Bentham-Moxon Trust

Summaries of grants awarded in December 2017

The Trustees made their awards in December 2017 for projects running between 1 January and 31 December 2018

Section A: Awards for plant and fungi 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 10 of Kew's research projects running in 2018 including three in South East Asia, two in Africa and two in Central America.

- **Dr. Bill Baker** and **Benedikt Kuhnhäuser** awarded **£4,500** to part-fund a four-week expedition to Borneo's rainforests to study palms, gathering data to update the palm tree-of-life. Tropical rainforests are the most diverse terrestrial ecosystems on earth, housing more than half of the world's species in 7% of the total land surface. Despite their importance, rainforests are being destroyed at an unprecedented rate, diminishing our ability to answer fundamental scientific questions about them. What species occur there? Where, when and how did rainforests evolve? Why are rainforests so diverse? Bill and Benedikt will use palms as a model group for rainforest research to understand how the astounding diversity of rainforests evolved. In Borneo they will collect essential material that is lacking at Kew to build a tree-of-life of all palms of Borneo, focusing especially on the climbing rattan palms. They will use the latest genomic methods to collect DNA data at an unprecedented scale for palms, an essential framework for evolutionary research. Their expedition will yield large numbers of new specimens for scientific research as well as creating capacity building opportunities for UK-based students and their Malaysian counterparts, contributing to a new generation of palm experts.
- **Dr. Sidonie Bellot** awarded **£2,700** to fund a three-week expedition to Bogor (Indonesia) to collect *Pinanga* and other Indonesian palms. Palms are a major component of South-East Asian rainforests and play important roles in the livelihoods of South-East Asian people. Knowing how plants diversified and how their distribution was influenced by past climate change will help us to predict how palms, and whole rainforests, may react to environmental transitions. Achieving this requires producing genomic data for as many palm species as possible in order to elucidate the palm tree-of-life. A major gap in Kew's sampling is the hyper-diverse genus *Pinanga* of which many species can only be found in Indonesia, where some are used as medicinal remedies or handicraft material. The mechanisms behind the diversity of *Pinanga* may be related to its variation in genome size, but more studies are needed to characterize the links between genomes, ecology and tropical diversity. Sidonie's time in Bogor collecting palms will produce genomic data for all species, facilitating future identification of

palms and their uses and improving the palm tree-of-life. The resulting tree-of-life will give deep insights on the shaping of South-East Asian biodiversity and on its adaptability to environmental changes.

