to the then vogue system of Durand. Druce also arranged Sibthorp's herbarium according to Sibthorp and Smith's *Prodromus* and the herbaria of Morison and Dillenius. Much of the curatorial work was funded out of Druce's own pocket, including the provision of mounting paper and genus folders. Druce did not have an introspective character but there was one thing that he did regret; the splitting up of the Du Bois herbarium; '... the advent of Prof. I. B. Balfour ... all the old things had to be changed, the herbaria sorted in ... Alas, Balfour, accustomed to other ways and to the use of modern methods, issued an edict to cast all these old collections into one general herbarium. ... I could only try to induce Balfour to leave the collections intact until they could be carefully examined, and to concentrate upon the modern plants which could be sorted

into the Fielding Herbarium. This suggestion did not prove acceptable, and in order to save the dispersal of the Morisonian, Dillenian, Sherardian, and Sibthorpian collections the Du Bois plants were sacrificed – as at the time I did not realise what light they threw upon the Raian plants. So these 80 volumes were cut up, and the plants in them were mounted by not very careful or competent hands, losing fruits and seeds in the disposal. Then, too late, it was brought home to the Professor that as they only had pre-Linnean names, they could not be sorted into the general collection as they were tied up in bundles, in the process of which much damage was done, and put in a storeroom where they remained for many years'.

Druce was not above self-publicity and exaggeration; he knew what his audience wanted to hear. Clokie, in her account of the Oxford Herbaria, casts some doubts on Druce's account of the state of the herbaria in the 1880s, since the Sherardian specimens are mostly mounted on early eighteenth-century paper, and the Morisonian specimens may have been unordered but they are mounted on original sheets. However, Clokie's most damning criticism of Druce's work was his great hurry and inattention to detail; features which are particularly found in his personal collection of British material (c. 200,000 specimens), which he left to the University on his death.

Druce was eager to try and please as many people as possible, if they were his intellectual or social superiors, help and perhaps patronise his intellectual or social inferiors and be at logger heads with his peers. He won a great deal of praise and loyalty from the amateur field botanists in the early 20th century, and the admiration of some professional botanists. However, among other professional botanists he was regarded with a mixture of suspicion and contempt. One reason for this, in addition to his social background and financial independence, was Druce's intolerance of criticism, as illustrated by his feud with James Britten (1846-1924); even the death of Britten in 1924 did not alleviate the bitterness. In the Introduction to *The Comital Flora of the British Isles* (1932), written no more than two months before Druce's death, he complained of the 'many years of misrepresentation which I suffered at Mr Britten's hands'.

During his life, Druce continually made wills and considered how he might best dispose of his personal library, herbarium and considerable fortune. The University was one place that he considered, although he had some qualms about this, as cryptically observed by his friend Frank Bellamy (1863-1936); 'for some years he [Druce] was uncertain as to what course to take; certain circumstances concerning the University, to which I had better not refer in precise words, caused him to hesitate about making an absolute and munificent gift to

the University'. However, in the end Druce did leave the bulk of his fortune to the University but this was not without controversy and probate was not obtained until 1934. Druce's bequest to the University effectively enhanced the herbaria through the addition of his personal collection of primarily British herbarium specimens, his extensive library (which included a copy of the *Flora Graeca* and, most importantly, the original landscapes prepared by Ferdinand Bauer from sketches made on John Sibthorp's first journey in the eastern Mediterranean) and much of his property.

The herbarium as Druce knew it has been transformed. However, Druce's influence remains, whether it is the arrangement of the Fielding herbarium, the academic work he undertook on the Dillenian and Morisonian herbaria or the money that he left to ensure the continued curation of the collections that occupied so much of his life.

