

Bentham-Moxon Trust

Summaries of grants awarded in December 2019

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The Trustees made their awards in December 2019 for projects running between 1 January and 31 December 2020

Section A: Awards for plant and fungal collection and field research expeditions

RBG Kew's scientists work with international partners to address key botanical issues facing the world such as climate change and maintaining biodiversity. Bentham-Moxon Trust is an independent small grants scheme at Kew and in this section the Trustees have contributed towards 7 of Kew's research projects running in 2020 including two in North America, two in South America, one in South East Asia, one in Australia and one in Africa.

- ❖ **Ms. Sara Bárríos** awarded **£4,000** to fund fieldwork in Anguilla researching Anguillan endemic species. The project focuses on researching Anguilla's endemic plants species, enhancing our understanding of the plant diversity found on the island and gathering data to develop effective management and recovery plans for threatened species. Collections will be made to bolster Kew's collections, data will be gathered to assess the extinction risk of endemic plant species and the UK Overseas Territories team's collaboration with Anguilla partners will be strengthened.
- ❖ **Rosie Clegg** awarded **£2,500** to part-fund fieldwork in Chiquitano ecoregion, Bolivia, enabling research and collecting at TIPA sites, and training being provided to local partners. Bolivia is one of the focus countries in Kew's Tropical Important Plant Areas (TIPAs) programme. Kew has well established links in Bolivia and is currently 3 years into a 4-year project to designate TIPA sites in the species-rich, yet highly threatened Chiquitania dry forest and Cerrado vegetation in eastern Bolivia. All the herbarium data has been collated and workshops held in Bolivia to identify TIPAs sites across the Chiquitania, however, these now require ground-truthing. The proposal is to visit and evaluate two further sites to add to the TIPAs network across eastern Bolivia. The field expedition will glean information on the diversity, abundance, current threats and quality of habitat that can be directly used to inform conservationists. These sites have previously been largely unexplored botanically and visits to other identified TIPA sites have led to the discovery of both new species and new records for Bolivia. From these sites essential material for Kew will be collected. Training courses will be given at the Natural History Museum in Santa Cruz in both IUCN Red Listing and data entry into the Kew developed TIPAs portal, further equipping Kew's local partners in the skills required to undertake further, future TIPAs work.
- ❖ **Dr. Jan Hackel** awarded **£3,000** to part-fund fieldwork in the Tsaratanana Massif, Madagascar to carry out collection of forest and mountain grasses. The project is for a four-week stay in Madagascar, with a two-week expedition to the Tsaratanana massif in the North. The area has an outstanding diversity of habitats and endemic species and is a key target for collection. This will be a joint field trip with the

Kew Madagascar Conservation Centre (KMCC) and also involve a botanist from the Parc Botanique et Zoologique de Tsimbazaza. Jan's particular goal is to collect specimens of the "Madagascar shade clade" of grasses, a large group that diversified on the island. This will allow him to complete sampling for a phylogeny of the clade and undertake a comprehensive biogeographic analysis. Specifically, he will test the role of mountain building in the diversification of the group, which could then lead on to a larger, cross-taxon project. KMCC will fund part of the trip to collect rare and threatened taxa from further plant groups. Outputs of the trip will be valuable herbarium vouchers of rarely collected species and silica and alcohol material, which will support at least two scientific papers.

- ❖ **Dr. Justin Moat** and **Dr. Gwilym Lewis** awarded **£4,600** to fund fieldwork in S Peru & N Chile to undertake the surveying coastal fog lomas. This southern Peru-northern Chile lomas survey project will utilise a combination of traditional plant surveys (collection, identification and naming) and remote sensing surveys (using both Unmanned Aerial Vehicles, [UAVs] aka drones) and real time satellite data. It builds on work carried out in previous years and generously funded by the Bentham-Moxon Trust. The Anglo-Peruvian-Chilean team will survey the southern extent of coastal fog lomas habitat, a dune vegetation which contains a high number of endemics and several potential new species. We anticipate the discovery of new plants, new data contributing to an understanding of the El Nino-La Nina climate cycle on the lomas flora, and the delivery of results that will support the protection and conservation of several southern lomas formations.
- ❖ **Dr. Alex Monro** awarded **£3,211** to part-fund fieldwork to carry out an exploration of an isolated and threatened mountain range located on the Pacific coast of Costa Rica, Cerro Anguciana,. Alex's aim is to improve conservation and scientific knowledge through this exploration. Cerro Anguciana has been poorly explored to date, but initial collections suggest an unexpected relationship to South America with several species collected there previously known only from South America. Cerro Anguciana sits within a heavily deforested agricultural landscape and has itself been partly deforested and so is itself threatened. Through lobbying by Alex and collaborators, there has been provisional agreement from the Government of Costa Rica to include Cerro Anguciana into a planned biological corridor. Motivation to do so will be strengthened by the collection of more evidence demonstrating its important plant diversity and scientific interest. Cerro Anguciana also represents a limestone massif and its exploration will contribute to an ongoing research programme at Kew into the plant diversity associated with this kind of rock.
- ❖ **Dr. Andre Schuiteman** awarded **£2,370** to part-fund fieldwork in Cambodia to collect specimens of Orchidaceae. The orchid flora of Cambodia is still poorly known. By making trips to carefully selected parts of the country in conjunction with local counterparts, while collecting specimens for study and cultivation in Phnom Penh and Kew, we plan to obtain a better overview of what is still present. These insights will serve in- and ex-situ conservation, as well as provide the material necessary for research and publications.
- ❖ **Dr. Timothy Utteridge** awarded **£3,000** to fund **Miss Pirada Sumanon (PhD student at Kew)** to Collect specimens and DNA samples of genus *Maesa* (primulaceae) in West Papua. *Maesa* is an Old World genus often confused with other related genera, and also with complex identification and species problems in the genus itself. The genus was last monographed in 1902, and the New Guinean taxa was revised in 1987. Since then, several new species have been described and published; however, some species delimitation is still unresolved due to the absence of flower and fruit variation, and a clear understanding of species boundaries is fundamental for further ecological and evolutionary work. This PhD research will use a phylogenomic framework to aid the taxonomic understanding of the genus and, to reach that goal, a species-level phylogenetic tree is needed. Pirada will join Kew's TIPA team in West Papua and undertake fieldwork with the aim of collecting materials for the herbarium, DNA sampling, visit the localities to estimate their regional conservation status, observe and record traits and variations to integrate into the tree to help solve evolutionary history of the genus. The results of

