

# Bentham-Moxon Trust

## Summaries of grants awarded in November 2016

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*The Trustees made their awards in November 2016 for projects running between 1 January and 31 December 2017.*

### Section A: Awards for plant and fungi collection and field research expeditions

Kew researchers work with international partners to address key botanical issues facing the world including climate change and maintaining biodiversity. Bentham-Moxon Trust is an independent small grants scheme at Kew and in this section the Trustees have contributed funding towards twelve of Kew's projects including five in South America, two in Africa and one in Madagascar.

- **Dr Aurélie Albert-Daviaud** awarded £3,082 to part-fund a three-week field trip to Madagascar to gather evidence for the main mechanism of seed dispersal for the endemic palm *Bismarckia nobilis*. Palms are a keystone group in Madagascar's unique ecosystems and this project follows on from a successful field trip in 2016, supported by Bentham-Moxon-Trust. *B. nobilis* occurs in large numbers over vast areas of north and west Madagascar and along with most species of palm, produces fruits adapted to animal dispersal yet hardly anything is known about the seed dispersal of Madagascan palms. Since most of the co-evolved large-body animal seed-dispersers are extinct in Madagascar, this project aims to study the possible dispersal of *B. nobilis* by livestock using various techniques such as feeding experiments and faeces collection looking for intact defecated seeds. This study will hopefully lead Madagascan policy makers to adopt new measures to prevent the extinction of Madagascan plants. Aurélie will also collect leaf samples for DNA analysis and together with existing collections this will allow Kew to conduct a cross-departmental genetic study of plants with anachronistic seed dispersal across wet and dry habitats.
- **Lucy Dablin** awarded £2,895 to part-fund a two-week expedition to collect seeds from five native tree species that will be used to establish an experimental silvopastoral system of 5,000 trees in Madre de Dios, Peru. Silvopasture is a farm management strategy where trees are integrated into livestock systems for environmental and economic benefits and could be used across the Amazon to reverse land degradation associated with cattle production. Fresh tree seeds, 1,000 of each species, collected locally will be planted in 2017 and once cultivated the trees will be compared to document each species suitability for silvopastoral systems. The project will be evaluated using a range of factors including the amount of livestock feed produced by different tree-to-grass arrangements, the impact on soil health and livestock performance. If successful this project will be used to develop innovative solutions that could

slow habitat destruction, increase food security for local populations and restore degraded landscapes. This project will work closely with local NGOs such as Agricultura Ecologica and the silvopastoral system will be presented to regional farmers through two workshops and a Spanish language book.

- **Dr Iain Darbyshire** awarded £3,645 to part-fund a pilot field study to search for Tropical Important Plant Areas (TIPAs) in Uganda. TIPAs are sites of global importance for conserving the world's plant diversity and this project will identify them in the forests of west and central Uganda with each site being assessed on its current status including such factors as how intact the forest habitats are, what management practices are in place and what threats are evident. Species of high conservation importance including tree species of high socio-economic value, will be specifically targeted and an assessment made of their abundance at each site. Wherever possible ripe seeds of these species will be collected for *ex situ* conservation in seed banks in Uganda and the UK. The field data accumulated will feed into the identification of TIPAs based on the presence of threatened species, threatened habitats and assemblages of important species and will be published online through the Important Plant Area Database. Kew's primary in-country partner in this work is Makerere University who are well connected to other stakeholders in Uganda's natural resources from national government to conservation NGOs.
- **Dr Jurriaan de Vos** awarded £1,648 to part-fund a ten-day field expedition to northern California to collect specimens of *Lewisia*, a genus of Montiaceae - a family of mostly temperate perennial herbs that occur in a wide range of ecological conditions. A central challenge in the evolution of plant reproductive diversity is to understand how flowers and inflorescences (the structures that support the flowers) evolve in the face of changing environmental conditions. Juuriaan's earlier research has yielded the hypothesis that extreme environments with brief growing seasons should select for inflorescences that are quick to build and therefore contain few but comparatively large flowers. This would explain the paradox that desert and alpine floras contain surprisingly large-flowered species. This expedition will enable the collection of rare endemic early flowering *Lewisia* species and lead to a better understanding of the evolutionary history (phylogeny) of Montiaceae. Root stocks will also be collected for introduction to Kew's living collection. The field work is in association with Montiaceae expert Dr Thomas Stoughton of the University of New Hampshire and botanists of the USDA National Forest Service and will be an important step towards a global treatment of Montiaceae.
- **Dr Mauricio Diazgranados** awarded £2,775 to part-fund a field trip to northeast Colombia to identify potential species that could benefit local communities by sustainable production and use. In 1941 the Spanish botanist José Cuatrecasas carried out an expedition to northeast Colombia and collected a new species of tree, *Schoenobiblus cannabinus* Cuatrec, a member of Thymelaeaceae, a family of flowering trees and shrubs. This tree was used by the indigenous U'wa people for making their hammocks, ropes, bags and clothes. The region later became inaccessible because of civil war and the species was never collected again. The U'wa people still live in their ancestral homeland but in recent times have struggled to protect their territory against oil and gas exploitation which threatens their environment and culture. They have managed to delay further exploitation by internationalising their campaign. Perhaps only by demonstrating the cultural and biological importance of this area