- **Leif Bersweden** awarded **£3,000** to part-fund fieldwork in France investigating species integrity and gene flow in orchids. Four English orchids in the genus *Orchis* [man orchid (*O.anthropophora*), lady orchid (*O.purpurea*), military orchid (*O.militaris*) and monkey orchid (*O.simia*)] hybridize when they co-occur here and on mainland Europe, creating populations of plants intermediate in appearance. Some hybrids appear to be evolutionary dead ends, whereas others backcross to their parents giving rise to a morphological (structural) and genetic spectrum with the two parent species at either end and the hybrids occupying the space in-between. Preliminary data show that some English morphologically "pure" populations in fact show genetic contamination from historic hybridization events. The lady orchid includes two genetic lineages, which could be equivalent to species, although morphological differences have yet to be detected. New DNA sequencing techniques now provide the opportunity to further tease apart relationships among these species and to characterize hybridization patterns. Results from Leif's work will lead to a greater understanding of species coherence in this group, improved understanding of hybridization patterns and better informed conservation management.
- **Dr. Aaron Davis** awarded **£3,575** to fund a two-week expedition to Pemba and Quelimane in Mozambique to survey three poorly known wild coffee species, namely *Coffea racemosa*, *C.zanguebariae* and *C.salvatrix*. All three species are indigenous but unrelated. There is small-scale production of coffee using *C.racemosa* at Pemba and limited beverage use of the other two species. Aaron's visit to Mozambidue will focus on investigating the development of niche coffee crops in dryland areas in response to a call from interested parties. There is an urgent need to develop new, climate resilient and especially drought tolerant coffee crop species. Arabica coffee (*C.arabica*) and robusta coffee (*C.canephora*) are the two main species used in global production but recent droughts in East Africa, Brazil and Vietnam have shown that long-term, increased temperatures linked to decreasing rainfall poses serious questions regarding the sustainability of these two coffee crop species. This project will also form part of a broader investigation into: climate-resilient coffee-crop development; the fundamental traits of drought resilience and a better understanding of the conservation status of the three study species.
- **Dr. Mark Lee** awarded **£2,883** to part-fund fieldwork in the north of England measuring how forage plant nutritional values are affected by the environment. Forage plants provide a valuable service by feeding our livestock, delivering meat, milk and other commodities. Variation in forage nutritive values changes animal growth rates, milk production and reproductive success. In the case of ruminants such as cattle and sheep, nutrition also changes the amount of methane (a greenhouse gas) that is produced. Mark's previous work used models to produce projections showing that warmer temperatures cause plants to be tougher for livestock to digest. To show this in the field and to further refine his models, Mark will measure changes to the nutritional value of forage plants across a climatic gradient, to quantify how nutrition is changed by the environment. Using three common forage grasses that livestock commonly consume he will quantify how the nutritive value of these grasses change with elevation, up a mountain in the UK. These surveys will utilize natural gradients in growing conditions such as climate, rainfall and light intensity which vary with elevation. This study will also give insights into how nutritional value may be influenced by climate change.
- **Dr. Ilia Leitch** awarded **£4,702** to fund an expedition to Kruger National Park, South Africa investigating how genome size impacts savannah ecosystem dynamics. A key global challenge facing humanity is to increase crop yield whilst maintaining biodiversity. This challenge will become more acute as the

human population continues to grow. Ilia's proposal is that an essential yet missing link in rising to this challenge is a lack of understanding of how nutrients nitrogen and phosphorous and different herbivores, interact with plant species that differ in genome size (the amount of DNA in the nucleus) to influence how and where plants grow. Fieldwork in the African Savannah will test the overall hypothesis and if correct, Ilia will have discovered a major component influencing plant community dynamics in African Savannahs with implications for the livelihoods of many people and nature conservation. Indeed, such knowledge can be incorporated into models that better predict the future of savannah ecosystems in the face of climate and land-use change and also inform how best to manage and conserve the habitat for people and wildlife.

- **Justin Moat** and **Gwilym Lewis** awarded **£4,600** to part-fund an expedition to Peru to carry out vegetation and species mapping and monitoring. The project will utilize both traditional taxonomic (classification) plant surveys and remote sensing surveys using an Unmanned Aerial Vehicle (UAV or drone). Building on earlier work it will cover two areas. In the dry forests in northern Peru a particular focus will be on huarango trees (*Prosopis palida*) which are currently infested with a disease causing over 60% die-back in areas where livelihoods have historically depended on the forest. This work will allow Kew to quantify infested trees, detect where action is most needed and provide a continuing baseline for monitoring. The team will also give community talks and demonstrations in Peru to raise awareness of the *Prosopis* plague issue. In southern Peru the team will, amongst other things, survey the costal fog Lomas habitat. Surveys will look at dune vegetation which contains a high number of new species. Further surveys on control plots will assess the numbers of plants and species to compare to previous years. Surveys from this project should contrast with vegetation surveys from 2016 which was an El Niño year.
- **Dr Alexandre Monro** awarded **£3,612** to part-fund his participation in an expedition to Amistad National Park (La Amistad), a biodiversity hotspot spanning the border between Costa Rica and Panama. La Amistad is a World Heritage property and the aim of the expedition (organized by a local university) is to determine the diversity of an unexplored sector of the park in support of its management and conservation. It is an area of exceptional plant diversity but significant areas remain unexplored due to the steep nature of the terrain, lack of roads and expense of field access. This expedition builds on nine previous ones, lead by Alexandre, that have so far resulted in the discovery of 35 species of plants, many new records of species for both Costa Rica and Panama, the classification of the vegetation of the Park and a checklist of the flora. It is highly likely that this expedition will result in the documentation of species new to science and or Costa Rica. It will also provide an opportunity for the vegetation and any human impacts in this sector of La Amistad to be documented and communicated to the binational commission responsible for its management.
- **Dr. Oscar A. Pérez-Escobar** awarded **£2,500** to part-fund a three-week field trip to the cloud forests of Costa Rica and Colombia to study genome size and diversification in Pleurothallidinae orchids. The extremely high plant diversity in the American tropics are thought to be the result of many factors including mountain formation processes and plant-animal interactions. However, how important biological processes linked to changes in genome size and diversification have affected speciation remains poorly understood. Because the diversity of Pleurothallidinae orchids peaks in mountainous areas of Central and South America, Oscar will collect fresh material from these orchids in Costa Rica and Colombia to document genome size diversity in this most species-rich sub-tribe. This will enable the link between changes in diversification and genome sizes to be understood for the first time using high-throughput-sequencing and flow cytometry methods. Fieldwork and laboratory work will be carried out in cooperation with Dr. Ilia Leitch (Kew Gardens), Lankester Botanic Gardens (LBG) and