Pirada's work will be published in Kew Bulletin as a synopsis of the genus in New Guinea and will contribute to Flora Malesiana project, while the phylogenetic part will contribute to Kew's Plant and Fungal Tree of Life project.

Section B: Overseas botanists and mycologists visiting, training or working at Kew

Providing training for botanists and mycologists from around the world helps Kew achieve its aim of training the next generation of plant and fungal scientists. At the same time Kew also invites expert scientific collaborators to work at Kew, analysing and improving the quality of its collections. The Trustees have made 20 awards for these types of projects running in 2020. The awards in this section are always given via a Kew staff member.

- ❖ **Dr. Sidonie Bellot** awarded **£3,000** to fund a six-week visit to Kew for **Dr. Randi Agusti (Indonesia)** to study and collaborate on Malesian palm diversity. Kew has a long-standing research interest in the diversity and evolution of palms in Malesia, the richest bioregion for palms in the world. To make the study of palms in Malesia sustainable, a new generation of palm botanists based in Malesian countries must be established. The aim of this study visit is to provide a career development and research opportunity to a rising star in Malesian palm science, Mr Randi Agusti of the institut Pertanian Bogor. During a 6-week research visit to Kew, the embryonic research links between Randi and Kew palm researchers Dr. Sidonie Bellot and Dr. William Baker will be developed. Randi will receive mentoring from world palm expert and Kew Honorary Research Fellow, John Dransfield, and will gain invaluable opportunities to study Kew's palm herbarium, the largest in the world. It is anticipated that at least one scientific paper will arise from this research visit, and that it will set the stage for longer-term collaborations aiming at documenting, conserving and sustainably using the palms of SE Asia.
- ❖ **Miss Renata Borosova** awarded **£2,300** to fund for a four-week visit to Kew for **Dr. Andrey S Erst (Russia)** to undertake Ranunculaceae research and collaboration on the Ranunculaceae of New Guinea. Andrey S. Erst, a senior researcher at the herbarium of Tomsk University and the herbarium of Central Siberian Botanical Garden in Novosibirsk, Russia, will collaborate with Renata Borosova on investigating Ranunculus in the Ranunculaceae (the buttercup family) from New Guinea. Ranunculaceae in New Guinea comprises of three genera (Thalictrum, Ranunculus and Clematis) and nearly 50 species. The genus Ranunculus is the largest genus of the family in New Guinea with an estimate of over 30 species. The genus and the family is yet to be treated for the Flora Malesiana, or recent regional floras such as the Flora of New Guinea. Recent work at Kew has recognised several new species of Ranunculus in preparation of a taxonomic revision of the family. Andrey's work on the project will include a critical examination of data using Kew herbarium specimens as well as loans from several herbaria, currently present at Kew herbarium and it will provide understanding of morphological and geographical patterns in this family. These data will be added to Kew's existing datasets for analysis and a checklist and a revision of New Guinea Ranunculaceae will be published. The possibility of future collaboration and developing research proposals for phylogentic analysis of DNA will also be explored.
- ❖ **Miss Renata Borosova and Miss Alison Moore** awarded **£3,780** to fund a four-week visit to Kew for **Mr. Thomas Magun (Papua New Guinea)** to attend the Tropical Plant Identification Course & collaborate with Kew staff. Thomas, an Herbarium Curatorial Technician and Field Parobotanist from LAE (Papua New Guinea National Herbarium, LAE) has been recommended by the head of the LAE herbarium as a good generalist botanist who would benefit highly from participation in the Tropical

Identification Course run at Kew. The transfer of knowledge gained at Kew would benefit other botanists and technical staff in-country upon Thomas's return to PNG.

Whilst here he would also continue his work on his areas of specialism; gingers (Zingiberaceae) and Saurauia (Actinidiaceae) in New Guinea potentially allowing collaborations with members of Kew staff already working on these groups. This could lead to publication in international journals both independently and with collaborators from Kew.

Knowledge gained by working alongside curators in the Asia team will provide excellent experience in specific herbarium techniques which can then be transferred to colleagues at LAE, thereby improving collections there which include a number of duplicates from Kew expeditions.