will they truly succeed. This project will try to relocate (and recollect, if possible) *S. cannabinus* as well as other useful plants used by the U'wa and any objects made of *S. cannabinus* will be brought to Kew's Economic Botany collection where the species is not currently represented. Also it will open the possibilities of continuing working on larger projects on diversity and livelihoods in the region.

- **Dr Aisyah Faruk** awarded £2,718 to fully-fund a trip to Oman to establish a working relationship with the staff of the Oman Botanic Garden (OBG). In 2014 the Oman Plant Red Data Book was published, highlighting the urgent need for *ex situ* conservation for Oman's most endangered species. This project will hopefully mark the start of a long-term partnership between RBG Kew and OBG by initiating *ex situ* conservation and a capacity building programme based in Oman. The Sultanate of Oman has over 1,200 species of flowering plants and ferns, the majority being concentrated in the northern and southern parts of the country. In the north the Jabal al Akhdar mountain range is famed for its wealth of endemic species that are now highly threatened from the pressure of overgrazing and rapid urbanisation. Together with staff at the OBG, Aisyah will travel to the northern mountain range to collect and conserve seeds of Omani plants, as well as explore potential project ideas for long-term conservation of endemic, endangered and/or economically useful plant species of the Arabian Peninsula.
- **Anna Haigh** awarded £2,500 to part-fund a field trip collecting specimens of Araceae (the aroid family) in the northern Andes of Colombia. The family is an incredibly variable group of flowering plants with around 4,000 species growing mainly in the tropics and subtropics. Colombia has around 1,000 aroid species and the western slopes of the Andes in northern Colombia is the most species rich region in the country. Several studies in this region have shown that up to 35% of the aroid species are new to science with high levels of endism. Despite the fact that taxonomic (classification of species) work has increased in recent years in South America, Colombia is botanically still the most poorly known. This project, part of a wider study run by Dr Alejandro Zuluaga of the Universidad del Valle, will evaluate the richness, endism and elevational diversity of aroids in a botanically poorly studied area of the northern Andes. This region sits among a series of 60 community-managed and seven state-managed nature reserves and forms part of a larger conservation corridor and there is a good chance that this project will discover species new to science.
- **Alex Hudson** and **William Milliken** awarded £3,090 to part-fund research to improve the sustainable management of natural resources in Mozambique's Chimanimani National Reserve, part of a trans-frontier conservation area. Within the Chimanimani area, natural forests are under pressure from increasing population and their activities such as illegal logging. This project builds upon earlier surveys carried out where Kew researchers highlighted species such as *Uapaca kirkiana* (the sugar plum or mahobohobo tree) that have economic potential not just for local communities but across southern Africa. When important crop species such as maize fail, indigenous species, such as the mahobohobo tree, often fill the gap providing money and nutrition. An ethnobotanical survey will be carried out with community members to rank the wild plants they use to understand which are most valuable to them, the current harvest rates and the levels of income generated from them. This research will be carried out in partnership with the Micaia Foundation (an NGO) and the Mozambique Institute of Agricultural Research. The results of the survey will inform future

investigations into non-timber forest products and highlight potential alternatives for local communities' to forest clearance for wood and agriculture, contributing to improved livelihoods and conservation goals.