University of Costa Rica. Genome sizes will be linked to herbarium specimens logged in the herbarium in Costa Rica and at Kew. This project will capacity-build graduate students based at LBG in orchid taxonomy (classification) and modern phylogenetic (evolutionary) methods.

- **Dr. Andre Schuiteman** awarded **£2,150** to part-fund a field trip to Cambodia to collect specimens of Orchidaceae (the orchid family). Cambodia is poorly explored botanically and material from this country is sparsely presented in Kew's collections, so more collections are needed to fill gaps in our knowledge of the flora of the region. This field trip will bring in new material for both the living collections of Phnom Penh and at Kew and the Herbarium/DNA bank. This will be a source for research and will be of value for a future volume on Orchidaceae for the "Flora of Laos, Cambodia and Vietnam" and for a field guide to the orchids of Cambodia. This expedition follows on from successful trips to Cambodia made by Andre in 2013, 2015 and 2016, resulting in valuable collections of living orchids for Kew, many species never cultivated before. New species for science have been identified from past collections as well as many new records for Cambodia. Photography, both in the field and at Kew will provide images of species not previously photographed, or inadequately so.

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, analyzing and improving the quality of its collections. The Trustees have made 13 awards for these types of projects running in 2018. The awards in this section are always given via a Kew staff member.

- **Dr. Ruth Bone** awarded **£2,230** to fund **Nicholas Wightman's** attendance on the Tropical Plant Identification Course at Kew. Nicholas is already established at the heart of a small environmental and botanical research community in Zambia, his home country. Zambia has diverse and interesting flora that is under threat from both small and large-scale agricultural expansion as well as destructive industries such as mining and logging. Unfortunately there are very few qualified botanists working in the country to continue documenting its flora or to push for the conservation of its habitat. Kew's current wild edible orchid project (funded by the Darwin Initiative) and our Zambian colleagues' successful bid to host the Association pour l'Etude Taxonomique de la Flore d'Afrique Tropical Conference in 2020 (AETFAT 2020) in Livingstone, has engendered optimism in the natural sciences community in Zambia. Nicholas is already installed as Project Manager on the edible orchid project and his attendance at the Identification Course will improve his botanical knowledge and enhance his ability to use professional taxonomic (classification) methods to identify plants up to family level in Zambia. Whilst at Kew Nicholas will also work with Kew staff at the Millennium Seed Bank on project development ideas.
- **Dr. Gemma Bramley** and **Marie Briggs** awarded **£3,860** to enable **Peter Homot**, a curator and botanist from Lae National Herbarium in Papua New Guinea (PNG), to train at Kew for four weeks in 2018. Peter has been identified by the Head of Lae Herbarium (a key partner institution for Kew) as a staff member who will benefit from intensive training in plant identification, curation and herbarium-based taxonomic (formal classification) research techniques that Kew specialises in. The project has a very strong capacity building element which has far reaching benefits in terms of conservation as PNG is an area of extreme biological diversity, but remains poorly explored and lacks in botanical training capacity. During his visit Peter will gain formal training in plant identification through the two week

Tropical Plant Identification Course before spending an additional two weeks in the Kew Herbarium with specialist curators and researchers, with access to Kew's extensive New Guinea collections. This will be of benefit to both Lae Herbarium, through transfer of skills, and to Kew, through the support of Kew's Science Strategy, as New Guinea has been identified as a Tropical Important Plant Area (TIPA) candidate.

