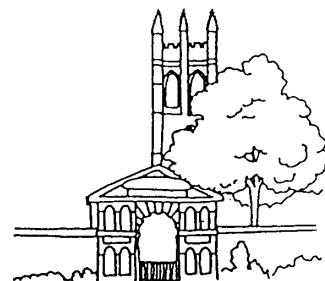


Oxford Plant Systematics



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

OPS 28

August 2023



Contents

Foreword

<i>Stephen A. Harris</i>	3
--------------------------------	---

News

Roots to Seeds Exhibition, Congratulations to Pablo Muñoz-Rodríguez, The Florilegium Project	3
--	---

Expeditions and visits	4
-------------------------------------	---

Publications 2021 and 2022	4
---	---

Two experiences of a field trip to Ecuador:

Searching for <i>Ipomoea aequatoriensis</i>, sweet potato's closest tetraploid relative	
<i>Pablo Muñoz-Rodríguez</i>	5
More discoveries in Ecuador	
<i>John R.I. Wood</i>	6

A field guide to Lauraceae in Ecuador's Chocó-Andino "bear corridor"

<i>Tom Wells</i>	7
------------------------	---

Oxford and Rapid Botanic Survey (RBS) in inclement times

<i>William Hawthorne</i>	8
--------------------------------	---

Strobilanthes violifolia

<i>John R.I. Wood & Apurba Kumar Das</i>	10
--	----

Aglaia elaeagnoidea: a complex tale

<i>Caroline Pannell</i>	11
-------------------------------	----

Innovations and project news with BRAHMS

<i>Denis Filer & Andrew Liddell</i>	13
---	----

Virtual Plant Hunting

<i>John R.I. Wood</i>	14
-----------------------------	----

News from the Herbaria – Fielding-Druce (OXF) and Daubeney (FHO)

<i>Serena K. Marner</i>	15
-------------------------------	----

Ten Bamboo Studio collection of calligraphy and painting

<i>Sophie Wilcox</i>	16
----------------------------	----

Oaks in Wytham

<i>Keith Kirby</i>	17
--------------------------	----

Charles Elton's herbarium

<i>Stephen A. Harris</i>	17
--------------------------------	----

Island specimens from Greenland, Saint Helena and the Seychelles

<i>Serena K. Marner</i>	19
-------------------------------	----

Florilegium Group paintings	20
--	----

Foreword

Welcome to another edition of OPS, volume 28. On 1st August 2022 Oxford University Herbaria formally changed its administrative location when the departments of Plant Sciences and Zoology combined to create the Department of Biology. The physical location of the Herbaria will move when the Life and Mind Building, the new home for Oxford Biology, is completed at the end of 2024. The continuing challenge for the Herbaria over the next eighteen months will be preparing for an orderly move of over one million objects, which includes herbarium specimens, manuscripts, books, microscope slides and three-dimensional objects such as wood blocks and dried fruits, whilst maintaining user-access to the collections. The move is an opportunity to make new discoveries about the Herbaria, revisit old issues and incorporate as much as possible since specimens are inaccessible to researchers if they are not in the cupboards. Some of the discoveries and the old materials recently incorporated are reflected in these pages.

Scientific collections are points of collaboration between often long dead collectors and modern researchers investigating plant biology in new ways. Collections are also places where modern collectors deposit data for future researchers who may use collections in manners that are inconceivable to the current generation. Such collaborations are reflected in the articles in this edition of OPS through the work of Oxford-based researchers working with colleagues in the Americas, Africa and Asia to investigate *Ipomoea*, West African vegetation, *Aglaia* and *Strobilanthes*. The long-term value of well-maintained data sets is demonstrated by Keith Kirby's investigations of oak at Wytham Woods, near Oxford.

Stephen A. Harris

Curator of Oxford University Herbaria

Front cover image:

From *Shuzhuzhai shuhuapu*, or *Ten Bamboo Studio Collection of calligraphy and painting Part 1* [© Sherardian Library of Plant Taxonomy 502 CH/BT] – coloured woodblock printing on paper.

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Typesetting and layout of OPS by Serena Marner

News

Roots to Seeds Exhibition

In 2021, between 18th May and 24th October, a public exhibition entitled *Roots to seeds: 400 years of Oxford botany*, curated by Stephen Harris, was held in the Weston Library in Oxford. The exhibition was originally conceived to mark the anniversary of the foundation of the Oxford Botanic Garden in 1621, and for non-specialists to engage with the breadth of material held by Oxford University Herbaria and the Department of Plant Sciences (now Biology) more widely. Moreover, it was also an opportunity for undergraduate and postgraduate students to reflect on the future of plant sciences through short video presentations of their own research projects.

Nearly 700 objects from the Herbaria were arranged thematically in this once in four-centuries exhibition. The objects, which came almost exclusively from the Herbaria collections, included books and manuscripts, botanical illustrations, teaching posters and models, and herbarium specimens, dried fruits, microscope slides and photographs. Themes in the Exhibition included: origins of botany; pre-Linnaean plant naming, description and classification; plant collecting and experimentation in research; agriculture and forestry; and botanical teaching.

Choosing the objects for inclusion, from the wealth of possible material was a major challenge. Ferdinand Bauer's original watercolours for the *Flora Graeca*, which illustrated numerous themes, could not be overlooked. A case of dried fruits was used to make a powerful point about the organisation of plant diversity. Bobart the Elder's herbarium (c.1660), the founding collection of the Herbaria and shown for the first time in public, attracted attention because of its age, size and curious history.

However, the display that attracted some of the greatest attention was a case filled with wood blocks from the xylarium. This was a last-minute addition. Initially only a few blocks were to be included but the opportunity was taken to arrange several hundred blocks at the back of a case like books on shelves. The effect was dramatic and generated vast numbers of selfies.

Beside the spectacle, an important part of the exhibition was to tell back-stories that showed something of how people worked within, and were sometimes cowed by, the university environment as they made contributions to local, national and international botany. Moreover, the contested histories of plant collecting and plant sciences with respect to colonisation, global inequality and marginalised peoples was also brought to the fore.

Planning for the exhibition began in 2018. However, everything was pulled together during the uncertainties of Covid lockdowns, so there was the continual risk that it would never open. However, the exhibition did open, with all the necessary precautions in place, and nearly 31,000 people visited in person and over 11,000 visitors accessed on-line resources. Covid restrictions stimulated innovation in the Weston Library exhibition space, so that for the first time there was: a live-streamed 'virtual' opening; an audio tour was created; the implementation of touch tours for blind and partially sighted visitors; and a volunteer focus group were used to test interpretation and design. A book entitled *Roots to seeds: 400 years of Oxford botany*, written by the exhibition curator, was published by the Bodleian Libraries to accompany the exhibition.

The success of the exhibition was down to the hard work of the Exhibition Team at the Bodleian Libraries, the students who contributed videos and the support of many people in the Department of Plant Sciences, the Botanic Garden and Arboretum and the Bodleian Library.



Botany Department lecture theatre at the Botanic Garden in the 1930s, with teaching diagrams hanging from the walls and botanical models crowded in cupboards.

Photo © Department of Biology

Congratulations to Pablo Muñoz-Rodríguez

After nine successful years in Oxford, as part of Robert Scotland's research group, Pablo Muñoz-Rodríguez has started a new position as Ramón y Cajal fellow at Complutense University in Madrid, Spain. The prestigious Ramón y Cajal programme is funded by the Spanish government and offers long term contracts to researchers with an outstanding track record. Pablo has also obtained funding to continue his studies on *Ipomoea* and the sweet potato, and to study the taxonomy and systematics of the genus *Acalypha* (Euphorbiaceae) worldwide. He will be based at the Faculty of Biological Sciences, Department of Biodiversity, Ecology and Evolution.

The Florilegium Project

This group of enthusiastic artists was steadily producing wonderful artwork of species from the Botanic Garden and the Arboretum when suddenly Covid hit. After many months of lockdown inactivity, the day we were able to meet up at the Arboretum, all masked and appropriately distanced, was indeed a very special day. We were able to collect specimens and to draw and paint once again. Soon more restrictions were lifted and we could meet up in the Botanic Garden. During our time away, the old rockeries had been totally refurbished and replanted with Mediterranean species, a new and exciting category for us, with lots of colourful and interesting plants to illustrate. We could understand how Ferdinand Bauer must have felt all those years ago when he travelled round the eastern Mediterranean.

Each year the artists can submit up to five pieces of work for judging. Far fewer were submitted last year but this is understandable as we spent time illustrating plants for the Oxfordshire wetlands project which were not judged.

The judges, Professors Simon Hiscock, Stephen Harris and Dr. Chris Thorogood look for botanical accuracy, the correct use of colour and technique and a pleasing composition. We are very grateful indeed for their comments; constructive criticism is always helpful and most welcome. Just over 120 pieces have been accepted and donated by the artists and are now in the herbarium archive, so it is almost time to start thinking about another exhibition!

In November 2021 we had our first large exhibition in the Barn Gallery of St. John's College, Oxford. Through donations and small grants we now have sufficient frames and mounts for the 75 works of art which were grouped by category, including "Medicinal plants", "Species with an association with Oxford", "The Merton beds" and "Trees". Over 700 people came, several three times, and all the comments in the visitors book were wonderful.

Examples of recent illustrations are on the back cover, page 20.

Rosemary Wise, Botanical Artist

Expeditions and visits

No travel was undertaken in 2021.

In March 2022, **John Wood** travelled to Bolivia to undertake field work in support of Rosie Clegg's (Exeter University) research into the flora of granite inselbergs in Bolivia.

John Wood was in Ecuador during May-June 2022. He went to conduct field work with **Pablo Muñoz and Tom Wells** to look for wild populations of sweet potato (*Ipomoea batatas* (L.) Lam.) and its relatives, as part of on-going *Ipomoea* project at Oxford (see separate report pages 5-7).