Stephen A. Harris

Linnaeus and Oxford

During 2007 the tercentenary of the birth of Carl Linnaeus (1707–1778), the Swedish naturalist and 'father' of binomial plant and animal nomenclature, will be celebrated. Because Linnaeus enabled worldwide dialogue about different plants to be made with ease after the publication of his *Species Plantarum* in 1753, there will be international celebrations on a Linnaean theme. Linnaeus has particular significance for us in Oxford University Herbaria, as he visited Johan Jacob Dillenius (1684–1747), the first Sherardian Professor of Botany at the Oxford Botanic Garden in 1736.

Dillenius, originally from Germany, was a great friend and colleague of William Sherard, a wealthy botanist and traveller, who bequeathed his herbarium and library to Oxford on his death in 1728. Dillenius was invited by Sherard to move to London in 1721 where he then worked for Sherard on his extensive herbarium collections. William Sherard endowed the chair of Botany at Oxford, on condition that Dillenius would be its first incumbent. Dillenius took up the post in 1734 once Sherard's will was sorted out. Two years later, Linnaeus travelled to England at the instigation of his patron and benefactor George Clifford. After visiting Sir Hans Sloane in London and Philip Miller at the Apothecaries' Garden at Chelsea, Linnaeus made his way to the Oxford Botanic Garden. Linnaeus could not speak any English and Dillenius could not speak Swedish, so perhaps not surprisingly, the first meeting of the two botanists did not go well! They did not share a common language, but Linnaeus was able to work out



Specimen, and label, of *Pedicularis hirsuta* collected by Linnaeus and cited in his *Flora Lapponica* (1737) from the Sherardian Herbarium in OXF

Latin derivations for various words and overheard Dillenius saying to James Sherard (William's brother) "This is the man who has thrown all botany into confusion"! He pretended not to comprehend what Dillenius had said but was obviously hurt by this remark. Linnaeus could contain himself no longer and a couple of days later confronted Dillenius about the remark. They then proceeded to discuss in detail the characteristics of various plants, where Linnaeus proved to Dillenius all his descriptions of a range of plants in *Genera Plantarum* were correct. [Dillenius had been sent a pre-publication copy of *Genera Plantarum*.] Dillenius was very impressed and the two botanists became the best of friends. Dillenius was reported to be in tears when Linnaeus left after a week in Oxford. They corresponded for the rest of their lives and exchanged dried plants and seeds. This is how the Sherardian Herbarium came to possess about 25 specimens collected by Linnaeus, mostly from Lapland, also a couple of plants from Götland. Many of the specimens Linnaeus sent to Dillenius had been cited in his *Flora Lapponica* (1737). Linnaeus continued to correspond with Humphrey Sibthorp, the second Sherardian Professor of Botany, after the death of Dillenius.

Dillenius sent Linnaeus copies of his own publications, the *Hortus Elthamensis* (1732) and the *Historia Muscorum* (1741), which Linnaeus cites frequently in his *Species Plantarum* (1753). Linnaeus also cites plants from *Plantarum Historiae Universalis Oxoniensis*, the work of Robert Morison (the first Oxford Professor of Botany) in *Species Plantarum*, and it is implied in the preface that Linnaeus consulted the herbaria of Sherard and Bobart at Oxford. I am sure we will discover more about the collections and links with Linnaeus during the coming year.

Serena Marner

News from the Herbaria

Fielding-Druce (OXF)

Work continued on the databasing and digitisation of the collections. In the summer of 2006, two very competent students, Nicola Preston and Daniel Goldhill, came to work in OXF continuing and completing the databasing and photographing of all the Caribbean material held in the Fielding Herbarium. This work was carried out as part of the Trinidad and Tobago Darwin Project (see *OPS* 13: 3); all the data and images will be available via BRAHMS online at