- **Dr. Elinor Breman** awarded **£1,734** to part-fund **Bogdan-Iuliu Hurdu** from the Institute of Biological Research (ICB) in Romania, to travel to Kew's Millennium Seed Bank (MSB) at Wakehurst for two weeks training on specific methods employed in seed trait measurements, to acquire new data on dispersal-relevant seed traits for Carpathian endemic species. The knowledge of Kew specialists on seed research will offer Bogdan a unique opportunity to learn new techniques and obtain novel data on specific seed traits that affect the dispersal capacity of *Draba*, a large genus of plants in the Brassicaceae (the cabbage family), many endemic to the Carpathian Region. Moreover, the study will be concerned with other endemic species from the Carpathians which will help to better understand the impact of dispersal capacity on range-restriction processes observed in endemic elements and provide insights into the causes of endism. It will also help to improve current conservation strategies applied to these rare elements within their narrow Carpathian distribution range. This project will offer significant benefits for the ongoing collaboration between Kew's MSB and ICB which is part of a regional project "Conserving the Endemic Flora of the Carpathian Region" that includes both conservation and research.
- **Marie Briggs**, **Claire Drinkell** and **Renata Borosova** awarded **£2,300** to fund **Willem de Wilde** and **Brigitta Duyfjes**, both research associates at Naturalis in Leiden, Netherlands, to visit Kew's Herbarium for three weeks to work on Myristicaceae (the nutmeg family). Asian plant experts Willem and Brigitta have each worked for over 50 years on plants of the Flora Malesiana region, which is the focus of Kew's Asia team and consists of Indonesia, Malaysia, Singapore, Brunei, the Philippines and Papua New Guinea. Their knowledge of the economically important Myristicaceae in Asia is unsurpassed. They will work on Kew's holdings of the family in the region and also identify the large back-log of unidentified specimens, currently estimated at over 1,500 specimens, which is more than 10% of the overall total. This targeted approached will allow specimens to be incorporated into the Herbarium and to be curated efficiently. Accurate, up-to-date curation will facilitate future research projects, maintaining Kew's collection as a world class resource. Willem and Brigitta will also deliver an identification training session for Kew staff and collaborators, to increase future identification capacity of this difficult group.
- **Dr. Martin Hamilton** awarded **£1,924** to fund **Omar Monsegur** on a three-week visit to Kew assessing and digitizing Kew's Puerto Rican collections. Omar, a botanist with the Caribbean Ecological Service Field Office of the US Fish and Wildlife Service is an expert in the rare and endemic flora of Puerto Rico. He will assist the United Kingdom Overseas Territories (UKOTs) team in undertaking a gap analysis of Kew's holdings of rare and endemic Puerto Rican species, around 230 species, and generating a high-quality dataset based on the available Kew material to inform International Union for Conservation of Nature Red List Assessments, provide information for targeting seed collections and inform local conservation initiatives and management. The gap analysis will feed into a funding proposal for a Tropical Important Plant Area (TIPA) project in Puerto Rico. The specimen data generated will assist the development of a major publication on the rare and endemic flora of the Puerto Rican Bank and the UKOTs team will disseminate the specimen data generated with our partners via the UKOTs Species and Specimens database. This will strengthen our collaborations and have a direct impact on species conservation through informing surveys, recovery plans and targeted seed collecting.