- ❖ **Dr. Gemma Bradley and Dr. Carmen Puglisi** awarded **£1,400** to fund a one-week visit to Kew for **Dr Max MJ van Balgooy** on the project "Solving identity problems in Kew's Malesian Herbarium species". Max is the world expert on Malesian plants. His most famous publications include a trilogy on Malesian Seed Plants consisting of two volumes of portraits of plant families and a volume on the identification of plants through spot characters, now in its second edition. Throughout his career he has collected thousands of herbarium specimens and identified Malesian plants across several world herbaria. At Kew, Max will study the Euphorbiaceae sensu lato, help the Asia team identify unnamed specimens from Malesia, and run a series of workshops on spot-character identification.
- ❖ **Miss Julia Carretero** awarded **£1,950** to part-fund a one-week visit to Kew for **Mr. Neelesh Yadav (India) & Mr. Riyadh Mustafa Fadhel (Iraq)** for digitisation training. Two plant researchers, Mr. Neelesh Yadav, Head of IT, Tropical Forest Research Institute, Jabalpur, India, and Mr. Riyadh Mustafa Fadhel, Assistant curator, National Herbarium, Baghdad, Iraq, will attend digitisation training at Kew. The herbaria in Baghdad (BAG) and Dehradun (DD) have plans to digitise their collections. Building capacity on digitisation and strengthening the bilateral collaboration will be of benefit to these two institutions, through transfer of skills, and to Kew, through the support of Kew's Science Strategy. More specifically, the one-week training will allow an exchange of data and images and this content will be published on Plants of the World Online portal (POWO). POWO is a Kew strategic output highlighted by the independent Science review.

The Iraqi Ministry of Agriculture has given all permissions to publish Flora of Iraq in POWO, with the one condition that training is provided to their nominated candidate from the National Herbarium. Neelesh works towards the digitisation of the herbarium DD at the Forest Research Institute in Dehradun. India is not sending any plant specimens abroad anymore, so digitisation will be vital, allowing plant data sharing in a digital form.
- ❖ **Mr. Lee Davies** awarded **£3,050** to fund a visit to Kew for **Dr. Joao Araujo** to review Kew's two entomopathogenic fungal families. The Cordycipitaceae and Ophiocordycipitaceae are charismatic fungal families notorious for their complex interactions with arthropods. Typically, they invade and parasitize their hosts, and in the case of those which parasitize ants, they exhibit complex manipulation. This has led to them being referred to as 'Zombie fungi'.

Kew's collections of these fungi have needed attention to bring it up to date with the most recent research and taxonomic changes to these families. The large and understudied holdings potentially hold new species records, new species and new ecological arthropod interactions.
- ❖ **Dr. Felix Forest** awarded **£1,260** to part-fund a visit to Kew for **Mr. Guilherme de Medeiros Antar** which will cover part of his laboratory expenses in relation to the project "Systematics of Hyptidinae (Lamiaceae) with emphasis in Hyptidendron Harley". Studies focused on highly diverse biological groups are important to detect patterns, reconstruct evolutionary histories, trace hypotheses about processes and mechanisms of diversification, and enable the positioning of taxa in more stable and permanent systems. Hyptidinae is a model for studies of this nature: of its 400 species, 300 occur in Brazil, of which 223 are endemic of the country. The group presents poorly resolved phylogenetic relationships, mostly related to Hyptidendron, a genus of 19 species, distributed in South America and

concentrated in the Brazilian Cerrado, a hotspot for conservation. In view of this scenario, this project aims to: 1) reconstruct the phylogenetic history of Hyptidinae with genomic data, using the PAFTOL protocol to provide a phylogenetic backbone, seeking to test the monophyly of genera and their circumscriptions; and 2) reconstruct the phylogeny of Hyptidendron. This proposal will enable this work to be performed with a larger number of samples (80) to help recover robust evolutionary relationships and historical biogeography of Hyptidinae and Hyptidendron. Results will be used to propose a solid and stable classification for Hyptidinae, ultimately allowing further taxonomic and biogeographic studies, and better plans for the conservation of the Cerrado biome biodiversity.

- ❖ **Miss Aurélie Grall** awarded **£1,685** to fund a three-week visit to Kew for **Eric Ngansop (Cameroon)** to receive training in curation and taxonomic research. Eric Ngansop, Curator in the National Herbarium of Cameroon, Yaoundé (YA), is a promising botanist and curator and at several occasions he was identified by the head of the Herbarium in Yaoundé, Dr Florence N'go N'gwe, as the staff member who would benefit the most from a trip to Kew for a training in both curation and taxonomic research. Eric has expressed several times his ambition to learn more from Kew staff and to visit Kew. During the first half of his stay, Eric will be given intensive training by the Kew curators of the Africa team on preparing for mounting, databasing, sorting duplicates and incorporating specimens; with a focus on material from our Cameroon projects. During the second half of his stay, he will assist Kew researchers in describing a new species from Cameroon, gaining expertise from Kew staff in taxonomic methods and scientific writing.

Eric will learn a lot from Kew's curation techniques, and the collections will also benefit from his time spent processing our workload. Many specimens will be processed by Eric, and a co-authored publication by one Kew Botanist and Eric Ngansop will result from this project.

- ❖ **Dr. Bente B. Klitgård** awarded **£3,375** to part-fund an 8-week study visit to Kew for **Maira Martinez (Bolivia)** to develop her skills, collaborate with Kew's TIPAs Bolivian coordinator, attend the Tropical Plant Family Identification Course and work collaboratively. Bolivia is one of seven focus countries in Kew's Tropical Important Plant Areas (TIPAs) programme. Kew has well-established links with Bolivia and is 3 years into a 4-year project to designate TIPA sites in globally unique, yet highly threatened Chiquitania dry forest and cerrado in Bolivia. Maira is working closely with Kew's Bolivia team as a consultant and her input is essential for the project outputs to be produced over the coming year. Furthermore, Maira is very talented, an excellent collaborator and shows promising leadership qualities, all needed to enhance Bolivian botanical research capacity. At Kew she will be working closely with the Bolivia TIPAs project coordinator and PI in writing a book on the TIPAs Network of the Bolivian Chiquitania and co-authoring a peer-reviewed publication on threat and rates of destruction in the Chiquitano ecoregion. She will benefit from this opportunity to develop professionally 1) as a future very promising leader in Bolivian botany; 2) from networking with Kew staff with opportunities of future collaborations; 3) from co-authorship on key publications that will impact the conservation of globally threatened habitats and plants of the Chiquitania; and 4) by attending Kew's Tropical Plant Identification course.