<http://herbaria.plants.ox.ac.uk/bol/home>

There was much activity sending herbarium material out on loan during 2006. Almost 1500 specimens were sent out from the Fielding and Druce collections of OXF. Material sent included specimens from the following genera and families: *Cirsium*, *Leontodon*, *Taraxacum*, Asteraceae; *Begonia*, Begoniaceae; *Cuscuta*, Convolvulaceae; *Carex*, miscellaneous Cyperaceae, miscellaneous Fabaceae; *Mentha*, *Scutellaria*, Lamiaceae; *Cambessedesia*, Melastomataceae; *Beaufortia*, Myrtaceae; *Koeleria*, miscellaneous Poaceae; *Mimulus*, Scrophulariaceae; *Solanum*, Solanaceae. The above material was borrowed by the following institutions: ABRN; ANK; BKL; E; K; MA; PERTH; PTIS; UEC; UPOS and WLU. Our thanks again go to Dr. Bruno Ryves for identifying many previously unnamed grasses from the Fielding Herbarium. We were delighted to find that some of these specimens turned out to be types, for instance some of the specimens collected by Richard Spruce in Brazil. We are also grateful to Dr. Tom Cope for facilitating the loan of Poaceae at Kew and returning the material. A number of 'internet' loans of digital images of specimens were also processed, mainly of sheets from the historic herbaria of Johan Jacob Dillenius and John Sibthorp which are not normally permitted to be sent on loan through conventional means.

A number of specimens were added to the Druce Herbarium, firstly a donation from Mr. John Killick which consisted of miscellaneous species collected by himself in Oxfordshire and Berkshire while compiling the *Flora of Oxfordshire* published in 1998. Voucher specimens from research work by Dr. Angela Hay of the Department of Plant Sciences were also incorporated into the Druce collection. In addition we were very pleased to receive a donation of one volume of William Baxter's "*Stirpes Cryptogamae Oxoniensis*" Fasciculus II [Dried specimens of Cryptogamous Plants collected in the vicinity of Oxford] 1828. William Baxter (1787–1871), botanist and gardener, was appointed Head gardener at the Oxford Botanic Garden in 1813 and

remained working there until his retirement from the active management of the gardens in 1857. OXF houses the sister volumes to this collection.

We were pleased to welcome visitors to the collections during 2006 from as far afield as Canberra & Sydney, Australia, Ceará, Brazil, Yucatán, Mexico, Katmandu, Nepal, Islamabad, Pakistan, Washington & Wisconsin, USA, as well as many people from the UK. David Elliott from South Carolina who is making a documentary film about the naturalist Mark Catesby, made a visit particularly to see the plant specimens collected by Mark Catesby in the 1720's which are held in the Sherardian Herbarium. He is the producer of a film entitled "*The Curious Mister Catesby*" which is sponsored by the Catesby Commemorative Trust, a non-profit organization based in Kiawah Island, South Carolina. (<http://www.catesbytrust.org/>). It was also a great pleasure to welcome a descendant of Jacob Bobart and to show him the Bobartian collections. 18 members of the Clifton Garden Society plus Friends of the Bristol Botanic Gardens came on a group visit on 8 June and were given a tour of the herbaria and shown associated botanical art. They were introduced by Anne Hancock who has a particular interest in the collections of Robert Morison (see *OPS* 13: 14-15). In December a group of students studying for a Diploma in Environmental Conservation from the Department of Continuing Education, University of Oxford, were shown the collections and their uses explained. Members of the Bobart Group of the Friends of Oxford Botanic Garden also visited to see various displays of historic material and botanical art.

December saw the publication of *Flora Zambesiaca Proteaceae* account, including an account of the genus *Faurea* by Serena Marner (see Publications 2006, page 6). A new project has now begun scanning and databasing images of slides of British plants with the plan of incorporating these images into the Virtual Field Herbarium in due course. (<http://herbaria.plants.ox.ac.uk/vfh/>) The slides of British species of plants have been photographed over many years by Mr. Don Park of the Worthing Natural History Society. He has kindly given permission for us to borrow them for scanning and to use the images for the Virtual Field Herbarium.

Serena Marner

Daubeny (FHO)

This year has been one of consolidation where the re-arranged space, databasing and photographic processes have become part of the herbarium routine. It has also seen the culmination of several years' work in substantial publications (see pages 6-9):

'Woody Plants of Western African Forests: a guide to the forest trees, shrubs and lianes from Senegal to Ghana' by William Hawthorne and Carel Jongkind.