John also visited Colombia in October 2022. He visited herbaria in Bogotá and Medellín funded by the Bentham Moxon Trust (Kew) to study Acanthaceae (see separate report on page 14).

Caroline Pannell visited the Faculty of Biology, Ludwig-Maximilians-Universität München and Munich Herbarium (M) for a week in April 2022 to work with post-doc Elizabeth M. Joyce on molecular systematics of *Aglaia* (Meliaceae).

During August–October 2022, Caroline spent six weeks in the herbarium of the University of Michigan, Ann Arbor (MICH) to consult the library and herbarium.

During October and November 2022, Caroline spent four weeks in Madagascar, for field work in the littoral forests of Ste Luce, supported by the Missouri Botanical Garden office in Antananarivo. She was accompanied by Malagasy botanist Richardson Razakamalala, with generous logistical support from Pete Lowry, Sylvie Andriambololonera, Faranirina Lantoarisoa, Marina Rabarimanarivo, Jeannie Raharimampionona and Chris Birkinshaw of the MBG office, and local field guide, Dauphin.

William Hawthorne attended a workshop - "Planning Conservation Action for Ghana's threatened tree species", 10-13 October 2022 in Kumasi Ghana (IUCN, BGCI, CSIRO-FORIG, Ghana, A Rocha Ghana, funded by Fondation Franklinia) which has developed a renewed strategy for tree conservation in Ghana.

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Two experiences of a field trip to Ecuador

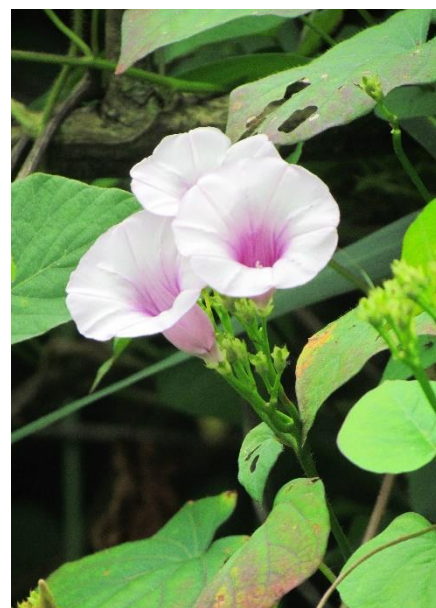
From Pablo Muñoz-Rodríguez and John Wood

In 2018, Robert Scotland was awarded a BBSRC project to study the origin and evolution of the sweet potato. This project, finished in early 2023, included two visits to Ecuador. The first took place in November 2019, just before the Covid pandemic outbreak, and aimed to establish contacts in Ecuador at the start of the project. The second trip, which included the bulk of the field work, was originally planned for the following summer but we were forced to

postpone it until 2022 at the end of the project. Here we focus on two aspects of the field work: on sweet potato and on additional discoveries.

Searching for *Ipomoea aequatoriensis*, sweet potato's closest tetraploid relative

We published *Ipomoea aequatoriensis* T.Wells & P. Muñoz as a species new to science in 2021, following the morphological and molecular study of a group of Ecuadorian herbarium specimens that did not quite fit with their identification as feral sweet potato (*I. batatas* (L.) Lam.). During our research, we accumulated strong evidence that this new taxon is sweet potato's closest living relative and, most likely, a direct descendant of sweet potato's tetraploid progenitor. Our principal aim in Ecuador, therefore, was to find and characterise populations of *I. aequatoriensis*.



Ipomoea aequatoriensis T.Wells & P. Muñoz Photo © Pablo Muñoz

We landed in Quito on 24th May 2022, and began field work a couple of days later. In addition to us two (John & Pablo), our team of four included David Espinel Ortiz —then at Pontificia Universidad Católica in Quito and now curator at Padre Luis Sodiro herbarium—, and Tom Wells, a doctoral student in Robert Scotland's group. Before visiting the country, our studies on *I. aequatoriensis* had relied on herbarium specimens collected mainly during the 1970s and 1980s in or around Esmeraldas province, in northern Ecuador. One of the main goals of our trip was to visit those same localities forty years later, to confirm that the plant was still growing there and to characterise the status of those populations.



Left to right: Leopoldo Ventura, Tom Wells, John Wood, Pablo Muñoz and David Espinel in Ecuador

Much excitement followed our first encounter with the plant in a rural road near Puerto Quito (Pichincha province), the plant growing on a fence by the roadside. To our surprise, from there on we found the plant very often, and confirmed it is much more widespread than could be guessed from herbarium specimens. We found it growing from sea level to over 2,000 m. above sea level in essentially all western provinces, including: Azuay, Cañar, Chimborazo, El Oro, Esmeraldas, Guayas, Loja, Los Ríos, Manabí, and Pichincha. We could not visit Santo Domingo de los Tsáchilas, but it is also likely to be present in that province as it has been collected there before. The plants were often growing on the roadside, but we also found populations in more remote protected areas, for example the Machalilla National Park (south Manabí province), the Bosque Protector Cerro Blanco near Guayaquil (Guayas province) and the Río Palenque Biological Station (Los Ríos province). From conversations with local people, we learned that the plant is well known in the area, often known as *camotillo* (little sweet potato), or sometimes *camote silvestre* (wild sweet potato). Leopoldo Ventura, a member of the Agua Blanca community at Machalilla who kindly spent a day in the field with us, mentioned he used to eat raw *I. aequatoriensis* roots occasionally as a child. We dug up some plants and found small, somewhat thickened pencil-like roots but nothing resembling sweet potatoes.

By the end of our trip, we had made almost 150 collections of *I. aequatoriensis*, deliber-

ately skipping some in-between places as otherwise we would not have been able to complete our trip on time. It is certainly surprising that we found so many populations throughout the country. Dan Austin and Fermín de la Puente, perhaps the most active sweet potato wild relative hunters—and the first authors to call attention to these wild tetraploids—traversed most of these places forty years ago looking for tetraploids. They did not report as many populations as we saw and, in several provinces, they did not report any populations at all. Whether they overlooked population—the plants perhaps not being in flower at the time—or the number of populations has increased as the result of recent dispersal following the development of the road network, remains uncertain.

Ongoing studies in our group will further assess the genetic diversity existing within this species, as well as the possibility that it is also present in northern Peru and part of Colombia, as suggested by the study of additional herbarium collections.

Pablo Muñoz

More discoveries in Ecuador

Our first visit, in May 2019, entailed visits to major Ecuadorian institutions in Quito, Guayaquil and Loja, mainly to develop contacts but also to visit herbaria and review

their collections of *Ipomoea*, particularly of wild populations akin to the sweet potato that we had previously recognised in Oxford. In this visit I was accompanied by Tom Wells. Our initial contact was with Carlos Cerón of the Universidad Central in Quito. I was excited to find in the herbarium of his university two apparently undescribed species of *Ipomoea*, one from the area around Quito (Pichincha province) and one from further south near Huigra (Chimborazo province). Consequently, when we eventually came back in 2022, I was eager to re-find the two plants in the field.



New species of *Ipomoea* from Ecuador
Photo © John R.I. Wood

The first proved very easy. Carlos agreed to show me one of the best populations, so on the first day after our arrival, 25th May 2022, we headed to the Guapoló Park on the edge



Habitat of new *Ipomoea* sp. from Chimborazo Province, Ecuador. Photo © John R.I. Wood

of Quito near the road to the airport. Here there was an abundance of the plant spreading out onto adjacent roadsides. Why an endemic species has adapted so well to ruderal habitats but is apparently absent from natural woodland or scrub in the area remains a mystery. All records of this new species are from the vicinity of the towns of Quito and Loja, and unsurprisingly we later found it growing on the fence of someone's garden, the flowers being very ornamental.

I think we were lucky to find the second species. We did have coordinates from Carlos' original collection and general location details. Arriving at Huigra we were faced by high rounded mountains largely devoid of natural vegetation. Assuming that Carlos had followed tracks, we followed trails in the general direction of the grid reference. Initially these passed through cultivated fields and then through areas of pasture gradually getting closer to our target. Time was passing and we knew we had to turn back before nightfall but then we came across surviving patches of woodland. Here in the gloom, we spotted a liana with yellowish-green flowers and knew we had found our objective. After hastily taking photographs, collecting specimens, and assessing the population we headed back as dusk fell, pleased with our success. We later confirmed that the plants we found were not from the same population as found by Carlos, so there are at least two populations of this new species; however, it is clear this species is very vulnerable as it will disappear if the forest is cleared but it is to be hoped it will hang on in other more remote wooded gullies in the area.

Both species will be described in a forthcoming paper, one to be named after the city of Quito and the other after the original discoverer, Carlos Cerón.

In summary, our work in Ecuador was a rewarding experience. We not only found more plants than we expected, but also had the opportunity to visit some truly unique

habitats and spend time with and learn from our Ecuadorian counterparts. This is not the end of the road, though, and we are already planning more collaborations and additional work on Ecuadorian *Ipomoea*.

John R.I. Wood

A field guide to Lauraceae in Ecuador's Chocó-Andino "bear corridor"

Last year, as I entered the final leg of my D.Phil., I used the opportunity afforded to me by the BBSRC Doctoral Training Program's 12-week internship scheme to lend a hand at two cloud forest reserves in northwest Ecuador. These two neighbouring reserves – Maquipucuna & Santa Lucía – are helping to conserve the unique biodiversity they contain while providing employment and sustainable livelihoods in the local area. Both afford important habitat and seasonal food sources for the threatened Andean, or "spectacled" Bear (*Tremarctos ornatus* Cuvier), as well as for many other native animals and birds.

Research on the biodiversity, ecology and conservation of these two reserves relies on accurate and efficient identification of key vegetation. Species of the flowering plant family Lauraceae are a major component of mid-elevation Andean forests such as those at Maquipucuna and Santa Lucía but are difficult for non-specialists to identify in the field. No species-level guide exists for Lauraceae in northwest Ecuador, requiring visitors and researchers at Maquipucuna and Santa Lucía to consult multiple specialist taxonomic sources or herbaria for identifications. My internship was spent

collecting data for a field guide to the species of Lauraceae at Maquipucuna and Santa Lucía, including key diagnostic characters, illustrations, high-resolution photographs and preliminary distribution data. Once complete, the resulting resource should provide insights on forest composition within the two reserves and facilitate further research in the area.