- ❖ **Dr. Bente B. Klitgård** awarded **£1,703** to fund a four-week study visit to Kew for **Dr. Mohamma Vatanparast (Denmark)** in respect of the project "Manuscript completion: comprehensive phylogeny of rosewood *Dalbergia* using genome-wide SNPs". Understanding morphologic, genetic and geographic variation of plant species is critical for advancing our knowledge of their biology and threats to their existence. Rosewoods include species of the genus *Dalbergia* L.f., a diverse group of c.250-300 species in the legume family (Fabaceae), with a pantropical distribution with centres of diversity in the Americas, Africa and Asia. Many *Dalbergia* species are known for their beautiful timbers of high economic value and are threatened by illegal logging, with some species on the verge of extinction. This illegal logging and trade resulted in 50+ *Dalbergia* species being assessed as threatened by the global IUCN red list. The success of CITES in supporting legal, sustainable timber trade and addressing

illegal trade saw all *Dalbergia* species being brought under CITES trade controls at CITES CoP 2017. However, despite the imminent threats to many rosewood species their biology is poorly understood and species boundaries weakly defined; and both are hindering effective conservation action. We aim to present a first comprehensive molecular phylogeny of the rosewood genus *Dalbergia* L.f. using genome-wide SNPs; in the process assess the boundaries of the accepted *Dalbergia* species; and determine the potential of the molecular markers used in this study for plant conservation purposes.

- ❖ **Professor Isabel Larridon** awarded **£900** to part-fund a three-week visit Kew for **Dr. Pedro Jiménez-Mejias (Spain)** to work on the project "Towards the first monograph of *Carex* (Cyperaceae) in the Neotropics". With about 2000 species *Carex* is one of the three largest genera of flowering plants. These grass-like plants are predominately distributed in cold and temperate countries of the Northern Hemisphere, but have colonized the Southern Hemisphere several times. In South America, *Carex* comprises about 200 species, and despite being ecologically important, the genus is still poorly understood in the continent. The available literature is fragmented and an integrative revision is lacking. The present project seeks to rely on Kew's Herbarium collections as one of the reference sources for the preparation of the first comprehensive taxonomic revision of the genus for South America. To this end, herbarium materials (including types) will be revised and photodocumented, the images made available via Kew's HerbCat in collaboration with Kew's Digital Collections team. This research will critically contribute to improve the knowledge of this still poorly understood group in South America and will stimulate further research in the future.
- ❖ **Dr. Gwilym Lewis** awarded **£2,470** to part-fund a twelve-week visit to Kew for **Miss Verónica Zúñiga** to receive training, carry out research and assessments. Verónica, a Peruvian botanist, will develop her botanical identification and IUCN conservation assessment skills. She will spend time with Dr Justin Moat of Kew's Bioinformatics and Spatial Analysis group and Dr Steve Bachman of the Conservation Science department learning skills in spatial analysis and Red listing. She will apply to attend the two-week Kew Tropical Plant Families Identification Course to further develop her plant identification skills. This combined training will contribute significantly to building botanical skills in Peru. Verónica will also spend time in Kew's Herbarium alongside Drs. Lewis and Monro, research visitor Oliver Whaley, and with the Tropical America Team reviewing Peruvian material. She will examine, database and verify species of our dry forest and Lomas collections housed at Kew. These new identifications will add to the 'Additions of the Flora of Ica' and dry forest checklists, and contribute to the lomas mapping papers that are in preparation. Her visit will strengthen collaboration between Kew and Peru.
- ❖ **Dr. Eve Lucas** awarded **£1,765** to part-fund a visit Kew for **Mariana de Andrade Wagner (Brazil)** in relation to the project "Phylosystematics of the '*Myrcia amazonica* DC'. clade - *Myrcia* section *Aulomyrcia*". Myrtaceae is an extremely ecologically important family of plants with thousands of tree species in tropical forest ecosystems. *Myrcia* is a mega species rich genus of the family in the Neotropics. Difficulties in identifying *Myrcia* species hamper conservation and other research efforts in Neotropical forests. Within *Myrcia* section *Aulomyrcia* (O.Berg) Griseb the '*Myrcia amazonica* DC'. clade comprising 26 species distributed in the Amazon basin and the Atlantic forest. This clade is constituted by a diverse group of trees presenting large whorled or opposite leaves, a red indumentum and terminal asymmetric inflorescences including the widely distributed *Myrcia amazonica* DC. The objective of this project is to revise the taxonomy of the *Myrcia amazonica* clade and understand through a phylogeny based on the broadest available sample of species from the clade, the relationship between these species and between other clades of *Myrcia*. With the obtained phylogeny we plan to examine macroevolutionary questions such as biogeography and- character evolution. We also intend to explore some vegetative traits for the first time. To further understand

Myrcia's incredible diversity is imperative in order to develop conservation management measures in a world experiencing an unprecedented species extinction crisis.