- **Ed Ikin** awarded £3,800 to part-fund a collecting field trip to Kyrgyzstan in Central Asia to bring back seed to be both banked at Kew's Millennium Seed Bank (MSB) for long-term *ex-situ* conservation and grown into young plants. The young plants will be used in the new Asia Landscape planned for Kew's Wakehurst Place site and will deliver Kew's strategy of creating the world's leading botanic gardens. The Asia Landscape will replace the 30-year old Asian Heath Garden, substituting island beds for a sweeping immersive design. The centrepiece is a dramatic steppe meadow highlighting the floral richness of the "Silk Road" from the Caucasus to China. The design was inspired by Kew Science's close links with Kyrgyzstan combined with the country's notable plant diversity and compelling ethnobotanical threads around plants of potential medicinal value. The aspiration is for the Asia Landscape to be planted with seed collected through overseas partners (which this trip contributes to) whilst consolidating collection targets for the MSB which has so far safeguarded 25% of the Kyrgyz flora. The new Asian Landscape will galvanise the relationship between Kew Science and Wakehurst Place, embedding conservation taxonomy (the classification of species) and ethnobotany into the designs.
- **Dr Rosemary Newton** awarded £4,600 to part-fund a two-week field trip to the British Virgin Islands (BVI), part of the Puerto Rican Bank, to assess threats to the *Agave missionum*. Endemic to the Puerto Rican Bank islands, *A. missionum* is threatened by the agave snout-nosed weevil and by land-use change. Weevil larvae burrow into the agave where they feed on internal plant tissue, weakening the plant and making it susceptible to bole rot disease which often kills the plant. The weevil breeds quickly, uses a broad range of host-plants and has devastated both cultivated and wild *Agave* species. This invasive pest has decimated populations of *A. missionum* on the islands of Great Tobago and Prickly Pear, two designated National Parks in the BVI. This project will assess the extent of the weevil infestation and the results will be used to develop a conservation action plan in collaboration with Kew's local partners, The National Parks Trust of the Virgin Islands. Information will also be shared with Puerto Rican colleagues to ensure a more holistic conservation approach to *A. missionum* throughout its entire range.
- **Dr Tuula Niskanen** awarded £1,500 to part-fund a collecting expedition to southern Chile to study the diversity and evolution of the fungal genus *Cortinarius*, building on a successful trip in 2016 supported in part by Bentham-Moxon Trust. *Cortinarius* is an extraordinarily diverse and ecologically important genus containing over 2,000 species and is dominant in South American *Nothofagus* (southern beech) forests, with its species forming mutually beneficial (ectomycorrhizal) relationships with the roots of trees. However the southern hemisphere species of *Cortinarius* are very poorly known and probably the vast majority remain undescribed. Tuula studies the global diversity and evolution of *Cortinarius* so the specimens collected on this field trip will bring valuable new knowledge. Many specimens may well provide a basis for the description of new species, provide DNA data to support research into evolutionary pathways and help to understand the evolution of *Cortinarius* species and similar fungi. Tuula will be working as part of a bigger research team organised by Dr

Matthew Smith of the University of Florida, funded by a National Science Foundation grant, involving many scientists from countries such as Chile, Argentina, USA, Finland and Austria.