Covering 5,670 hectares of primary and secondary pre-montane cloud forest between 1,200 and 2,800m above sea level, Maquipucuna Reserve sits at the heart of The Chocó-Andino Biosphere, which links the southern end of the Chocó-Darien lowland rainforests with the mid- to high-altitude montane forests of the Andes. In addition to 1,960 recorded plant species and over 400 birds, the reserve provides an important seasonal feeding ground for the spectacled bear, South America's only native bear. Key to this ecological importance are the fruits of the *pagche* tree (*Nectandra acutifolia* (Ruiz & Pav.) Mez and several other of the 30 species in the family Lauraceae recorded in the reserve, which are highly abundant in the area. During the latter part of the dry season, large numbers of bears often visit the lower part of the reserve where these trees predominate, feeding extensively on the small oil-rich, acorn-like fruits of the *pagche*.



Humid Andean forest in Ecuador
Photo © Tom Wells

During my stay I was fortunate enough to see several bears, and to observe them feeding on *pagche* fruits. The bears come down from the high ridge early in the morning, selecting one or more trees and snapping branches to retrieve the individual fruits. Though generally shy and relatively

difficult to see, they will mostly tolerate quiet human observation while they eat high up in the tree. This makes Maquipucuna one of the best places in the world to see spectacled bears, bringing valuable eco-tourism revenue to the area. By midday the bears have often retreated back up into the higher forests, leaving their seed-filled dung along the way. This diurnal migration, and their relatively destructive browsing habits has led the reserve's owner, Dr Rebeca Justicia to believe the bears may be having an impact on dispersal, forest composition and regeneration after years of local deforestation. Rebeca studied for her Ph.D. in Ecology at the University of Georgia, and is keen to have a better understanding of the diversity and abundance of Lauraceae in Maquipucuna and the surrounding area as a pre-requisite to understanding the bears' role in the forest ecosystem.



Fruit of the *pagche* tree
Photo © Tom Wells

A couple of hours walk uphill from the entrance to Maquipucuna, the smaller, community-run reserve of Santa Lucía lies between 1,300 and 2,500m, with the lodge perched on the end of a ridge at 1950m, giving views across the valley to the neighbouring ridge of Maquipucuna. The reserve covers a combination of pasture, primary forest and both reforested and naturally regenerated secondary forest. Bears are frequently spotted on camera traps within the reserve, however there are no comparable stands of *pagche* to attract seasonal feeding like that seen at Maquipucuna. The group of 25 local families that own the reserve were originally foresters and farmers, but have turned to eco-tourism with a particular focus on attracting visiting student groups who want to learn more about the area's biodiversity. The guides and former foresters know the importance of Lauraceae trees both as a valuable timber and for supporting the abundant bird life such as Crested Quetzals (*Pharomachrus antisianus* D'Orbigny, 1837), Plate-billed Mountain Toucans (*Andigena laminirostris* Gould, 1851), Chocó Toucans (*Ramphastos brevis* Meyer de Schauensee, 1945) and Toucan Barbets (*Semnorhis ramphastinus* Jardine, 1855). The lodge itself is built entirely from a

species of Lauraceae tentatively identified as *Ocotea rugosa* van der Werff, which is endemic to the area and highly sought after.

In 2021, three monitoring plots were established across the altitudinal gradient of Santa Lucía, in which 16 species of Lauraceae were recorded. These plots formed a key resource for collecting data on these species, which I undertook with the help of Santa Lucía's team of guides led by Noé Moreno, as well as with Dr Ana Mariscal, a local botanist and ecologist from Fundación Cambugan, and several visiting students. In Quito, taxonomist and Lauraceae specialist Álvaro Perez reviewed the material and notes I had collected, and helped me with updated determinations. Back in the UK, and having submitted my thesis, I am now working to pull together all the material we collected during my short stay and produce the promised guide. I am also looking for funding to continue working on Lauraceae in the Chocó-Andino.

<https://www.maquipucuna.org/>
<https://www.santaluciaecuator.com>
<https://www.cambugan.org/>

Tom Wells
D.Phil. student

Oxford and Rapid Botanic Survey (RBS) in inclement times

In the last few years, botanical fieldwork has been seriously hampered by pestilence and politics. Quite apart from the global disruption due to Covid, the bauxite-rich, bioquality hotspot area in south-east Guinea, where there is an ongoing demand for botanical surveys, has seen outbreaks of Marburg virus, Ebola and Lassa fever (not to mention concurrent measles, meningitis, polio, yellow fever, malaria and presidential elections). Even bubonic plague lurks in the Congo forest regions. Complicated by cautious University safety protocols and the general need to reduce air travel for the sake of the climate, the fieldwork of a tropical botanist has been harder to organise than previously. However, out of this, a new approach to RBS is evolving – “remote RBS”: remote, that is, as far as I am concerned. Of course, a local field survey team is still required, and we are fortunate that there are now many botanists with RBS experience in Africa that can take part. We plan and regularly discuss the progress in a remote RBS using online meeting platforms; all specimens are photographed and uploaded to the cloud along with copies of the field sheets. Identifications are made or checked from online photos, in parallel with identification in local herbaria.

The first of these remote RBS surveys was in the vicinity of Kouroussa in Guinea (see Figure 1), a fairly remote area in east central Guinea visited first by passing French botanist Charles Henri Oliver Pobéguin in 1904 and seldom re-botanised since. The savanna, riverine, dry forest and bowe (thin grassland on almost soil-less, lateritic hardpan or shallow ponds) here was surveyed during a short field trip in 2021-2021 by a field team led by longstanding RBS experts Ouo ouo Haba and David Bilivogui with Julien Faya Simbiano and Roger Kolie, yielding just over 1000 observations in 44 sample points. Compared to many areas in Guinea, relatively few globally rare plants occur amongst the widespread savanna species in the area but rare species like *Indigofera pobeguini* J.B.Gillett (not collected since 1904) may have escaped sampling because “dry bowe” areas had already burnt and were not sampled on this trip. This survey established that the remote RBS approach has potential (despite frustrating internet connections in Guinea).

More recently, from 2022 to the present, Ebo RBS in Cameroon has been coordinated remotely, in collaboration with a field team from Ebo Forest Research Project† (see page 10); Bethan Morgan (Africa Forest Program of San Diego Zoo Wildlife Alliance); and botanists from Kew. Martin Cheek has stated: “Not only is Ebo of incredible global importance for its documented plant diversity, but it is the most exciting forest in Cameroon in terms of the high numbers of new scientific discoveries of species still being found.” Ebo Forest Reserve is an important part of the lower Guinean rainforest block. Only a small portion had been previously sampled and all could be re-opened for logging. The RBS seeks to provide information which should help management and the case for its protection. 68 RBS samples were made throughout the reserve in late-2022 and we are now in the analysis stage, but we can already see there are some very hot hotspots within this landscape, based on the 12,000 online photos of vouchers, field forms and sample areas, with online Google sheets linking them.

Although identification of physical specimens is of course much more accurate and in many ways easier than using photos, the challenge is to make the most of the advantages of e-voucher (online voucher photo) identification, which includes: immediate arrangement of sets of e-vouchers by species, sample location or day; rapid sharing of sets of e-vouchers with specialists internationally; and juxtaposition of fresh and dried e-vouchers of a plant, all of which are much easier than with physical specimens. A modicum of zooming in on details is easy with the photos from today's high resolution-digital cameras, though I do miss the smell and touch of dried specimens, the ability to study them from different angles, and the added characters of real (unmounted) vouchers bring to the identification bench. Ultimately, for the Ebo



Figure 1: RBS samples near Kouroussa, Guinea:
a) top left: gallery forest along the Niger river; b) top right: dry forest-savanna transition with *Pouteria alnifolia* (Baker) Roberty and *Pterocarpus erinaceus* Poir.; c) and d) middle: wet bowe vegetation with *Rhytachne rottboelioides* Desv., *Dopatrium senegalense* Benth. (mauve), left, *Chaetolepis gentianoides* (Naudin) Jacq.-Fél. (yellow) (right).
Photos © Ouou Ouou Haba