'Plant Identification: creating user-friendly field guides for biodiversity management' by Anna Lawrence and William Hawthorne.

'Photoguide for the Forest Trees of Ghana: a tree-spotter's field guide for identifying the largest trees' by William Hawthorne & Ntim Gyakari

'A checklist of the Spermatophytes of Mt. Mulanje, Malawi' by Alison Strugnell based on the Mt. Mulanje specimens held in the collection as well as the expertise of the previous curator, Dr. Frank White.

It has also been a year of change as far as the research projects based on the herbarium are concerned. The *Strobilanthes* (Acanthaceae) revision under the auspices of Dr. Robert Scotland is moving into its final stages under the guidance and work of Dr. John Wood. Several taxonomic papers have already been produced and others are in the pipeline. This has enabled much of the large amount of herbarium material we have on loan for this project to be returned. This in turn has created much-needed space for new loans for our new graduate student, Tiina Sarkinen, who is commencing studies on the taxonomy of *Amicia* (Fabaceae).

Legume specimens collected by Marcelo Simon in Brazil, mainly *Mimosa*, have come into FHO for mounting and incorporation. *Strobilanthes* specimens collected by Drs. Mark Carine and Robert Scotland in India and Sri Lanka, Dr. Jonathan Bennett in Java, Dr. John Wood in Bhutan and collections from Myanmar have been incorporated along with *Hemigraphis* from the Philippines collected by Dr. Elizabeth Moylan.

In the mounting pipeline is a final swathe of specimens collected by Dr. William Hawthorne and colleagues for their book entitled *'Caribbean Spice Island Plants: trees, shrubs and climbers of Grenada'* and specimens collected in Sierra Leone by Dr. William Hawthorne. All these will be databased and photographed before incorporation.

The big change for FHO will come in 2007 as I shall be retiring at the end of 2006 after almost 21 years in the department: firstly in the post of Curatorial Assistant to Frank White in FHO, and then as Collections Manager for FHO (curating the collection, processing incoming and outgoing loans and working on the Mt. Mulanje flora). It is somewhat gratifying that I am able to leave FHO in a good state ready to underpin the initiatives planned for the future. After years of contraction from space elsewhere in the department and working through the previously-accumulated backlog, we are now at a stage where we have managed to accommodate everything in one place, the

backlog is down to two or three small bundles and there will be a significant amount of newly-collected material ready for incorporation during 2007. The collection is easy to access and use and there is some working space – not as much as we would like – but a great improvement on what we had before the refurbishment.

I have overseen the transition from the original Oxford Forest Herbarium under Dr. Frank White (African forest flora, Meliaceae and Ebenaceae) and its associated satellite groups of Dr. Brian Styles (Meliaceae, woody legumes of Central America and forest genetics) and Dr. David Mabberley (S.E. Asian and Pacific Meliaceae and Verbenaceae) to a modern-looking herbarium fit for its purpose in the 21st Century. During this time there has been a swing away from its original African and forestry-based focus to the current general plant systematics focus with more emphasis on South and Central America, although the woody flora is still a major research interest together with specific groups – at present Acanthaceae and Fabaceae. This reflects the interests of the current people working in our area rather than a deliberate decision to change direction. We also have much more interaction with the other disciplines in the department and other parts of the University, as well as being of more interest to people working in other herbaria.

My time in Oxford has coincided with the origin of the Plant Sciences Department, formed by the amalgamation of the Botany, Forestry and Agriculture Departments in the academic year of 1985-1986. The Daubeny Herbarium (originally the Forest Herbarium Oxford, the acronym FHO is still retained) was the focus of the Forest Systematics group in the Forestry Department in order to provide a scientific basis to forestry – detailed species descriptions, forest flora accounts, monographic work on important wood-producing families such as the Meliaceae, Ebenaceae and Pinaceae. It now functions alongside OXF, the former Botany Department Herbarium, under the umbrella title of the Oxford University Herbaria, with full integration of people and facilities.