- **Dr Gerhard Prenner** awarded £1,500 to part-fund a three-week field trip to the Brazilian Amazon and Caatinga, a semi-arid forested region in northeast Brazil, collecting rare legumes. Recent insights from DNA analysis of the big and important bean family (Leguminosae) have revealed unexpected novel evolutionary relationships. Already the study of, for example, flower structure (morphology) from existing datasets have proved useful for understanding and interpreting these new relationships. However, gaps in currently available data mean there are still questions of floral evolution in legumes that need addressing such as “What are the key events in the evolution of the legume flowers?” and “Are there characters that were previously unrecognised?” To address these gaps, Gerhard, working with his Brazilian collaborator Dr Domingos Cardoso of the University Federal da Bahia, will collect herbarium specimens, leaf material in silica gel for DNA studies and flowers along with their supporting structures (inflorescences) in ethanol or solutions containing ethanol (FAA). Specimens for developmental (ontogenetic) studies will be analysed by electron microscope at Kew and by X-ray Computer Tomography at the Natural History Museum, London.

## **Section B: Awards for overseas botanists and mycologists visiting, training or working at RBG, Kew**

One of Kew’s important roles is training plant and fungal scientists. Visiting botanists and mycologists from around the world can draw upon Kew’s rich resources of scientific knowledge and the collections of plant and fungal specimens. By disseminating scientific knowledge in this way Kew increases botanical expertise worldwide, enhancing conservation strategies. The Trustees’ awards in this section are always given via a Kew staff member.

- **Dr Gemma Bramley** and **Marie Briggs** awarded £3,800 to fully-fund **Tiberius Jimbo**, a forest ecologist from the Papua New Guinea Forest Research Institute (PNG FRI) to visit and train at Kew for four weeks in 2017. Kew’s Science Strategy has highlighted New Guinea as a Tropical Important Plant Area. Kew has established links with institutes on the Indonesian (western) and Papua New Guinea (eastern) sides of the Island and both areas are in need of additional botanical capacity building, especially training in the classification of species (taxonomy) and the identification of plant species. Whilst at Kew Tiberius will attend the two-week Tropical Plant Families Identification Course to give him a solid foundation in identification skills and plant family recognition. He will then spend a further two weeks working in Kew’s Herbarium along with curators and researchers with access to Kew’s extensive New Guinea collections. Tiberius is currently working on a revision of the species-rich Rubiaceae (the coffee family) and will start with the small genus *Wendlandia* to be studied as part of a taxonomic training project in collaboration with PNG FRI and Kew.
- **Dr Aisyah Faruk** awarded £2,140 to part-fund **Konstantine Kereselidze** from the Institute of Botany (IoB) of Georgia to attend Kew for three weeks of training. His training has the following components: training in traditional botanical taxonomy; work alongside Kew specialists to learn molecular (DNA) techniques to resolve taxonomic (classification of species) issues surrounding *Corylus colchica* (a type of hazelnut) and lastly taking part in seed

collecting trips with the Millennium Seed Bank (MSB) UK team to gain further training identifying target species in the field. The IoB of Georgia have been part of the MSB Partnership since 2005 and to secure the future of botany and plant conservation in Georgia they have recently recruited early career botanists and students into their seed collecting programmes. Training programmes that include a practical component are not available locally so this project will greatly benefit the future of plant conservation in Georgia. Additionally the skills learnt will be highly beneficial for the current Global Tree Seed Bank Project running in Georgia and further research projects planned between RBG, Kew and the IoB.