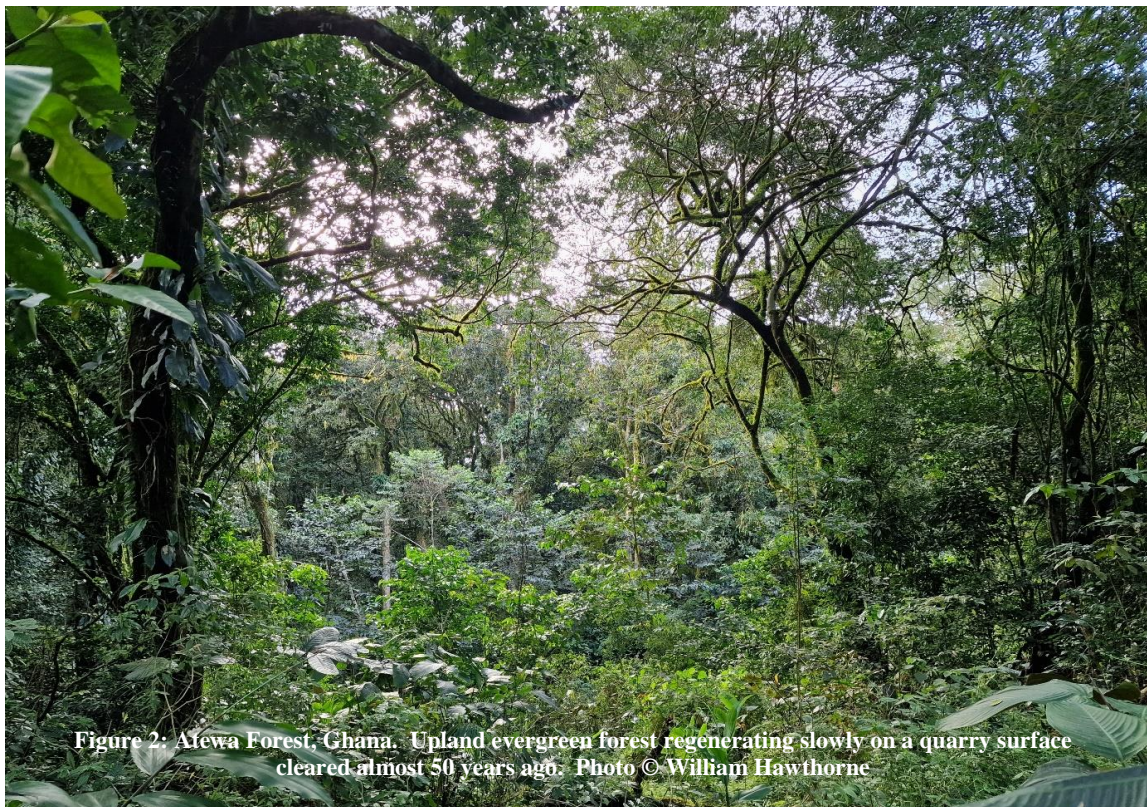


Figure 2: Afewa Forest, Ghana. Upland evergreen forest regenerating slowly on a quarry surface cleared almost 50 years ago. Photo © William Hawthorne

survey, there will be a pile of physical vouchers (maybe 10%) that someone will need to identify or check in an actual herbarium, but we are making good progress with the virtual component.

Fortunately, I have not abandoned all fieldwork and finally managed to arrange an actual field visit, to Atewa Range Forest Reserve in Ghana in October 2022 after several postponements (see page 4 under ‘expeditions and visits’). Atewa is an important patch of protected Upland Evergreen forest (Lindsell et al., 2019) and under renewed threat from bauxite mining, making all information on the biodiversity there especially important. In a short project combining training and research, a team from A Rocha Ghana (an NGO helping conserve the forest), Mike Swaine (retired professor of Forestry at Aberdeen University) and myself have re-enumerated permanent sample plots. These were originally set up on the Atewa ridge top by Swaine in 1976 over a trial bauxite quarry with control plots in adjacent forest. Whereas the past plot enumerations have included only the trees, we have now completed a full RBS plant inventory of the sample areas, and can estimate the recovery rate of bioquality on bauxite mining surfaces in this forest type. We intend to publish the results shortly.

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† Ebo Forest Research Project: Bethan Morgan (Head, Africa Forest Program of San Diego Zoo Wildlife Alliance); Ebo Forest core team is Rodel Vouffo, Ekwoke Abwe, Marcel Ketchen; with Tchiengué Barthélemy (Herbier National Camerounais). Kew Team helping identify the specimens Martin Cheek, Xander van der Burgt, Bruce Murphy.

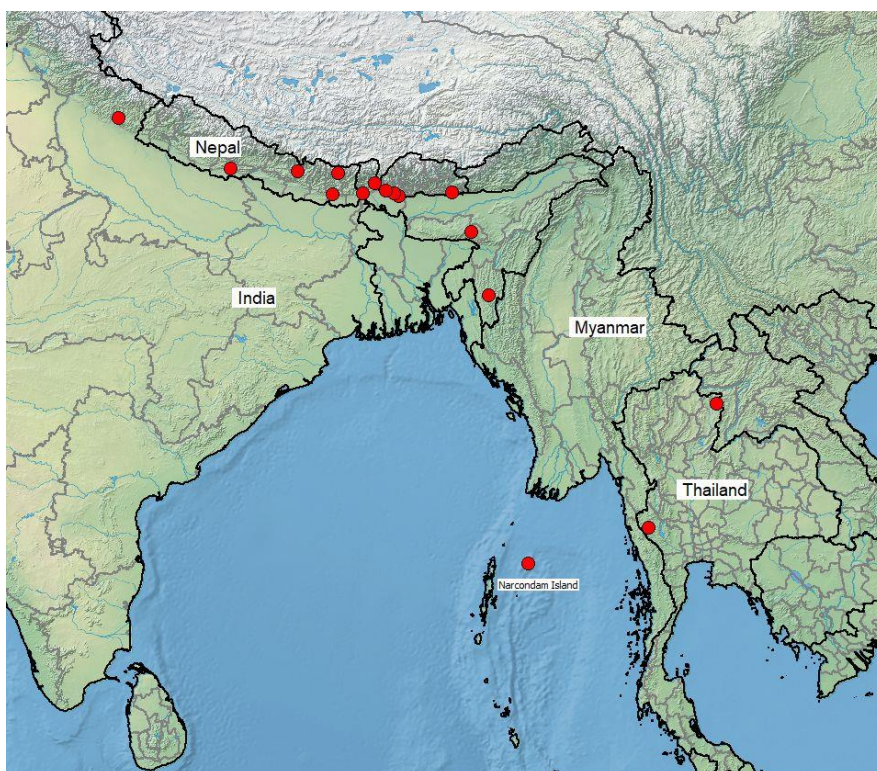
William Hawthorne
Research Associate

Strobilanthes violifolia

Strobilanthes violifolia T.Anderson is unusual within the genus both morphologically and geographically. Morphologically it can readily be identified by the zigzag rhachis of the inflorescence, from which short side branches develop at the angles on the rhachis, something easily observed in the photo. More technically it is



Flowering branch of *Strobilanthes violifolia*. Photo © Apurba Kumar Das



Map of total distribution of *Strobilanthes violifolia*

unusual in having 4-8 ovules in the ovary the capsule with 8-16 or more seeds, whereas *Strobilanthes* usually has a 4-seeded capsule. As a result it was once placed in the genus *Echinacanthus* Nees and more recently in its own genus *Clarkeasia* J.R.I.Wood. Molecular studies (Moylan et al. 2004), however show it to belong to *Strobilanthes* and sister to the relatively widespread *Strobilanthes tomentosa* Nees.

Geographically, its distribution is remarkable. It is most commonly found in the Himalayan foothills of east Nepal, West Bengal and Bhutan but there are also isolated

but unsurprising records from Meghalaya and Manipur in Eastern India. It has never been found in Myanmar but there are two very disjunct records from Thailand, a considerable distance further east and from each other. What is truly remarkable is its discovery by Apurba Kumar Das on Narcondam Island, a volcanic island that lies east of the main Andaman Archipelago and is technically India's most easterly point. The island is forest covered with mixed evergreen and deciduous woodland. *Strobilanthes violifolia* was found in dry gullies and shaded rocky areas associated with ferns and other

stunted shrubs and trees at two locations, one at an elevation of 220 m with 11 individuals and another with only two individuals around 560 m near the island summit.

The biggest mystery is how this plant reached Narcondam Island. It was presumably by long-distance dispersal, perhaps by agency of birds from Thailand – Narcondam Island is an important ornithological site - but at what date is quite uncertain. The Andaman group is rich in plant diversity but *Strobilanthes* is poorly represented. Apart from *Strobilanthes violifolia*, the only other confirmed record is of the quite unrelated endemic species, *Strobilanthes andamanensis* Bor.

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John R.I. Wood, Research Associate & **Apurba Kumar Das**, Zoological Survey of India



Strobilanthes andamanensis Bor
Photo © Apurba Kumar Das

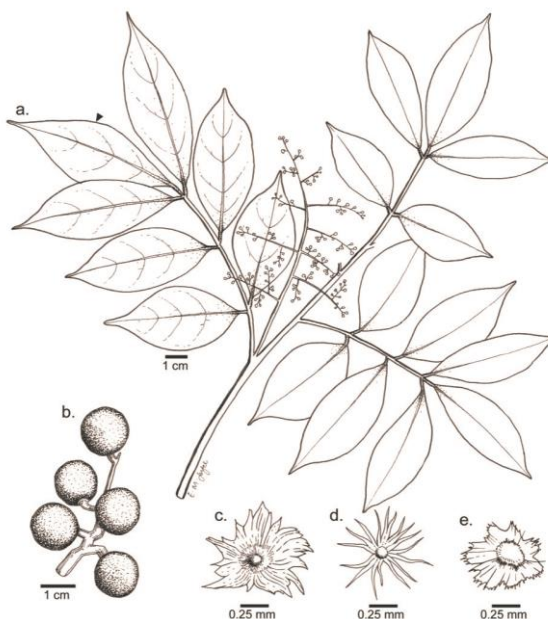
Aglaia elaeagnoidea: a complex tale

The Daubeny Herbarium, Oxford (FHO) has a history of monographic work by plant taxonomists which was at its height during the time when it was the herbarium for the Forestry Department. Ebenaceae, Chrysobalanaceae, Meliaceae, Pinaceae, Fabaceae and, more recently, the Convolvulaceae have all been subjects of intense study, with particular emphasis on tropical groups and their economic importance (for timber, food or bioactive phytochemicals). The genus *Aglaia*, with more than 126 species, is the largest genus in the Meliaceae, confined to SE Asia, Australasia and the western Pacific and a conspicuous component of the lowland rainforests of these regions. Beginning in 1977, its reproductive biology in the primary