So what of the future? For myself there will be a major life-style change but with intentions of keeping my botanical interests going, with the possibility of further involvement on the Mt. Mulanje flora and ancient woodland surveys in England as well as spending more time on hands-on gardening (vegetables and flowers) and visiting other countries. For FHO the future is looking optimistic under the curatorship of Dr. Stephen Harris, with current research and new developments in the pipeline. Although the work of curating a collection is never finished, I am satisfied I can leave this one in a state that will be of use for future research developments.

Alison Strugnell

BRAHMS 2006

Botanical Research And Herbarium
Management System

Training courses

During 2006, training courses were held in Bolivia, Brazil, Malaysia and Puerto Rico. The Bolivian course funded by the Darwin Initiative and organized by John Wood was held in Cochabamba with attendants also from La Paz, Santa Cruz and Sucre. The Malaysian course, held at the Forestry Research Institute of Malaysia in Kepong catered for 40 students from the Malay Peninsula, Sabah, Sarawak, Singapore and two botanists from Beijing. This course, organized by Saw Leng Guan and Richard Chung, was funded by the Flora of Peninsular Malaysia project. Eight courses were held in Brazil, most of these organized and run by Mike Hopkins. A further course was given at the MAPR herbarium Mayaguez, Puerto Rico, in November – funded by the International Institute of Tropical Forestry and coordinated by Jeanine Velez Gavilan. Harvey Ballard from Ohio University, USA completed a week of BRAHMS training in Oxford.

Publications

Publications derived from BRAHMS databases during 2006 include *A checklist of*

the spermatopytes of Mt Mulanje, Scripta Botanica Belgica Vol 34, Alison Strugnell; *A Checklist of Gabonese vascular plants*, Scripta Botanica Belgica Vol 35; *A Monograph of Cupressaceae and Sciadopitys*, Aljos Farjon, Kew; and *A Checklist of the Plants of Pulong Tau National Park, Sarawak*, Kit Pearce & Angela Muri.

System development

Three system upgrades were published on www.brahmsonline.com during 2006, the last in August. The principal changes concerned improvements to mapping, image management, the handling of nomenclature and internet links. Map production based on ArcView or DIVA GIS was streamlined, minimising the steps to create good species distribution maps. DIVA also includes options to calculate and map species diversity. Mapping exercises were added to the BRAHMS help file. Image storage was also targeted during 2006 with functions to link images to any RDE file. Images of labels have proved very useful for specimen data entry and verification. A hierarchical tree view to display taxa was implemented. Aside from giving a snapshot view of the taxon content of any relevant file, the tree view can be used to navigate to records. Editing species synonymy was simplified by adding new toolbar options to add and remove synonym links. Internet links to key

botanical sites were strengthened with a new dedicated internet links toolbar.

Version 6 development

The upgrade to Version 6 commenced in September. This new system, scheduled for early May 2007, includes installation, data structure and interface enhancements. Amongst these are the ability to link and view PDF files, a much simplified RDE to BRAHMS procedure, the ability to track all editing changes in any file, a living collections module, XML export functions, improved custom lookups, context sensitive help and a new approach to system configuration allowing network users to create and edit their own profile. BRAHMS 6 brings all collector, detby and taxon authority names into a single 'people' resource file. All specimens (included associated collection data) are now stored in a single 'specimens' file and determination histories have a separate file storing a greater level of detail. Another key change is the more central role played by the literature module, now incorporated into all databases by default and used to manage and configure all taxon protologue citations.

BRAHMS online databases can now be published and configured directly from BRAHMS 6. BRAHMS online has been moved to SQL Server Express.