- **Dr David Goyder** awarded £1,700 to fully-fund the training of **Francisco Maiato Gonçalves**, Researcher at Lubango Herbarium in Angola for two weeks at Kew. The Lubango Herbarium is relatively small but well curated and is the most active botanical institution in Angola and being at 1,800m it is not so susceptible to pests as are equivalent collections in the capital, Luanda. Francisco works closely with Kew on inventories of sites of conservation concern and on projects related to Angola's Protected Areas Expansion Strategy that provides the framework for Kew's involvement in the country. Current work is focussed on the upper catchments of several major African rivers to feed into conservation planning by Angola's Ministry of the Environment. Francisco will benefit greatly from training at Kew with its unrivalled regional collections enabling him to identify material collected on recent expeditions concentrating particularly on Angolan endemics. He will be embedded within Kew's Africa and Madagascar Team and will get to know the procedures of a big herbarium. He will also become familiar with associated activities for future project development such as Tropical Important Plant Areas and red-listing threatened and endangered species.
- **Dr Eve Lucas** awarded £2,500 to part-fund **Augusto Giaretta de Oliveira**, a Brazilian PhD student from São Paulo University, to carry out genetic research at Kew. Eve supervises Augusto during his year at Kew researching the drivers of diversification of the complex genus *Eugenia* in the context of neotropical forest evolution. *Eugenia* contains over 1,000 species of flowering trees and is widespread in South America. In places *Eugenia* is the dominant tree genus but is very difficult to identify to species level so hampering conservation in some of the most threatened environments. Two major structural characters used to classify *Eugenia* are flower structure (morphology) and the inflorescence (the structure supporting the flowers). Developmental studies are underway at Kew to explain the responses of *Eugenia* flowers and inflorescences to their environment e.g. pollinators and climate. However a robust evolutionary history (phylogeny) is necessary to correlate these results. This project will use whole-genome sequencing to give robust evolutionary relationships and historical biogeography of *Eugenia*. The results will give a better understanding of this complex genus ultimately allowing ecologists and conservationists more refined tools to develop questions and strategies respectively.
- **Virginia Mills** awarded £860 to part-fund **Sailesh Pradhan** to attend and speak at the Joseph Dalton Hooker bi-centenary conference at Kew. Sailesh is a renowned plantsman from Sikkim, a small north-eastern state of India and is an authority on rhododendrons in Sikkim. The *Joseph Hooker: The Making of Modern Botany* conference will celebrate the life and work of Kew's foremost 19<sup>th</sup> century scientist, Sir Joseph Hooker with a varied programme of talks and an opportunity to see Hooker collections behind the scenes at Kew. Leading scholars and

researchers from around the world will attend the conference (funded from other sources) and consider Hooker's place in the history of science as well as his continuing influence on current botanical research in related fields. It is planned to video-link the conference to India to share speakers' insights with a wider audience. Furthermore, speakers' presentations will be made available online after the conference and in academic journals.

- **Dr Alexandre Monro** awarded £1,750 to fully-fund Costa Rican botanist **Daniel Santamaria** for a three week visit to Kew to revise and describe new species from Kew's *Freziera* collection and to identify Kew's Latin American family indet (unidentified) collections. *Freziera* is a genus of around 60 species of poorly known montane trees and shrubs from Latin America. The classification (taxonomy) of the genus has been little studied since the 1980s at which time a specialist undertook a partial revision, most of which remains unpublished. As a consequence many of the names assigned to the Kew collections are invalid or unpublished and we know of at least seven species that need description and publication. Working with Alexandre, Daniel will describe these new species of *Freziera* during the course of his visit and recurate Kew's *Freziera* collections. Family indet collections are specimens that lack family, genus or species identifications. Kew currently has around 500 of these Latin American herbarium specimens. Daniel is recognised as an exceptional identifier of Latin American plants and will identify most if not all of this material to family level. Once this is done specimens can be forwarded to specialists for naming to genus and species level.
- **Andre Schuiteman** awarded £2,095 to fully-fund **Sikhoeun Nay** of the Forestry Administration (FA) of Cambodia to attend the Tropical Plant Identification Course at Kew. Sikhoeun is involved in plant collecting for the FA and curating the living collection, but lacks proper training in plant taxonomy (the classification of species) and identification. The Tropical Plant Identification Course will improve her skills in these respects and contribute significantly to building botanical skills in Cambodia. The FA manages forested areas not protected as nature reserves and is also the management authority for CITES (Convention on International Trade in Endangered Species) in Cambodia. This means their co-operation is needed to obtain CITES export permits for such things as orchids and pitcher plants, for export to Kew. The FA has a small herbarium and good facilities for drying field-collected material, although at present there are only a few collecting activities going on for their herbarium. Since 2016 when the FA moved to a new compound, it has established a living plant collection, currently mostly orchids, which may form the nucleus of a future botanical garden. At present there is no botanical garden in Cambodia.