rainforests of Peninsular Malaysia became the subject of my D.Phil. thesis. After a year of fieldwork in Peninsular Malaysia, it was clear that the classification of the genus was in need of complete revision. The most recent monograph was that of Casimir de Candolle in 1878. Numerous names had been published since then, mostly in connection with exploration (e.g. in Indochina, New Guinea and the Philippines) and floristic accounts (e.g. in Peninsular Malaysia). The names in use for the species that I had encountered during my fieldwork were mostly from Hiern's account in the *Flora of British India* and King's and Ridley's accounts for the *Flora of Malaya* and these were the ones I used in the taxonomic account section of my thesis, which included all the species in Peninsular Malaysia. Earlier names from Indonesia published by Blume and Miquel (1861, 1868) had not been adopted and this inspired me to embark on a complete revision of the entire genus throughout its range, which was published in 1992. In this monograph, all published names were typified and all species, throughout the entire range of the genus were included. Most of the 105 species treated were either clear-cut and relatively easily delimited throughout their geographical range or could be described as 'variable', with several morphological variants connected by intermediates (Pannell, 1992). Seven species, however, exhibited complex variation over a wide geographical area. These proved too difficult to resolve with confidence into distinct entities, when all variation throughout their range was considered. The most widespread of these was *Aglaia elaeagnoidea* (A. Juss.) Benth., a species of coastal and dry habitats, not often encountered in humid equatorial forests. The history of the nomenclature of this species revealed that, until 1965, two species were

generally recognised, *Aglaia elaeagnoidea* on the coast in the east of its range and *Aglaia roxburghiana* (Wight & Arn.) Miq. inland in India. The intermediates between these two species found in West Malesia, however, prompted Backer & Bakhuizen van den Brink (1965) to treat *A. roxburghiana* as a synonym of *A. elaeagnoidea* and this was adopted by most authors thereafter. Muellner *et al.* (2009) highlighted the molecular distinction between *Aglaia elaeagnoidea* and *Aglaia roxburghiana*, but did not include sequences from West Malesia, where the morphological overlap made it impossible to determine how many species were involved and how to distinguish between any segregate species morphologically.

In 2017, the migration routes of *Aglaia elaeagnoidea* into Australia became the subject of a molecular investigation by Elizabeth M. Joyce, a Ph.D. student at James Cook University, Cairns, Australia, now post-doctoral researcher at Ludwig-Maximilians-Universität, Munich. *Aglaia elaeagnoidea* has a disjunct distribution in Australia and Lizzy established that it had entered Australia by two different routes: one via Timor into the (inland) Kimberley area of Western Australia and one via New Guinea into coastal Queensland (Joyce *et al.*, 2021, Pannell, 2021). As part of this investigation, she and I sampled herbarium specimens from localities throughout the range of the complex. She obtained and analysed DArT sequences from DNA extracted from these samples and produced a resolution of this complex species into three separate species. The mostly coastal variant in the eastern half of the range, with its abundant entire pale peltate scales on vegetative parts and on the flowers is maintained as *Aglaia elaeagnoidea*. The fruit of this species is subglobose, with a red pericarp, few scales on the outside and, at least sometimes, a



Aglaia elaeagnoidea (A. Juss.) Benth. illustration by E.M. Joyce, first published in *Blumea* (2023) and reproduced here with permission.



Image on the left: *Aglaia roxburghiana* (Wight & Arn.) Miq. illustration by E.M. Joyce, first published in *Blumea* (2023).

Image on the right: *Aglaia wallichii* Hiern illustration by E.M. Joyce, first published in *Blumea* (2023).

Both images reproduced here with permission.



vestigial aril. The only observed fruit-eater feeding on these fruits is the Pied Imperial Pigeon in the Kimberley. It swallows the fruits whole (Kenneally & McKenzie, 1989). Two additional species are recognised in the western part of the range: *A. roxburghiana* confined to the Western Ghats and other areas of SW and SE India and *A. wallichii* Hiern from Bangladesh (type locality) NE India, Bhutan, China, Indochina, Thailand, P. Malaysia, Philippines and West Malesia (including Java and Bali). These are mostly inland plants from relatively dry habitats, often on limestone, with pale orange-brown peltate scales that frequently have a fimbriate margin. In contrast to *A. elaeagnoidea*, the indumentum is usually sparse on the leaflets, is nearly always absent from the petals of the flowers and is dense on the pale yellow, orange or brown fruits. Primates (monkeys in Sri Lanka and White-handed Gibbons in Thailand) have been observed to remove the pericarp and feed on the seeds. The sweet gelatinous aril adheres firmly to the seed and is removed in the mouth or gut of the primate. The cleaned seed is either spat out or voided in the faeces.

The morphological and ecological distinction between *A. wallichii* and *A. elaeagnoidea* is lost in Java and Bali, where *A. wallichii* grows on the coast and has an indumentum with the morphology and distribution of *A. elaeagnoidea*. The conclusion drawn from the molecular analysis that the one Javanese sample successfully sequenced belongs to *A. wallichii*, however, is supported by fruits collected in Java that match *A. wallichii*. They are densely covered with peltate scales. This is the first resolution of a complex species using non-morphological characters, 30 years after publication of the monograph. It describes the diagnostic differences in the morphology and ecology of the segregate species and the exception that exists. This resolution relied on sampling from across the range and the morphological variation of what I had defined as a complex species. Had I attempted to distinguish between the entities using morphological characters alone

in 1992, I would have mistaken the Javanese plants for *A. elaeagnoidea* and would have been unlikely to recognise *A. wallichii*. *Aglaia elaeagnoidea* would not have been perceived as complex and the molecular investigation to resolve it would not have taken place. By treating this and six other species as complex, the problem of species delimitation within them was evident to everyone who examined specimens from different parts of the range and this stimulated the molecular work that has resulted in the resolution of *A. elaeagnoidea*. This work brings the total number of accepted species in the genus to 126. The remaining complex species that would benefit from next generation sequencing of DNA extracted from comprehensive geographical and morphological sampling are *Aglaia lawii* (Wight) Saldanha ex Ramamoorthy, *Aglaia tomentosa* Teijsm & Binn., *Aglaia elliptica* Blume, *Aglaia korthalsii* Miq. and *Aglaia edulis* (Roxb.) Wall.

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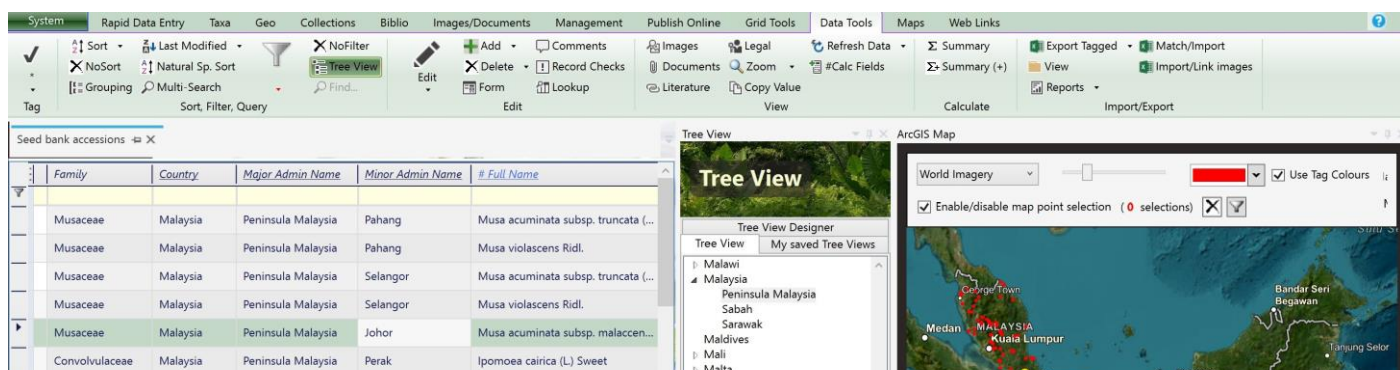
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Caroline Pannell
Research Associate



Using the Tree View control with the ArcGIS mapper. Tree Views may include any selected hierarchy of fields. They have a filter function to auto-update your data grid and, as in this example, the mapped data points.

Innovations and project news with BRAHMS

Since the last OPS newsletter was published, the BRAHMS team has been busy with new projects and technical developments leading to the publication of v8.5.1 in June this year.

In the Netherlands, we have now completed the migration of the Naturalis herbarium data into the new BRAHMS system. This is our largest project managing data and images for over 7 million specimens. Working with Naturalis, we have also introduced the ability to store and switch between different family-genus classification systems within a single BRAHMS project. New tools have also been added to assist with herbarium curation, in particular, helping out where specimens have different accepted names from those they are stored under.

In Brazil, with some more flexible licensing options provided by Oxford University Innovation (OUI), some of our BRAHMS v7 herbarium projects are now upgrading to the new system. Included is the INPA herbarium in Manaus with its tremendous collection of material especially from the Western Amazonian region. INPA are also undertaking the translation of our language resource file to Portuguese. We hope to have a fully operational Portuguese UI version of BRAHMS by September this year.

A key development this last year has been with Chicago Botanic Garden. Together with CBG, we have developed a new module to manage plant requests, scheduling and ordering (RSO). This coordinates all requests made by the garden curators, both for seasonal/display and for plants to be permanently accessioned. Each request is linked to a garden project category and has a required delivery container size and date for a specified location. Once requests are approved and any new species registered, the RSO module then schedules plant purchasing, taking into account forecasted production and propagation requirements, the top priority being to have plants ready to deliver for the requested week number. The RSO module comes with a new Rapid Data Entry (RDE) import option for speedy data capture by the curators.

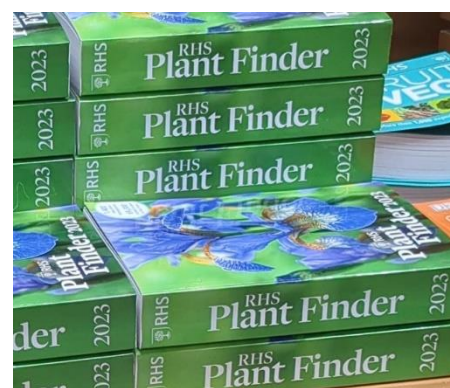
Together with the South African National Biodiversity Institute (SANBI), we have

been working to enhance functionality across BRAHMS, integrating data from their key herbaria in Cape Town, Pretoria and Durban together with botanic gardens data from across the SANBI botanical gardens network. Central to this project is the management of the taxa infrastructure for the Flora of South Africa, contributing to their overall mission to create an integrated South African biodiversity information system.