- **Dr. Bente Klitgård** and **Rosemary Clegg** awarded **£3,000** to part-fund a 12-week study visit to Kew for Bolivian botanist **Dr. Daniel Villaroel Segarra**, building his botanical skills. Bolivia is one of the focus countries in Kew's Tropical Important Plant Areas (TIPAs) programme and Kew has well established links in Bolivia and is currently four months into a two-year project to designate TIPA sites in the species-rich, yet highly threatened Chiquitania dry forest vegetation in eastern Bolivia. Whilst Daniel, currently consulting with Kew on the project, is a competent field botanist and plant taxonomist (classifier), he lacks the skills needed to undertake the steps used in TIPA designation like geo-referencing and International Union for Conservation of Nature (IUCN) Red List assessments of endemic, rare, range-restricted species, and the other methods involved in site selection. Furthermore, Daniel is very talented, an excellent teacher and showing promising leadership qualities, which are needed to enhance Bolivian botanical research capacity. During his time at Kew, he will benefit from working in the Herbarium to verify the identification of specimens collected during the first project field trip.
- **Prof. Dr. Isabel Larridon** awarded **£1,271** to part-fund **Prof. Muthama Muasya** of the University of Cape Town, South Africa, on a three-week visit to Kew to work on the taxonomy (formal classification) and evolutionary studies of Cyperaceae (the sedge family). Biodiversity conservation and utilization of plants is dependent on unambiguous delimitation (boundaries) and naming of species. Despite the long period of botanical exploration in southern Africa dating to the 18th century, new species continue to be discovered and described. Over the last four years Muthama has worked on specimens of *Finicia* (a genus of Cyperaceae) that cannot be matched to the currently known species from the Greater Cape Floristic Regions (GCFR) and he will use Kew's rich collections of South African specimens of Cyperaceae to resolve these issues. Whilst at Kew, Muthama will also: investigate whether unmatched material of *Tetraria* (another genus of Cyperaceae) from the region on Mpumalanga are distinct from tropical African *Tetraria mlanjensis* and *T.usambarensis*; explore the possibility of future collaboration and developing research proposals for Next Generation Sequencing (of the DNA) of Cyperaceae and strengthening ongoing research on the diversity and evolution of plants in GCFR, a globally important biodiversity hotspot.
- **Dr. Eve Lucas** awarded **£970** to part-fund **Dr. Vanessa Staggemeier**, a post-doctoral researcher at University Estadual Paulista, Brazil for a three-week visit to Kew studying the biogeography of *Myrcia*, a large genus of Myrtaceae (the myrtle family). This study will further the understanding of the evolution and biogeography of *Myrcia* sect. *Aulomyrcia* in the Atlantic forest of Eastern Brazil. Species in this section share a common ancestor and the clade has been proposed as the oldest clade in the genus, with nearly 750 species. In this project Vanessa verified the origin of this group and its dispersal throughout the Atlantic forest biodiversity hotspot, showing how the group evolved and spread through Brazil's Atlantic forests. Additionally, new occurrence data recently collected for the tribes (a ranking above genus but below family) Myrteae and Syzygieae will be used for species distribution modelling techniques to map the potential niche of these species and combine this information with the established phylogenetic (evolutionary) knowledge for Myrtaceae, aiming to reconstruct the climate history of the evolution of fleshy-fruited lineages of Myrtaceae. These analyses will clarify the processes that have led to the mega-speciation witnessed in multiple Myrtaceae genera.
- **Dr. Eve Lucas** awarded **£2,020** to fund **Dr. Duane Fernandes Lima,** an Associate Researcher at Paraná Federal University, Brazil, on a four-week visit to Kew investigating the *Myrcia* sect. *Aquava*, in the large genus *Myrcia* in the Myrtaceae (the myrtle family). Recent work at Kew has established *Myrcia* as monophyletic (having a common ancestor) comprising nine clades that form the basis of a new formal classification where sect. Aguava is recognised for the first time. Duane's studies focus on the

evolution of the mega-diverse genus. This project involves mobilization data gathered or produced using Kew collections and facilities. *Myrcia* comprises nearly 750 species and is widely distributed in tropical South America and plays an important ecological function in fragile Brazilian ecosystems such as Cerrado and Atlantic Forest. However, the difficulty of species-level identification prevents realistic conservation assessments in these ecosystems. *Myrica* sect. *Aguava* contains around 30 species and is one of the most complex groups of the genus for species management and identification. A robust phylogeny (evolutionary history) based on molecular data from cutting edge whole genome (DNA) sequencing techniques will provide understanding of morphological (structural) and geographical patterns inside the group, as well as its relationships within *Myrcia*.