## Section C: Awards for travel to botanical and mycological institutions

These awards enable research to proceed when plant or fungal specimens are not available for study at RBG, Kew. This year our Trustees have made one award.

- **Dr Maria Vorontsova** awarded £1,340 to fully-fund a 10-day trip to the Paris Herbarium to study specimens of the genus *Digitaria*, a member of Poaceae (the grasses family). *Digitaria* species have inflorescences (the structures supporting the flowers) that look like several thin fingers with tiny flowering parts. They have soft nutritious leaves that animals love to eat and

are a critical forage group for livestock in Madagascar. However, species of *Digitaria* are difficult to identify so this project will enable Maria to spend time at the Paris Herbarium studying specimens under the microscope and measuring flower parts. Paris holds around 800 specimens of *Digitaria* from Madagascar, largely not identified to species level and they are not available on loan. Maria will compile species descriptions and write an identification key to be used by Malagasy botanists and students. This project will discover whether Madagascar's key forage plants are ancient and endemic or perhaps recent introductions. This new knowledge will be used by botanists and ecologists to improve understanding of Madagascar's ecosystems and to make informed judgements for future planning of pastoral livelihoods in the face of growing populations and climate change.

## Section D: Awards for travel to and presenting at conferences

The Trustees' awards in this section contribute towards Kew staff making presentations, spoken or in poster form, at conferences around the world. Conferences bring researchers together enabling them to compare notes, establish new collaborations and seek out new funding opportunities. They also help to maintain Kew's international research reputation.

- **The Trustees** made seven separate awards totalling £13,593 to part-fund 13 senior members of Kew staff to participate at the 19<sup>th</sup> International Botanical Congress (IBC) to be held in Shenzhen, China. The IBC is held once every six years and provides a premier opportunity for sharing and exchanging a huge diversity of research with scientists from around the world in such areas as biodiversity, taxonomy (the classification of species), genetics, ecology and horticulture. The last Congress, held in Melbourne, Australia in 2011 was attended by over 2,000 delegates from more than 70 countries and the 19<sup>th</sup> Congress is likely to be equally diverse and so provide an ideal opportunity to showcase Kew's recent research findings. The papers being presented by Kew staff cover a wide range of research topics including legume pollen evolution, how floral architecture and symmetry has evolved in the daisy family, genome size and the resilience of seed germination to climate change. In addition some Kew participants are also involved in other areas of the Congress such as keynote speakers and organising symposia. Some Kew staff will also attend the Nomenclature section of the Congress. The International Code of Nomenclature is the set of rules that govern how algae, plants and fungi are formally named and there is a proposal to implement some form of name registration for which Kew has already participated in a pilot study. It will likely be a central topic of debate and may have far reaching consequences for Kew's names databases, a resource accessed by over a million users per year. It is an opportunity for Kew to develop and highlight its talents and resources as a potential registration centre.
- **Stuart Cable** awarded £2,476 to part-fund 5 staff members at the Kew Madagascar Conservation Centre (KMCC) to attend the 21<sup>st</sup> Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale (AETFAT) Congress held in Nairobi, Kenya. The Congress will help to build the careers of the Kew Madagascar team. Romer Rabarijaona and Cédrique Solofondranohatra will give oral presentations with Guy Onjalalaina, Landy Rajaovelona and Linah Rabarivola giving poster presentations on their research. All of the KMCC staff above are early-career researchers and their participation at AETFAT will give them an opportunity

to network with other botanists working on African floras and within their areas of expertise. The participation of Kew Madagascar staff at the AETFAT Congress will add to Kew's commitment to Madagascar and African taxonomy (the formal classification of species). In terms of the growth of KMCC's programme, building botanical capacity for the Malagasy scientific staff is one of the most important strategic investments Kew can make and will pay dividends for the conservation of Madagascar's threatened flora.