An update to the BRAHMS seed bank manager module has now been completed. The revised seed manager includes extended features for managing seed storage; seed transactions; new tables for recording multiple moisture content and tetrazolium tests per seed accession; and a seed collection quality evaluation tool. The revised seed store options provide greater control for storing and monitoring seed quantities measured by seed count or weight, for example, 50 x 5g barcoded packets, in documented storage locations. Seed can be linked to transactions, controlling all aspects of distribution and maintaining a record of remaining seed stock. This new system works equally well for projects with numerous, small seed containers/packets and those with larger quantities of seed distributed by weight. The seed collection quality evaluation tool uses the Seed Conservation Standards developed and adopted by seedbanks across the global Millennium Seed Bank Partnership (<http://brahmsonline.kew.org/msbp/Training/Standards>). This provides an objective method to evaluate collection quality based on a list of ranked collection standards. Seed quality can be assessed at the accession level and then summarised by country of origin, supplier, taxon group or any other selected data category.

Working with the RHS, we have developed online tools that enable plant nurseries in the UK and Europe to submit details of the plant species they currently have in stock. These data are then assembled by the RHS into their central BRAHMS database where the nursery submissions are checked and standardized against their tightly controlled species list. The names in their database, mostly cultivars, are stored and organised using a new approach called 'Plant Entities', soon to be formally published as an improved way to manage the complexity of cultivated

plant names. The assembled names are formatted using BRAHMS reporting into their Plant Finder publication. The 2023 edition includes more than 69,000 plant names and over 1,400 new plant introductions.



Projects that have difficulty accessing the appropriate IT resources can now use a secure and affordable cloud-based BRAHMS. With cloudmantra, a services provider used by BRAHMS, you can host PostgreSQL or MSSQL Server databases in the cloud and easily access your data from multiple workstations running BRAHMS, regardless of where you are located. A data connection is configured to access the server and you can store the BRAHMS application on your PC or on the cloud server. It offers 24/7 monitoring and security, data encryption at rest and in transit, and an option for role-based access control. Further details are provided at <https://herbaria.plants.ox.ac.uk/bol/brahms/brahmscloudmantra>.

This year, we have also upgraded our botanic garden app. The android app, which works off-line, gathers plant data and images from garden surveys. These data are then fed into the main database, updating plant records and their related events and requests. The revised app has a much-improved user interface and provides a range of new functions and features for data capture and mapping.

The latest BRAHMS updates are published on <https://herbaria.plants.ox.ac.uk/bol/brahms/software/revisions>

Denis Filer & Andrew Liddell

Virtual Plant Hunting

Colombia is a country of extraordinary natural beauty, varied scenery and amazing biodiversity. When I lived there in the 1980s I was able to explore many parts of the country. I visited the Sierra Nevada de Cocuy and Sierra Nevada de Santa Marta, climbed volcanoes like Ruiz and Galeras and focussed my botanical studies on the bleak open paramos and the cloud forest lying below them. I did visit lowland areas from the Pacific Ocean to the llanos in the east. However, the country was so large, the diversity so great that you could never see everything, particularly when employed to work in a totally different field. However, I was able to add to our knowledge of the wealth of plant species with studies in the families I focused on, especially Lamiaceae and Acanthaceae.

In October 2022 I went back to Colombia to look for plants. In the moist-covered Serranía de Macuira in the otherwise arid Guajira, I found one undescribed species. In the Serranía de Perijá separating Colombia and Venezuela I found another. In the deep canyons of a limestone region of Antioquia with their crystal-clear streams were a series of new species suggesting a hotspot of diversity. Further south near caves famed for harbouring oil birds I found another while in the Amazon basin near the frontier with Brazil and Peru was yet another. And there were new records of species in Colombia from one in the foothills of the Sierra Nevada to Santa Marta to another along the Rio Putumayo near Ecuador.

In 2022 I found even more new species than in the 1980s but there was a crucial difference. This time I was experiencing the huge diversity through the collections of other botanists. I was not collecting the species myself. I was identifying plants found by others. I could imagine seeing the new *Justicia* in the mists of the Serranía de Macuira or the new *Ruellia* clinging to limestone rocks above a fast-flowing stream but I wasn't there in person. I visited the Andes and the Amazon in my mind through the recognition of new species collected by leading Colombian botanists, such as Julio Cesar Betancur, Dairon Cárdenas and Alvaro Cogollo.

Plant hunting aka plant collecting conjures up the picture of an intrepid individual or team heading out to the mountains or the jungle to find, collect and photograph plants with the aim of bringing back specimens for scientific study or for cultivation, always with the hope of finding something new, rare or beautiful. This kind of plant hunting continues today but is becoming more complex. Concerns over conservation, biopiracy and exploitation of natural resources have resulted in a growing number of regulations for both the national and expatriate plant collector. Permits and restrictions on the movement of biological



New species of *Justicia* from the Serranía de Perijá on the Colombia-Venezuela border area. Photo © John R.I. Wood



Photograph of a specimen of a new species of *Justicia* from Antioquia, Colombia. Photo © John R.I. Wood

material have all made life more complicated for the traditional plant hunter.

However, there is a partially untapped source of new plants – what is already in the collections scattered around the world in museums and botanical gardens. Bebbier *et al.* (2010) estimate that half of the undiscovered plants awaiting recognition and description are already collected and deposited in the world's herbaria. This is not a uniquely botanical phenomenon. Kemp (2017) talks of going on a “museum safari” as “millions of animals unknown to science languish in the world's natural history collections. Just open a forgotten cupboard and you could find a new species.” Frequent reports of new species found in museum collections from fleas to dinosaurs appear in newspapers.

I do not want to suggest that my journey to Colombia in 2022 represents something entirely new. However, when I visited herbaria in the past whether in Brazil, the United States, Mexico or Europe, I worked by identifying potentially new or interesting species with the aim of arranging a loan to Oxford or Kew. Only very occasionally did I make images and prepare descriptions without borrowing specimens. The Colombian expedition was different in

several ways. I set out knowing that I would not borrow specimens and am grateful to the Bentham Moxon Trust of Kew not only for funding my travel but also for agreeing to pay Colombian artists to illustrate the new species I found. In the event I was able to describe 14 new species, commissioned drawings of all these and developed on-going links with Colombian botanists and botanical illustrators. Results will be published in three forthcoming papers.

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John R.I. Wood
Research Associate



Justicia spicigera Schtdl. refound in Colombian Choco in the herbarium after more than 150 years. Photo © John R.I. Wood

News from the Herbaria

Fielding-Druce (OXF) and Daubeney (FHO)

There are currently two years of curation activities within the Herbaria to report on here, those in 2021 and 2022, including the detection of much interesting material. From the pandemic perspective there were still certain restrictions to the numbers of people allowed to work in the Herbaria at any one time until late-summer 2022. Access to the collections by visitors was strictly limited until the same time, but staff were allowed back working on-site full time from autumn 2021. In August 2022, the Departments of Plant Sciences and Zoology merged to become the Department of Biology. With this came the news that we would all be moving, including the Herbaria and Sherardian Library, into a new building towards the end of 2024. Apart from everyday curation activities, this precipitated planning to reduce our considerable backlog of unincorporated specimens before this pending move. Pressing activities also focused on returning loaned specimens to other herbaria after the completion of monographic work on *Ipomoea* (Convolvulaceae) and other studies on Acanthaceae.

Visitors

There had been virtually no visitors to the Herbaria in person between 14 March 2020 and 13 September 2021. Due to the restrictions there were just 28 visits during 2021. The visitors who did come then were nearly all local to Oxford including a small group of Botanic Garden trainees and six Oxford College gardeners! However the public had an opportunity to visit the Exhibition *Roots to Seeds: 400 years of Oxford Botany* at the Weston Library (see page 3). During 2022 there were 54 visits by

individual researchers recorded, plus 79 people in five groups, the latter came mostly during October and November. Two groups of students visited from Oxford Brookes University studying on an M.Sc. Conservation Course, who were instructed on how to collect plants and learnt about the functions of herbaria. A group of undergraduates from the University of Northamptonshire studying Plant Sciences were also given instruction on how to collect plant specimens. Members of the Bobart Group of the Friends of the Oxford Botanic Garden visited in October. The focus of their visit was research and teaching in the eighteenth and nineteenth Century Physic Garden. The role of herbaria in modern Biology and an introduction to the collections was also the focus for a group from the Oxford University Biology Society.

Loan material

As soon as various herbaria in other countries were re-opened after Covid-related restrictions eased in 2022, one of our priorities was to return all specimens, especially in the genera *Ipomoea* and *Stictocardia* (Convolvulaceae), borrowed for research by Professor Robert Scotland's group. In total 46 loans were returned in 2022 comprising nearly 1,800 specimens, this included 1,243 specimens in the family Convolvulaceae. Other returned material included 48 specimens in the family Acanthaceae, 98 specimens of *Faurea* (Proteaceae) and nearly 400 specimens of *Ophrys* (Orchidaceae), the latter having been borrowed for an undergraduate project.

During the two years 620 specimens were received as incoming loans for research including 232 sheets of Acanthaceae from Japan sent for identification by John Wood and 387 specimens of *Ophrys* (Orchidaceae) sent for an undergraduate project from the BM. Few specimens were sent out on loan

from OXF and FHO. Interestingly four historic herbarium sheets from the Herbarium of Charles Du Bois were lent to the Fulham Palace Trust for an exhibition at Fulham Palace entitled 'Discovering the Bishop of London's Palace at Fulham' which ran until the end of 2022. The plants lent had been grown in the grounds of the Palace by Bishop Henry Compton (1632-1713). The loan included a chilli plant which caused much interest from visitors who learnt that the Bishop liked to spice up his food with chillies (pers. com. from the Collections and Conservation Officer at Fulham Palace, Roxane Burke).