- ❖ **Dr. Eve Lucas** awarded **£1,856.50** to part-fund a visit to Kew for **Marcelo Tome Kubo's (Brazil)** to carry out a survey of genes influencing evolutionary development in tribe Myrteae. Myrtaceae is a bogeyman for those seeking to manage species diversity in tropical biomes because it is so hard to confidently distinguish genera and identify species. This project is focused on the mega (species) diverse and taxonomically complex neotropical tribe Myrteae that contains two large genera that have evaded classification for over two centuries due to extreme morphological confusion. Published studies from Kew Science have made significant progress in understanding the early development of morphological characters both most often used to identify Myrteae taxa, but also that are the most confusing because although they look the same, they have evolved in different ways. This study is focused on one such character, the architecture of the Myrteae inflorescence. The next step is to investigate the genetic differences responsible for producing inflorescences that look the same, but that have different developmental origins. With this information and by combining it with Myrteae family trees, we will better understand relationships within the tribe will gain a suite of additional taxonomic characters with which to confidently interpret phylogenies and ultimately underpin much needed monographic revision in the taxonomically difficult genera of tribe Myrteae.
- ❖ **Dr. Justin Moat** awarded **£3,310** to part-fund a five-week visit to Kew for **Mr. Lucas Peixoto Teixeira (Brazil)** in respect of the project "Climate change impact on Caatinga biodiversity". It is widely recognised that global climate change is going to change the distribution of species across the global and threaten biodiversity in many ecosystems. How species distributions will be shaped in a warmer world is still not fully understood, especially for plants in semi-arid areas, which tend not to thrive in increasingly wet or arid climates. The Caatinga, the largest Brazilian seasonally dry tropical forest is already subject to high levels of environmental degradation and is at great risk of desertification. The consequences of global climate change in Caatinga are still poorly understood. The aim of this project is to model the distribution of hundreds of plants species native to Caatinga, identify biodiversity hotspots and evaluate impact of climate change on these areas so that we can make recommendations as to appropriate conservation action.
- ❖ **Dr. Alex Monro** awarded **£1,595** to fund three-week visit for **Mr. Daniel Santamaría (USA)** in respect of the project "Naming and revision of the neotropical forest dominant *Virola* (Myristicaceae)". *Virola* is a genus of ca 60 species of tree in the nutmeg family (Myristicaceae). *Virola* are dominant in the lowland rainforests of Latin America. They are important sources of food for rainforest mammals/ birds and also sources of timber. They are most famous, however as a major source of poisons and hallucinogens for native peoples. They also have many folk medicinal uses, from treating tumours, toothache to skin ulcers. Despite its ethnobotanical, ecological and economic value, the species of *Virola* have not been reviewed since the 1930s and there are few people with the knowledge to identify them. This will provide support for Daniel, a Costa Rican botanist, who is undertaking a revision of the genus to review the very important collections of this group held in the Kew herbarium where he will add value to them by identifying all 38 boxes of our collections, including 6-10 new species, which he will then publish jointly and in doing so provide some support for their conservation. Daniel will also provide a masterclass to Myristicaceae identification to Kew botanists so that they are better placed to identify them in the future.
- ❖ **Prof. Mark Nesbitt** awarded **£2,050** to part-fund a three-week visit to Kew for **Dr. Art Whistler** in relation to the project "Botanical identification of Pacific artefacts in Kew's Collections". Kew's collection of plant raw materials and products from Pacific islands is of exceptional importance as it is well-provenanced and usually identified to plant species. Much of it dates to the mid-nineteenth century and records crafts and plant uses that have in some cases been lost. Portions of the Economic Botany Collection, such as barkcloth (tapa) are already used in research programmes that have led to

new links with Pacific botanists and with indigenous makers and researchers. Examination of the Collection by Art, a pre-eminent specialist in Pacific botany and ethnobotany, will enable a comprehensive species-level identification to be applied or checked to most of Kew's ethnobotanical specimens from the region, greatly increasing its usefulness. The results of this work will be shared by updating specimen records on Kew's collection database, publishing a research paper, and hosting an event for Pacific community members in London to discuss the research findings with Kew staff and Art. The work also helps develop Kew's ethnobotanical connections with the Pacific, and plans underway for further research in the region.