- **Stuart Cable** awarded £1,700 to fully-fund Dr Helene Ralimanana, a senior staff member at the Kew Madagascar Conservation Centre (KMCC), to participate at the State of the World's Plants (SOTWP) Symposium to be held at Kew. The SOTWP Symposium will feature Madagascar as the case study and Helene will give a poster presentation of her work done in collaboration with Steve Bachman entitled *International Union for the Conservation of Nature Red Listing in Madagascar*. She will stay at Kew for two weeks undertaking research in her area of specialism and together with work of other senior staff at KMCC, it is expected that at least four new species will be published as a result. Helene's visit will also allow more time to be spent working on the KMCC website ([www.teamkmcc.org](http://www.teamkmcc.org)) including the online presentation of specimen images - herbarium and DNA specimens. This will build capacity for the evolutionary history of species (phylogenetics) projects both at genus level for Kew's Plant and Fungal Trees of Life projects and at species level. With Madagascar being the country of focus for the 2017 SOTWP Report it is vital that Helene, our KMCC team leader, attends the Symposium to present her work.
- **Dr Louise Colville** awarded £1,061 to part-fund her participation at the International Society for Seed Science Conference in Monterey, California. Louise will give an oral presentation of her research into seed tocopherols (the group of vitamin E compounds). The tocopherol compounds are often abundant in seeds and reported to be associated with seed longevity due to their function as antioxidants which protect against oxidative damage associated with seed ageing. There are eight tocopherol isoforms (distinct forms performing a similar function) and Louise has studied the variation of tocopherol distribution in seeds of diverse wild species drawn from Kew's Millennium Seed Bank collections to understand the evolutionary patterns that underlie tocopherol composition. Louise has also analysed the relationships between seed longevity, tocopherol content and lipid (fatty acid) composition. A better understanding of the factors which determine seed longevity will enable a more accurate prediction of seed lifespan in *ex situ* storage which is vital for long-term conservation of threatened species. Furthermore, tocopherols are important in human nutrition and the evaluation of the seeds of diverse species could lead to the identification of tocopherol-rich species, which may have potential for sustainable agriculture.
- **Prof Dr Isabel Larridon** awarded £8,468 to part-fund 15 RBG, Kew staff members to participate at the 21<sup>st</sup> Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale (AETFAT) Congress held in Nairobi, Kenya. The Congress is held every three or four years and brings together young and established African and Madagascar researchers and specialists from around the world working in botany, taxonomy (the formal classification of species), ecology, conservation and ethnobotany. All Kew staff attending the Congress will present either a talk, a poster presentation, or both on an aspect of their work in Africa most of which are in collaboration with our in-country partners. In addition some staff members are also

involved in other areas of the Congress such as giving a keynote lecture, being a member of AETFAT Scientific Committee or planning and chairing symposia. Kew currently has active partners in 24 African countries and many of these relationships have been developed through the AETFAT meetings and networks.