The processing of 457 specimens from several returned loans to the Herbaria during the same period also took place, with updating of any new identifications in the database etc. A pleasant surprise was that one returned loan consisted of 40 specimens of Colombian Asteraceae which had been sent to The Smithsonian in the early 1970s but had not been recorded in our old loans book! The specimens had been collected by our resident woodland ecologist Keith Kirby and a fellow student when they were on an undergraduate expedition. The specimens have now been incorporated into the Fielding Herbarium (OXF).

New accessions

Several gifts of Acanthaceae were received of material collected in Myanmar from the Herbarium of the Makino Botanical Garden, Kochi, Japan, from the National Museum of Nature and Science, Tsukuba, Japan and from the New York Botanical Garden collectively totalling 166 specimens. A few Convolvulaceae specimens collected in Myanmar were also sent from New York and 30 miscellaneous species collected in the USA by Peter H. Raven were sent from Missouri.

Throughout the two years accessions consisting of Convolvulaceae specimens have continued to be mounted, databased and digitised from gifts received from 2014 to 2020, the biggest accession from the University of Arizona, ARIZ. This has resulted in almost 1000 'new' specimens added to the OXF collections.

Processing and incorporation of specimens

This has been a major activity and a large amount of material has been databased, digitised and incorporated helping to reduce the number of specimens held outside the main collections and making them more accessible to researchers. The material ranged widely from across the world.

A large collection, almost 1500 British plants collected by Charles S. Elton FRS (1900-1991), animal ecologist at Oxford University, and his collaborators, was incorporated into the Druce (British) Herbarium. Many of the specimens had been collected in Wytham Woods, Oxfordshire, where long-term studies of the natural world

have taken place (see article by Stephen Harris on pages 17-18 and the article by Keith Kirby on page 17).

Specimens collected in the USA and donated from the (former) herbarium at Haileybury and I.S.C. [Imperial Service College] were databased and incorporated into the Fielding Herbarium OXF, this comprised 276 sheets. A collection of 39 plants from mixed families and genera collected by Andrew Harvey from Afghanistan in 2010 were also processed.

A number of returned loans which had been sent back before the pandemic had been awaiting re-incorporation. Using the new version of the BRAHMS database, new determinations for the specimens were recorded under the 'collection event' form creating a determination history for the material. Specimens were then re-incorporated into the collections under their new names. A couple of hundred specimens of grasses were also treated in this way, as well as many mid nineteenth century specimens originally without names which had been identified at least to genera. Many of the latter were South American or African specimens from OXF which were also digitised before incorporation. Processed in a similar manner were a sizeable batch of Lauraceae specimens which had been determined with new names.

Serena K. Marner
Assistant Curator

Oxford University Herbaria database at:
<http://herbaria.plants.ox.ac.uk/bol/oxford>

Ten Bamboo Studio collection of calligraphy and painting

Checking through the Sherardian Library's collections, in preparation for the forthcoming move to the new Life & Mind Building, has led to the serendipitous discovery of some lesser known works.

A previously underappreciated treasure found recently is a copy of *Shuzhuzhai shuhuapu*, or *Ten Bamboo Studio Collection of calligraphy and painting* [502 CH/BT]. Also known as *Ten Bamboo Studio Manual of calligraphy and painting*, it is one of the earliest picture collections from China to be printed in colour.

Clare Pollard, Curator of Japanese Art at the Ashmolean Museum in Oxford, provided us with a translation of the title of this work, previously described only as 'Chinese botanical work'. Produced in many editions and printings between 1633 and 1879, it is the earliest Chinese book printed by the technique of polychrome xylography, known as *douban*, invented and perfected by Hu Zhengyan (1584-1674), a Chinese artist,



From *Shuzhuzhai shuhuapu*, or *Ten Bamboo Studio Collection of calligraphy and painting* Part 9 [© Sherardian Library of Plant Taxonomy 502 CH/BT] –woodblock printing on paper of an orchid.

printmaker and publisher. He worked in calligraphy, traditional Chinese painting and seal-carving, but was primarily a publisher, producing academic texts as well as records of his own work. Hu lived in Nanjing during the transition from the Ming dynasty to the Qing dynasty and the *Manual* is named after his residence, the Ten Bamboo Studio.

The *douban* printing method involves the use of multiple wooden printing blocks which successively apply different coloured inks to the paper to reproduce the effect of watercolour painting. The high level of skill required to achieve a convincing result is evident from the beautiful gradations of colour, and have led to its reputation as a fine work of art. Upon first examining this work we were initially convinced that it was a collection of original Chinese brush paintings.

To create his *Manual*, Hu compiled a selection of calligraphy and paintings by past and contemporary scholar-artists and commissioned a team of skilled artisans to turn them into prints. Containing a collection of around 320 prints by thirty different artists, including Hu himself, the work is divided into eight sections with each category divided into two fascicules. Focussing on the natural world the sections cover miscellany, orchids, bamboo, plums, round fans, stones, fruit and birds. The leaves are printed onto incredibly thin and fragile paper, on one side only, folded in half and glued together along the outer fold. This 'butterfly' binding allows the reader to open the book flat to view the full image. As well as a collection of artworks, it was also intended as an artistic instruction manual,

with information on correct brush position and technique included in the sections on orchids and bamboo. The majority of the artworks are also accompanied by a poem.

Dating this work is notoriously difficult as there is no publication date printed on the item, so I referred to Thomas Ebrey's comprehensive comparison of the different versions or 'states' which compares differences in border styles, stamps and illustrations to determine that our copy was probably produced in 1817.

If you would like to browse this amazing work, then a digitised 1633 version has been made available by Cambridge University Library: <https://cudl.lib.cam.ac.uk/view/PR-FH-00910-00083-00098/1>

Further Reading

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Hu Zhengyan
https://en.wikipedia.org/wiki/Hu_Zhengyan

Sophie Wilcox
Alexander & Sherardian Librarian

Oaks in Wytham

Ask people in Britain to name a type of tree and the most popular response would probably be an oak. I am currently working on a book on oak and oak woodland for the New Naturalist series, as part of which I have been collating material about the oaks, mostly *Quercus robur* L. in Wytham Woods (near Oxford).

Unusually for a lowland wood we have evidence on site for its composition in the distant past from a peat core taken from a small fen in Marley Wood. This shows that oak was present some 7,000-8000 years ago. It was one of the earliest trees to recolonise Britain after the last ice age, along with birch, pine and hazel, and its spread may even have been helped by our ancestors who probably ate acorns in hard times.

The woods at Wytham were part of the larger Cumnor Woods, referred to in the Domesday Book as belonging to the monks at Abingdon. When the monasteries were dissolved some of the land was sold to Sir John Williams – I imagine the process being a bit like the break-up of the Soviet Union with valued assets going to the equivalent of Henry VIII's oligarchs – and this included 18 acres set with oaks of 60-80 years growth mostly firewood valued at 40 shillings per acre; but also 84 acres thin set with oaks of like age valued at 53 shillings/4 pence per acre. These would be quite small trees (30-40 cm dbh) based on current growth rates, because big trees were more difficult to cut and transport and most of the villagers' needs could be met by small trees.

Up until the 1800s much of what is now woodland was grazed common land, but following enclosure of Cumnor and Wytham parishes, the 5th Earl of Abingdon planted some areas while others regenerated to woodland naturally. There was a patriotic fashion for planting oaks in the early nineteenth century to ensure the future of the 'wooden walls' of the Navy. The larger oaks found in the Woods today (typically 80-100 cm dbh) date from this time. Some of the oak was probably planted in mixtures with Scots pine (*Pinus sylvestris* L.) as a nurse crop, and some of the old pines scattered in Holly Hill Copse may be derived from that mixture.

The market for ships' timbers had disappeared by the time the 5th Earl's plantings had matured, but oak was felled from the Woods in both the first and second World Wars to replace imports that were being restricted by the U-boat blockades. As a result, the Woods were quite open when they were gifted to the University in 1942/43 by Colonel Raymond ffennell.

The Department of Forestry was asked to oversee the management of the Woods and in line with their view it should be a teaching forest, demonstrating good forestry practice, they set about planting new stands and clearing out unproductive areas. The long-term aim of the management plan was a



An old oak standard on the edge of coppice, contrasting with the adjacent young beech plantation. Photo © Keith Kirby

mixed broadleaved woodland and oak featured strongly in many of the stands planted. However, the ecologists led by Charles Elton became increasingly concerned about the loss of old trees and open space, a key biodiversity resource. The Forestry Department withdrew from involvement in the site in 1962 and the trees both old and new were left largely to their own devices for a couple of decades.

The older oaks are in many places now being overtopped by the cohort of ash and sycamore that grew up between the decline of rabbits (1954) and rise of deer (c.1975) as limiting factors on tree regeneration. Severe droughts have also contributed to oak decline. Meanwhile there is little natural regeneration of oak because their seedlings do not grow well under shade or in small treefall gaps.

Oak has a well-deserved reputation for the number of associated invertebrates; the caterpillars on its leaves in spring are a key food for Wytham's birds, so its future is of interest from a biodiversity perspective. However, the oak population in Wytham is far from 'natural', even if some of the trees are self-sown. Its current predominance is a consequence of it being the tree favoured by woodmen in the past. The cohort of younger trees from the 1950s plantings should ensure oak's future in the Woods for at least a couple of centuries. However under the minimum intervention management prescribed for much of the woodland the older trees are likely to continue to decline.