- ❖ **Dr. Eimear Nic Lughadha** awarded **£905** to part-fund a two-week visit to Kew for **Dr. Karen Bacon (Ireland)** in respect of the project "Hidden extinctions: assessing plant traits and extinction risk in Legumes". It is often said that "fossil plants do not exhibit mass extinction" but reports by Kew, the IUCN and others state that up to 20 – 30 % of plants are currently at risk of extinction. This project attempts to disentangle the evidence underlying this apparent contradiction. One potential reason for the contradiction is that the plants most likely to go extinct are the very ones that are least likely to be preserved in the fossil record. The aim is to test this hypothesis by studying the leaf traits of a variety of different legumes with a range of life forms and extinction risk assessments. Then test whether legumes listed as at risk of extinction and those currently listed as not threatened share features that make them more or less likely to be preserved in the fossil record. This will provide pilot data for a larger grant application and will also generate a scientific paper focused on legumes. Legumes have been selected as the target family for this study because they are geographically widespread, economically important and show a wide range of morphological variation. They also have a good fossil record, making morphological comparisons to fossil plants relatively straightforward.
- ❖ **Dr. Tuula Niskanen** awarded **£3,200** to fund a seven-week visit to Kew for **Anna Berthe Ralaiveloarisoa (Madagascar)** in relation to the project " New species of Hygrocybe from Madagascar". Majority of the fungal diversity of Madagascar is unknown and natural habitats are rapidly vanishing. Basic taxonomical research is urgently needed to provide fundamental knowledge of these important players of the ecosystems. The aim of this project is to study the taxonomy and evolution of the genus Hygrocybe in Madagascar. Five species will be described as new and the study will also shed light to the evolution of this genus. The purpose of the visit is to gather data and gain skills to complete the third manuscript of Anna's PhD thesis. Proper facilities for microscoping and bioinformatics are lacking and access to international publications is limited in the University of Antananarivo and this visit will be extremely important for the progress of her PhD work. This study will create baseline data of fungi to increase capacity in Madagascar for conserving and enhancing biodiversity and natural capital. In addition, species will be presented in iNaturalist to be viewed by a broad audience. This study will also build capacity for mycological research for the partners University of Antananarivo, Kew Madagascar, National Herbarium at Parc Tsimbazaza, and Centre National de Recherche sur l'Environnement in Madagascar, through the partnership with Kew Royal Botanic Gardens.
- ❖ **Ms. Kiri Ross-Jones** awarded **£1,300** to part-fund travel to Kew for **Prof. Abena Dove Osseo-Asare (USA)** present a keynote talk for Kew's *Botany, Trade & Empire* conference. *Botany, Trade & Empire* is a one-day conference in May 2020, designed to promote use of Kew's Miscellaneous Reports collection. This will build on the Wellcome Trust Research Resources Grant (2018-2020) which funded its cataloguing and conservation, and which has highlighted the extraordinary global coverage and depth of its contents. The reports are by far the most important resource for understanding Kew's global networks in the period 1840-1940 and, by extension, the role of plants in trade and empire. Much of this material is crucial to understanding the current day status of useful plants. The Wellcome project has made it much easier to discover and access the contents of the Reports; the key aim of this conference is to widen the user base beyond our existing networks, particularly to under-represented

BAME and Indigenous communities, and to independent researchers. Abena (University of Texas) will undertake a short research visit and present a keynote speech raising the visibility of the conference, demonstrating Kew's openness to new approaches, and acting as a catalyst for future research directions, particularly those at the interface of humanities and plant science.

Section C: Travel to botanical and mycological institutions

RBG Kew's collections provide a rich resource for plant and fungal enquiry. However, their usefulness can be enhanced by visiting and working at other institutions around the world in areas where Kew's collections or expertise are lacking. The Trustees have supported four projects for 2020, one in Africa, one in Asia, one in Europe and one in South America.

- ❖ **Stuart Cable** awarded **£760** to fund a visit to CIRAD at Montpellier to work on models of deforestation for Madagascar with Ghislain Vieilledent. Based on current rates of deforestation, the forests of Madagascar are expected to have mostly disappeared by 2050. This collaboration will add greater resolution to the effects on biodiversity, leading to one or more scientific publications and improved evidence for government, NGOs and protected area managers.
- ❖ **Dr. Sichong Chen** awarded **£1,100** to fund a visit to University of Göttingen to work with Prof. Holger Kreft's research group in respect of the project "Plant dispersal and defence on islands and on continents". Due to the geographic isolation and ecological simplicity of islands, species on islands exhibit differences in biology, ecology and physiology from those on continents – "island syndrome". The idea that island species have evolved reduced dispersal and defence can be dated back to Darwin, but the available evidence is only based on a few regions and taxa. The aim is to provide the first global-scale quantification to test this long-standing idea, using a series of plant life-history traits relating to dispersal and defence. Because of the massive data compilation and essential communication to disentangle the relationships, this proposal enables a short-term stay within Prof. Holger Kreft's research group at the University of Göttingen, a world-leading centre for the study of biodiversity, macroecology and biogeography. The data from this group (i.e., the GIFT database – a global archive of plant checklists and functional traits) will be combined with data in Kew's collections and Sichong's existing compilation. This collaboration will combine our expertise, knowledge and data, to advance the current understanding of global patterns in the evolution of plant traits and functional diversity. It will also pave the way for deep exchanges and promising long-term projects between members of the two institutes.
- ❖ **Dr. Tom Prescott** awarded **£1,539** to part-fund visits to the Padjadjaran University, Java & Udayana University, Bali in respect of research for the project "Antifungal assay training and establishing contacts with Indonesian researchers". The purpose of this proposal is to establish a research collaboration with an Indonesian natural product research lab headed by Prof. Unang Supratman at Padjadjaran University, Indonesia. Tom will travel to Indonesia and teach their researchers how to carry out the preliminary screening step used in Kew's antifungal natural product research. The end application for this research is to find antifungal plant extracts that can be used as low-cost replacements for agrochemical fungicides. The aim is to establish a research collaboration in which isolation of active compounds from active plant material can be carried out in Indonesia, and then active compounds sent on to Kew for more advanced testing. This will greatly increase the efficiency of this collaboration as the Indonesian researchers need only focus on those plants/compounds that show antifungal activity. In the short term a collaborative publication between Kew and the Indonesian researchers will be enabled and demonstrate proof of principle in working over long distances. This in

turn could leverage funding for a research grant proposal to the Newton Indonesia scheme focusing on plant-based alternatives to fungicidal crop sprays.