- **Dr. Eimear Nic Lughadha** awarded **£2,700** to fund **Dr. Marcelo Moro**, Adjunct Prof. at Universidade Federal do Ceará, Brazil, to visit Kew for 4 weeks to analyze plant diversity patterns in Caatinga vegetation. Brazil's semi-arid northeastern region has a vegetation type unique to Brazil, known as Caatinga (white forest) due to the lifeless appearance of thorn scrubland during dry seasons. Rainy seasons turn the Caatinga green with deciduous trees, shrubs and short-lived herbs. Rainy seasons are unpredictable and short, so Caatinga plant diversity was underestimated historically with less than 2% of Caatinga fully protected in nature reserves. Recently botanists recognized that Caatinga harbours thousands of plant species including hundreds of endemics, with many more awaiting discovery. Marcelo's PhD research confirmed reports of differences in species composition between Caatinga vegetation on different soil types and showed for the first time that plant communities on these different substrates differ in the extent to which their species are closely-related or distantly-related. Marcelo will quantify the turnover in species and evolutionary structure of plant communities with geological environment and geographic distance across the Caatinga landscapes. This will in turn guide the selection of new protected areas to maximize protection of species and evolutionary diversity.
- **Dr. Hélène Ralimanana** awarded **£2,400** to fund **Guy Onjalalaina**, a botanist at Kew's Madagascan Conservation Centre, to visit Kew for four weeks researching Madagascan Acanthaceae (the acanthus family). The Acanthaceae is Madagascar's sixth largest family of flowering plants with over 500 species representing 65 genera. Over 90% of species and 35% of genera are endemic but the family has not been revised and new species are regularly discovered. The Acanthaceae occur in all ecosystems across Madagascar and is an ideal group to study patterns of diversity. During his time at Kew, Guy's technical training and research will include three main components. Firstly the formal classification of species (taxonomy) of several new species including *Podorungia gesnerioides* from Madagascar, recently described by Guy. Secondly, the compilation of a collections database which will combine data from several sources: Kew Herbarium (496 specimens), Paris Herbarium (2220),Missouri Botanical Gardens (3644) and Kew Madagascar (200). After checking data quality, Guy will work on building a visual identification tool using Zegami software to facilitate identification work. Thirdly Guy will collaborate on a Kew's Plant and Fungi Tree of Life (PAFTOL) project to produce a genus-level phylogeny (evolutionary pathways) for the Acanthaceae of Africa and Madagascar.
- **Dr. Hélène Ralimanana** awarded **£2,200** to part-fund **Vonona Randriansolo** and **Fabien Rahaingoson**, both botanists at Kew's Madagascan Conservation Centre (KMCC) to visit Kew for three weeks training in seed management techniques for a Madagascar Millennium Seed Bank (MSB) project. The MSB programme in Madagascar has been highly successful so far, achieving over 5,000 collections and some 2,500 species. It is estimated that consistent with the rest of the flora, 70% of these species will be classified as threatened with extinction if International Union for Conservation of Nature (IUCN) Red List criteria is applied. Fabien and Vonona's training has four components. Initially they will work on the latest Brahms 8 (software) seed management module as their work in Madagascar involves

coordinating seed collecting by local communities. The visit will also enable KMCC to make the move to electronic data capture in the field using new rugged smartphones. They will get to test this with the help of Kew's GIS (Geographic Information System) team. They will also attend Kew's Tropical Plants Identification Course, receive technical training at Kew's Millennium Seed Bank working with the curation teams and lastly receive 10 days of intensive training on IUCN Red Listing of threatened species.