Denis Filer

The screenshot shows the BRAHMS software interface. The main window is titled 'Advanced mode BRAHMS Admin in Conifers [C:\ALLBRAHMSDATA\CONIFERS\B5 single-user]'. It features a menu bar (File, Edit, View, Goto, Tag, FastSort, Calculate, Tools) and a toolbar with various icons. Below the menu bar is a status bar showing 'Collection extract file [c:\brahms5work\af\extracts\collextract.dbf (alias= COUT)]'. The main data area contains a table with columns: TAG, DEL, COLLECTOR, PREFIX, NUMBER, SUFFIX, SPECIES, COUNTRY, and MAJORAREA. The table lists various plant species, including *Chamaecyparis formosensis*, *Chamaecyparis thyoides*, and *Chamaecyparis obtusa*. A tree view on the right side of the window shows a hierarchy of taxonomic groups, including *Chamaecyparis* and its various species. The tree view is currently expanded to show the species list under *Chamaecyparis*.

TAG	DEL	COLLECTOR	PREFIX	NUMBER	SUFFIX	SPECIES	COUNTRY	MAJORAREA
		Kirkham, A.S.	ETOT	42		<i>Chamaecyparis formosensis</i>	Taiwan	Nantou
		Tegel, [?]	B-W	18550		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	Canada	
*		Kao, M.T.		s.n.		<i>Chamaecyparis formosensis</i>	Taiwan	Nantou
		Kalm, P.	LINN	1137.4		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	Unknown
		Fogg, J.M.		3884		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	Massachusetts
*		Clark, R.A.		615		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	Massachusetts
		Seymour, F.C.		17190		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	Massachusetts
		Boulford, D.E.		8031		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	Massachusetts
		Engelmann, G.		s.n.		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	New Jersey
		Heerd, P.F. van		774		<i>Chamaecyparis lawsoniana</i>	U.S.A.	Oregon
		Tracy, J.P.		10995		<i>Chamaecyparis lawsoniana</i>	U.S.A.	California
		Radford, A.E.		11378		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	South Carolina
*		Moldenke, A.L.		30407		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	New Jersey
		Kramer, K.U.		1936		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	Massachusetts
		Godfrey, R.K.		81668		<i>Chamaecyparis thyoides</i> var. <i>henryae</i>	U.S.A.	Florida
		Maas, O. van der		58		<i>Chamaecyparis thyoides</i> var. <i>henryae</i>	U.S.A.	Florida
		Kirkham, A.S.	ETOT	115		<i>Chamaecyparis obtusa</i> var. <i>formosana</i>	Taiwan	Nantou
		Howick, Lord	WH	20		<i>Chamaecyparis thyoides</i> var. <i>thyoides</i>	U.S.A.	Massachusetts
		Tamura, M.		22194		<i>Chamaecyparis formosensis</i>	Taiwan	Nantou
		Page, C.N.		10234		<i>Chamaecyparis formosensis</i>	Taiwan	Nantou
		Page, C.N.		10219		<i>Chamaecyparis formosensis</i>	Taiwan	Nantou
		Page, C.N.		10288		<i>Chamaecyparis formosensis</i>	Taiwan	Nantou
		Page, C.N.		10242		<i>Chamaecyparis formosensis</i>	Taiwan	Nantou
		Page, C.N.		10287		<i>Chamaecyparis formosensis</i>	Taiwan	Nantou
		Takeda, H.		s.n.		<i>Chamaecyparis obtusa</i> var. <i>obtusa</i>	Japan	Honshu
		Tamura, M.		3538		<i>Chamaecyparis obtusa</i> var. <i>obtusa</i>	Japan	Honshu
		Keng, H.		1203		<i>Chamaecyparis obtusa</i> var. <i>formosana</i>	Taiwan	Nantou

A typical BRAHMS data screen with column and tagged record highlighting in use. The tree view control in the right pane provides a summary of the taxon content of the current file and can be used to locate and filter records. The internet toolbar, docked right, provides handy links to a selection of botanical websites.

Typesetting and layout of this issue of OPS by Serena Marnier



See article "Every Picture Tells a Story" on pages 10-11. Rosemary Wise's work is currently on exhibition at Oxford University Museum of Natural History, Parks Road, Oxford, OX1 3PW until 29th June 2007.

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