- ❖ **Mr. John Richard Ironside Wood** awarded **£3,375** to part-fund a visit to Colombian Herbaria in Bogota and Medellin to revise the collections of Acanthaceae. The aim of this proposal is to revise the collections of Acanthaceae in the principal Colombian herbaria in Bogota and Medellin. This is a large family of flowering plants in Colombia with 355 species of which 60% are endemic to Colombia, one of the highest percentages of any large family. The Acanthaceae collections in Colombia have never been revised and it is expected that they contain many additional new species. This study will constitute a significant contribution towards our knowledge of the Colombian flora, will identify key endemic species for conservation and is expected to result in several significant publications drawing attention to conservation priorities, revised taxonomies, as well as describing new species.

Section D: Travel to and presenting at conferences

Conferences bring researchers and others together enabling them to compare notes, establish new collaborations and seek out new funding opportunities, as well as helping to maintain Kew's premier international research reputation. The awards in this section contribute towards Kew staff making presentations, spoken or in poster form, and organizing, at conferences around the world. The Trustees have provided funding for Kew staff to attend three international conferences during 2020, one in Africa, one Australia and one in South America.

- ❖ **Dr. Raquel Pino Bodas** awarded **£3,108** to attend and present a talk at the 9th International Association for Lichenology Symposium (IAL9), Brazil. She will present her results on the genus *Pilophorus*, a group of interesting lichens. The IAL happens every four years and promotes the study and conservation of lichens, gathering the global experts in lichenology. This congress is an excellent opportunity to disseminate the outputs that RBG Kew is currently producing on lichen research. The results of *Pilophorus* studies will be of great interest for the lichenologists community because few studies have been focused on this genus and no phylogenetic studies have been carried out up to date. She will also attend to a post-congress excursion in order to collect useful material of lichens for other projects in which Kew is involved.
- ❖ **AETFAT2020** will be the 22nd meeting of the **Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale or Association for the Taxonomic Study of the Flora of Tropical Africa (AETFAT)** since it was established in 1951. It will be held in Livingstone, Zambia from the 23 to 27 March 2020. The AETFAT conference takes place every three years and is widely regarded as a key event for the exchange of information on African botany. The conference is the most important meeting for many plant taxonomists, ecologists, and ethnobotanists, including Kew's specialists of the African flora. Seven Kew Science staff members have received awards to attend the Conference.
 - **Dr. Martin Cheek**, Senior Research Leader and Head of (Africa team), awarded **£1,500** to part-fund his participation at the Conference. Martin will convene a symposium on the desperate need for conservation of plants in Africa, and will also be presenting a plenary speech on progress with TIPAs (Tropical Important Plant Areas) to update the congress on the plenary given at the AETFAT in Nairobi 2017. This received great interest from many countries. TIPAs is a Kew-led, science strategy (2015-2020) output, that seeks to evidence and support implementation of the most important areas for plant conservation in the tropics seeking to address the problem that one in five of the world's plant species are threatened with extinction. Of the seven areas that Kew seeks to implement TIPAs globally, four are in tropical

Africa, and two, Guinea and Cameroon, are the direct responsibility of Martin who will also be making presentations on these two projects.

- **Dr. Olwen Grace**, Senior Research Leader (Integrated Monography), awarded **£2,050** to fund her participation at the Conference. Olwen's research programme at Kew focuses on the systematics and evolution of water storage in succulent plants, and how they will respond to climate change. She focuses on the diverse and charismatic genera Aloe (Xanthorrhoeaceae) and Crassula (Crassulaceae), which share a similar distribution pattern with centres of diversity in southern Africa and East Africa. Her group has become an international hub for research on xeric succulent plants, leading the systematic advances on both genera. She works closely with collaborators in Ethiopia, Kenya, Tanzania, Namibia, South Africa and Madagascar, and co-supervises four PhD students at African universities. With this momentum, she intends to initiate new lines of investigation and share the outcomes of her work to date. Building on this momentum, she has co-convened with Dr Emily Wabuye (Kenyatta University, Kenya) the 'Plant adaptations, succulents and arid plants' theme of the upcoming this conference.
- **Dr. Jo Osborne**, Project Officer, Mozambique Tropical Important Plant Areas (TIPAs) Program, awarded **£801** to part-fund her participation at the Conference. Jo will give a presentation on behalf of the team working on Mozambique's Tropical Important Plant Areas (TIPAs) programme, a collaboration between Mozambique's Agricultural Research Institute (IIAM), Eduardo Mondlane University and the Royal Botanic Gardens, Kew. The Mozambique Tropical Important Plant Areas (TIPAs) programme was launched in 2015 with the aim of identifying and documenting the most critical sites for plant conservation in Mozambique, promoting their conservation and sustainable management. The conference presents an ideal opportunity to share and promote the research of the Mozambique TIPAs programme, which is highly relevant to the theme of this 22nd conference: "Diversity and conservation of African plants: challenges and opportunities". The presentation will include the distributions of Mozambique's endemic, near-endemic and threatened plant taxa and Mozambique's Important Plant Areas identified so far.
- **Dr. Philippa Ryan**, Early Career Research Fellow (Economic Botany), awarded **£1,561** to fund her participation at the conference. AETFAT is held every three years and is the main meeting place for those scientists studying the vegetation and taxonomy of the wild plant and fungal species of Tropical Africa. Philippa will give a presentation on the "Ethnobotany of useful plants and traditional crops in Nubian agricultural systems". Building on earlier research projects in which she has documented recent changes in crops grown – her new fieldwork in 2019 investigated more broadly all traditional plant uses within the same local settings, and with a special focus on wild edible plants. She has been invited to be the convenor and chair for the conference session on "Ethnobotany and use of African plants", which presents an opportunity to build new collaborations with researchers and botanical organisations.
- **Dr. Xander Van Der Burgt**, Curator and Field Officer (Africa Team), awarded **£1,720** to part-fund his participation at the conference. Xander will present two research projects on which he is working on. Several of his teams' research projects in which he is also involved, will be presented as well. This conference will provide him with the opportunity to meet and build on working relationships with African colleagues and other researchers studying the African flora.
- **Dr. Maria Vorontsova**, Research Leader, awarded **£2,200** to fund her participation at the conference. She will present her talk *African grasses have conquered the world*. She will build and maintain her professional network of grass taxonomists and botanists with an interest of African and Malagasy grasses. Arrangements will be made for grass identification assistance, new student projects, field work sampling agreements, and joint grant applications.