Keith Kirby
Woodland Ecologist

Charles Elton's herbarium

Charles Sutherland Elton (1900-91) spent his entire academic career at the University of Oxford, where he made fundamental contributions to animal ecology and invasion biology. Born in Withington, now a suburb of Manchester, Elton was the youngest of three sons. He was educated at Liverpool College before going to Oxford University in 1919 to read zoology. In the early 1920s, Elton took part in expeditions to Svalbard with botanist Victor Samuel Summerhayes (1897-1974), journeys which greatly influenced his ecological ideas and played an important part in the trajectory of his later scientific career (Paviour-Smith, 2004). Specimens from these Arctic expeditions are held by Oxford University Herbaria. In 1923 Elton became a Zoology demonstrator and six years later a university demonstrator. By 1936 he was a university reader in animal ecology, a post he held until his retirement in 1967. In addition to his interests in the dynamics of animal populations, Elton built a collection of herbarium specimens. In the early 2000s, this herbarium was transferred from Oxford University Museum of Natural History to Oxford University Herbaria, where it has been accessed to OXF.

Elton's herbarium is neither a comprehensive representation of the British vascular plant flora nor a collection of particularly rare or unusual species. Rather it is a collection of plants that attracted Elton at different points in his career. Early on the specimens evidently helped him develop

skills in the identification of plants, whilst later the specimens helped him understand the distribution of plants. Moreover, they are permanent scientific records which mean we know precisely what Elton meant when he used a plant name.

The herbarium comprises 1,529 specimens, most (97.3%) of which are from the United Kingdom and Ireland. The specimens are well prepared and meticulously mounted, most often using paper straps threaded through slits in the mounting sheet and glued behind, together with hand-written or typed labels in the lower right-hand corner. Each sheet is covered by a tracing paper flap, glued along the right-hand edge. At some stage in their history, the specimens had evidently been housed in a smoke-filled environment, as during the accession process a strong and persistent odour of tobacco surrounded the piles of specimens.

The earliest collection, a specimen of *Sorbus torminalis* (L.) Crantz from the Malvern Hills (where the Eltons spent their summer holidays), was made by Elton's oldest brother, Geoffrey Yorke (1893-1927), in 1909 (Geoffrey added a further 16 specimens to the herbarium). Elton's classic work *Animal ecology* (1927) is dedicated to Geoffrey, who cultivated the younger man's interest in natural history, but died suddenly in the year of the book's publication (Crowcroft, 1991). The final specimen added to the collection was a *Rumex obtusifolius* L. made by Charles Elton on 1st August 1984 in Combe, Oxfordshire.

Two clear phases of collection activity are represented: (i) summer 1914 – summer 1919 and (ii) summer 1942 – summer 1966. In the years between these phases no specimens are represented in the herbarium. The early phase (c. 31 specimens added per year) is dominated by collections Elton made close to his home in Liverpool and Cheshire or on family holidays which ended when he arrived in Oxford. Some of these early specimens are also augmented with printed botanical illustrations. It is probably no coincidence that the second phase of collection coincided with the bequest of Wytham Woods, Oxfordshire, to the university by Raymond William ffennell (1871-1944) and his wife Ellen Hope (1877-1956), and the development of Elton's interests in ecological surveys and the complexities of communities at the site (Perrins, 2010; c. 48 specimens added per year for all collectors, c. 32 specimens collected by Elton added per year). Approximately 22% of the specimens in Elton's herbarium were collected in and around Wytham Woods, mostly in the 1950s. Today, Wytham Woods is among the best studied ecological sites in the world.

Unsurprisingly, the most prolific collector was Elton (943 specimens) himself, although 32 other collectors contributed specimens. After Elton, the two most prolific collectors were the future tropical botanist Terence (Terry) Dale Pennington (265 specimens) and future polar ornithologist William Joseph Lambart Sladen (191 specimens).

Herbarium specimens, especially when areas are recorded in detail (e.g., Wytham), have become important for investigating plant populations through time. For example, changes in plant distributions following introduction to new areas or changes in plant behaviour in response to environmental change – all of which interested Elton as a scientist. Data associated with specimens in Elton's herbarium are now accessible and could contribute to research programmes in manners that Elton may never have envisaged.

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Stephen A. Harris
Curator of Oxford University Herbaria



Specimen of *Geranium pyrenaicum* Burm. collected by Charles Elton in 1958 between Marleywood and Wytham. Photo © Oxford University Herbaria



Specimen collected from Angmagssalik, Greenland, of *Antennaria canescens* Malte (Asteraceae) in 1969 (see opposite page).
Photo © Oxford University Herbaria



Specimen of the carnivorous pitcher plant *Nepenthes pervillei* Blume, collected from the island of Mahé, Seychelles in 1986 (see opposite page).
Photo © Oxford University Herbaria

Island specimens from Greenland, Saint Helena and the Seychelles

Specimens from a number of oceanic islands which had been stored away for some years have now been databased and digitised before being added into the main OXF Herbarium. In today's world these island floras are very fragile and contain many endemic species which could themselves be under threat of extinction. Indeed a couple of species are already extinct in the wild. Some fascinating material has been uncovered which we hope will be useful in studies in the future.

An interesting set of specimens of plants collected in Greenland, mostly in the 1960s, which were gifted to Oxford in 1972 from the Botanical Museum at the University of Copenhagen, have been databased and digitised. This has resulted in the addition of 739 new specimens comprising 252 different species. Many of the specimens were collected by L. Kliim-Nielsen and colleagues. This is a valuable addition to the OXF collections which were made by Nicholas Polunin, a former Curator of the Fielding Herbarium, from Greenland, comprising over 950 specimens. The material ranges from the native plants *Antennaria canescens* Malte (Asteraceae), *Pyrola grandiflora* Radius (Ericaceae), *Dryas integrifolia* Vahl. (Rosaceae), *Salix herbacea* L. (Salicaceae) plus 29 different species of *Carex* (Cyperaceae) and 108 specimens of Poaceae in 16 genera.



Specimen of *Trochetiopsis erythroxylon* collected by Thomas Wollaston (c. 1877) from Saint Helena © OXF

A very remote small island in the South Atlantic, Saint Helena, with an interesting endemic flora, was the focus for another

batch of specimens to be databased. Collections already known in the Herbarium of Du Bois are two specimens of the extinct species *Trochetiopsis melanoxydon* (Sol. ex Sims) Marais (Dwarf St. Helena Ebony), collected by Stephen Poirier in 1701 and 1702, and one of *T. erythroxylon* (G.Forst.) Marais (St. Helena Redwood) collected by Dr. Alexander Brown in 1697. Further specimens were found in the general Fielding Herbarium (OXF) including three more specimens of *T. erythroxylon* collected in the nineteenth century. This plant is now extinct in the wild. The Saint Helena OXF collections were made by five individuals: William John Burchell (1782-1863) who was acting botanist for the East India Company and collected between 1805 to 1808; John Charles Mellis (1835-1910) born on the island; Hugh Cuming (1791-1865) explorer and dealer of natural history items; Thomas Vernon Wollaston (1822-1878) collections dated from 1877; K.E. Toms who collected in 1936 while in the post of Agriculture and Forestry Officer in Saint Helena. The discovery was made that we have specimens of another extinct species in OXF, *Nesiota elliptica* (Roxb.) Hook.f. (Rhamnaceae), the Saint Helena Olive. The specimens were collected by Burchell. The only remaining tree in the wild died in 1994 and after some initial success in growing the species from cuttings, all the plants in cultivation have since died apparently from a fungal infection. Another endemic species *Commidendrum robustum* DC. (Asteraceae), Gumwood, is represented by a couple of specimens collected by Wollaston in 1877 and Toms in 1934. Notes on the label of the latter said it had been the commonest tree on the island, but now [1934] found only in a few small scattered areas. The endemic Saint Helena Rosemary, *Phyllica polifolia* (Vahl) Pillans (syn. *P. ramosissima* DC.) was collected by J.C. Mellis, as was another endemic *Petrobium arboreum* R.Br. ex Spreng. (Asteraceae) Whitewood, plus *Wahlenbergia linifolia* (Roxb.) A.DC. (Campanulaceae), Large bellflower. Investigating these collections highlights how fragile native island floras are.

Another fascinating collection of some of the rarest plants in the world from remote islands in the Indian Ocean was also awaiting databasing etc. These made by Rosemary Wise, Botanical Artist in the Department, from expeditions she made to the Seychelles during 1986 to 1995. Rosemary's mission was to paint all of the endemic plants of the Seychelles. Over several trips she collected material for the herbaria too, in total 168 herbarium specimens comprising 74 different species, in 44 different families. They are mostly endemics and mostly from the islands of Mahé, but with others from Silhouette, Aride, Curieuse and Praslin. Rosemary illustrated 78 species from the Seychelles in her book *Portraits of the endemic flowering plants of the granitic Seychelles* (1998). Included in the book on Plate 27 is the first published colour painting



Specimen of *Nesiota elliptica*, Saint Helena Olive, collected by William Burchell

of the critically endangered *Medusagyne oppositifolia* Baker, the Jellyfish tree, and corresponding collections for the herbarium were made from Mt. Sébért and Mt. Bernica on Mahé. For many years during the twentieth century, this species was thought to be extinct until half a dozen plants were rediscovered in 1970 on Mt. Bernica. The species is the only member of its family Medusagynaceae. Another extremely rare species with the growth habit of a shrub and found only on Silhouette Island, *Psychotria silhouettae* F.Friedmann, was collected and painted. Rosemary also collected the only pitcher plant species to be found in the Seychelles, *Nepenthes pervillei* Blume, the specific name commemorating the French explorer August Pervillé (see page 18). The herbarium specimens were collected from two sites on Mahé and a beautiful painting of the species is on Plate 33 in the book. The specimens together with the paintings make an excellent record of the species extant on the islands towards the end of the twentieth century. OXF also has specimens from Aride Island collected by Stephen Warman in 1975.

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Serena K. Marner
Assistant Curator



Recent paintings from the Oxford Botanic Garden and Harcourt Arboretum Florilegium. Top left: *Verbascum chaixii* Vill. and *V. chaixii* 'album' © Candida Groom and bottom: *Aristolochia rotunda* L. © Rosemary Wise, both plants from the Oxford Botanic Garden. Top right: *Amanita muscaria* (L.) Lam. © Penny Land, fungus from Harcourt Arboretum.