- **Dr Rosemary Newton** awarded £700 to part fund her participation at the combined 14<sup>th</sup> International Mediterranean Ecosystems (Medecos) and the 13<sup>th</sup> Spanish Association for Terrestrial Ecology (AEET) meeting in Seville, Spain. Rosemary will give an oral presentation of her research which examines the role of direct and indirect fire cues on seed germination in 40 species of *Leucadendron*, an endemic South African genus of small trees and shrubs. The Cape Floral Kingdom in South Africa is the smallest yet most biodiverse plant kingdom per unit area in the world. Fire is an important ecological driver in fynbos, a heath and shrubland habitat which is the predominant vegetation in the Cape Floral Kingdom. Most plant species recruit after fire from seeds stored in the soil or on cones in the plant crown, where fire stimulates seed release ensuring germination under optimal conditions for seedling establishment. Smoke is also known to contain a number of chemicals that promote germination of many soil-stored seeds. In addition to direct fire cues, indirect cues such as increased temperature alternation at the soil surface between day and night due to vegetation removal following a fire, can also cue seed germination.
- **Dr Cynthia Sothers** awarded £1,000 to part-fund her participation in a workshop at the Malpighiales Laboratory based at the CEPEC herbarium in Ilhéus, Bahia, Brazil. The workshop is on Malpighiales one of the largest orders of flowering plants and Cynthia has been invited to talk on the phylogenetics (evolutionary development) of Chrysobalanaceae, a family of flowering trees and shrubs with around 540 species worldwide of which 80% are distributed in the Neotropics. In Brazil the family is primarily Amazonian with the Atlantic forests around Ilhéus constituting a secondary centre of dispersal. The region has a diverse range of habitats and a rich flora with new species described every year. RBG Kew holds a world-class collection of specimens of Chrysobalanaceae and ongoing research at Kew has resulted in the reclassification of the largest genus *Licania* and the description of new genera. In addition Cynthia is the principal organiser of Chrysobalanaceae for the Flora of Brazil 2020 project which aims to provide a taxonomic (formal classification) of all known species for Brazil by 2020. This talk will disseminate knowledge on the family and help support research carried out at CEPEC herbaria and Universidade Estadual de Santa Cruz, co-organisers of the workshop.
- **Thais N C Vasconcelos** awarded £1,000 to part-fund her participation at the 68<sup>th</sup> Brazilian Botanical Congress held in August 2017 in Rio de Janeiro. She will co-ordinate a symposium and deliver a paper on Myrteae, the largest tribe within Myrtaceae (the myrtle family), one of the most ecologically significant groups of plants in the tropical Americas. Due to historical neglect, relationships in Myrteae are complex, hindering conservation initiatives and making ecological and evolutionary modelling less accurate. A key component of Thais's Kew-based PhD was developing a comprehensive understanding of the relationships within this group on which further evolutionary, ecological and systematic study can be built. After carrying out fieldwork in seven countries, samples representing 46 of the 51 Myrteae genera were sequenced (using DNA analysis) to infer evolutionary relationships and analysed for biogeographical and diversification patterns. Thais's research represents the most

comprehensive evolutionary understanding of this important group to date and is already implicated in other work examining such things as diversification rates, anatomical development and trait evolution studies underway at Kew and elsewhere.

## Section E: Awards from restricted funds

The awards in this section are from restricted funds set aside for specific areas of botanical work conforming to the wishes of the donor. Here the Trustees have made two awards, both from the Marjorie Hurley Fund bequeathed for the preservation of wild flower sanctuaries at RBG Kew and Wakehurst Place, Kew's garden in the countryside.

- **Sandra Bell** awarded £600 to fully-fund the continuing upkeep of honey bee hives at Kew in 2017. There are now four thriving hives of honey bees located in the Quarantine House meadow at Kew. The population of honey bees has grown steadily since the project, supported by Bentham-Moxon Trust, started with two hives in 2013. Both wild and cultivated pollinators are under threat as never before and honey bees make ideal pollinators in the UK since they can be kept in very large numbers and are general feeders, visiting a wide range of native and exotic plants. This ensures a good seed-set within the gardens at Kew as well as improving fruit and seed-set in surrounding gardens and along the Thames towpath. Two of the hives house sensors installed by Nottingham Trent University which provide all the signals that activate the lights and sound in The Hive, the high profile visitor attraction just off the Broad Walk at Kew. Plans are in place for further honey bee research linked to The Hive by scientists at Nottingham Trent University. [178]
- **Sandra Bell** awarded £1,602 to fully-fund the banking of wildflower seeds for Kew's pollinators. Many species of wild plants of great benefit to pollinators grow within RBG, Kew's 300 acres and this project will save seed from them for storage in Kew's Millennium Seed Bank (MSB). This is important because plants are easily lost due to changes in personnel, land management practices, new developments and increased visitor numbers, which all put greater pressure on Kew's native flora. This project will enable Sandra to make 40 visits to Kew during 2017 to locate wild plants of significance to pollinators either as pollen and nectar sources or as larval food plants and collect seeds from them for storage in the MSB. Each species from which seeds are taken will be accessioned (given an MSB number), photographed, herbarium specimens prepared and the presence of seed lots in the MSB will appear on each record on the Living Collections Database at Kew. The reserves of seeds collected could be invaluable to local organisations seeking to encourage pollinators by providing wild sources of nectar and pollen.