- **Mr. Martin Xanthos**, Curator-Botanist (Africa & Madagascar Team), awarded **£700** to part-fund his participation at the conference. and give an oral presentation on the Cyperaceae (Sedge family) to the international scientific community.
The Cyperaceae are a tropically diverse group of plants, related to grasses, where numerous species form complexes i.e., species closely related to each other to the point that the boundaries between them are unclear. One such complex is *Cyperus margaritaceus*; a pan African species adapted to fire regimes. Morphological and molecular analysis has been carried out and the use of statistical analysis aims to clarify the relationship between *C. margaritaceus* and its closest relatives. This approach will have positive implications for its conservation in the wild and contribute to a better understanding of its ecology. The findings of the analysis will be presented as an oral presentation at this conference.
- ❖ **The Australasian Seed Science Conference (ASSC)** will be held in Canberra, Australia from 5 to 9 April 2020. This conference brings together researchers and practitioners from across Australasia to discuss all aspects of conservation seed banking and seed use, building on the success of the previous Seed Science Forum. It is organised by the Australian Seed Bank Partnership (ASBP), formed of the nine seed banks in Australia. Two Kew science staff members have received awards to attend the Conference.
 - **Dr. Elinor Breman**, Conservation Partnership Coordinator, (Europe and Australia), awarded **£3,165** to fund her participation at the conference. Elinor represents Kew on the ASBP Steering Committee. In addition to her oral presentation Elinor will help to deliver a workshop on best practice in seed conservation and organise the initial meeting of the proposed Australasian network of seed conservation and research practitioners. Outside the conference Elinor will take the opportunity to meet with Millennium Seed Bank partners to discuss on-going projects, including travel to Brisbane to meet with new personnel at the seed bank at Mount Coot-tha.
 - **Dr. Kate Hardwick**, Research Leader (Americas team) awarded **£2,360** to part-fund her attendance at the Congress. The Millennium Seed Bank (MSB) has collaborated with Australia for years but the wider Asia and Pacific programmes are relatively new. Focusing on islands and biodiversity hotspots, there are current or recent projects at least 13 countries in the region. To date the partners have had little interaction with each other: an Australasia-Pacific regional seed bank network would enable the MSB partners to come together to share ideas, promote best practice, discuss common issues and collaborate on multi-partner research and conservation projects. Specifically, the participation of Kate Hardwick in the ASSC has the following objectives: strengthen Kew's existing ties with MSB Australasia-Pacific partners and facilitate new ones; allow Kate to present a conference paper with the working title, "What next for native seed banking in Australasia and the Pacific?"; to co-organise a conference workshop to explore options for setting up an Australasia-Pacific native seed conservation network and to co-organise a seed conservation training course to build capacity for delegates from Australia, Asia and Pacific countries.

Section E: Marjorie Hurley - Restricted fund for the preservation of wildflowers at RBG, Kew and Wakehurst Place

The trustees have made three awards for projects running in 2020, from the Marjorie Hurley Fund, bequeathed for the preservation of wildflower sanctuaries at Kew's world-leading botanic gardens.

- ❖ **Sandra Bell** awarded **£578** providing continued support for Honeybees for Pollination at Kew. The threats to pollinating insects worldwide seem to grow worse with each year. In many countries including the UK honeybees are excellent pollinators as they are generalist feeders visiting a wide range of flowering plants to feed and inadvertently pollinating them as they do so. Under favourable conditions honeybee numbers respond well to good husbandry and their increasing numbers improve pollination within their foraging area. Thanks to the support of the Bentham Moxon Trust and our beekeeping volunteers, hives have been maintained on the Quarantine House meadow since 2013 and the bees from them pollinate plants both inside and outside Kew for up to 10 months of the year.
- ❖ **Sandra Bell** awarded **£2,430** to conserve Kew's most vulnerable native wildflowers. Some populations of UK native wildflowers growing in the Gardens are easily and unwittingly threatened or even lost as a result of developments designed to meet Kew's objectives. This ongoing initiative seeks to locate and map the rarer wild plants and archive the data gathered for the future. The plants are photographed, vouchered, verified and their seeds are collected for storage at Kew and in the Millennium Seed Bank to offset future losses. Some of the rarer wild plants are being grown from seeds either to allow more seeds to be bulked up or to establish new populations in safe sites in The Gardens. Both permanent and temporary interpretation for the public are being facilitated. Local conservation organisations are being encouraged to use part of the seed stocks to re-establish wildflowers which have been lost to urban development.
- ❖ **Chris Stubbings** awarded **£1,000** to support Honeybees for pollination at Wakehurst. At Wakehurst there are 10 thriving hives which have increased the pollination of many plants and showcased the importance of insects in their role as pollinators in line with the National Pollinator Strategy. This award will help to continue this vitally important work and to maintain healthy bees by brood changes to prevent brood diseases. The main frames which the bees live on will be changed, treatments for varroa mite and the funding of new beekeeping equipment will enable vital work.