- **Dr. Maria Vorontsova** awarded **£2,250** to fund **Dr. Neduvoto Mollel**, a researcher at National Herbarium of Tanzania, Arusha, to visit Kew for 3 weeks to collaborate with her on Tanzanian grasses. Neduvoto recently completed her PhD on the flora of Kilimanjaro, Africa's tallest mountain and a unique centre of endemic species. She has, together with a colleague, spent many years studying Mount Kilimanjaro recording and analysing vegetation plots and possesses extensive unpublished data on grasses of Kilimanjaro. Whilst at Kew she will examine, database and verify species level identification for all Kilimanjaro grasses held at Kew's Herbarium. These data will be added to our existing datasets for analysis, and a Grass Checklist of the Kilimanjaro area will be published in the Biodiversity Data Journal. The project will also provide a broad educational experience for Neduvoto and on her return to Tanzania, she will carry out a training workshop on grasses identification for the staff at the National Herbarium. This research will also provide new data for Maria's ongoing analysis of African grass diversity patterns at different spatial scales, provide access to DNA samples from Tanzania and expand her network of grass and savannah collaborators in tropical Africa.

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 two projects for 2018, both in North America.

- **Dr. Laura Martinez Suz** awarded **£2,575** to fund a visit to the Natural History Museum of Utah (NHMU), University of Utah, USA, to work in collaboration with Dr. Bryn Dentinger, Curator of Mycology and Associate Prof. of Biology. Laura's visit has two main goals. Firstly to complete a research article based on earlier work on ectomycorrhizal fungal diversity in Madagascar. Laura and Bryn will create baseline fungal diversity data from two distinct Madagascan ecosystems and explore the host preference of the ectomycorrhizal fungi that form a mutually beneficial association to the roots of native and exotic trees in Madagascar. Secondly the visit will enable the preparation of a joint grant proposal with the NHMU seeking funding from Natural Environment Research Council (UK) and National Science Foundation (USA) to study cryptic specialization in the porcini mushroom, *Boletus edulis*. In Europe *B.edulis* forms a symbiotic (mutually beneficial) relationship with a large number of host plants but in North America it is less promiscuous. The host specialization of *B.edulis* will be explored using various techniques including whole genome (DNA) comparisons and the isolation of mycelium, the fungal network of fine filaments, to compare and test individual *B.edulis* strains isolated from different plant hosts.
- **Dr. Samuel Pironon** awarded **£1,000** to fund a short visit to Prof. Navin Ramankutty's Laboratory at the Institute for Resources, Environment and Sustainability (IRES) of the University of British Columbia (UBC), Vancouver, Canada. Although biodiversity and agriculture are fundamental factors for human

subsistence, ecologists and agronomists rarely work side-by-side. IRES is a world recognized centre of excellence for the study of global agriculture and food security and this collaboration will combine expertise, knowledge and data from RBG Kew and IRES to provide a better understanding of the potential effects of climate change on agriculture in Sub-Saharan Africa by studying the relationship between crop occurrence and performance (production/yield). This project will also allow discussions about how crop yield could be maximized to provide sufficient goods to an ever-increasing global human population with minimum negative impact on biodiversity, with the idea of setting further long-term collaborative projects that bring Kew and IRES together to pursue further common research on major global issues in the future. Bridging the gap between these two disciplines by bringing together two major institutions will help find solutions to important world issues, especially in the context of global change.

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 2018, one in North America and two in South America.

- **Dr. Rodrigo Cámara-Leret** awarded **£2,320** to attend and give a spoken presentation on his research "Conservation Biogeography in New Guinea" at the 103rd Annual Meeting of the Ecological Society of America (ESA) to be held in New Orleans, USA from 3 to 12 August 2018 (https://esa.org/neworleans/). ESA is the most important ecological society in the world with over 10,000 members including scientists, decision makers, policy managers and educators. New Guinea has a rich plant diversity of around 14,000 species and is the largest tropical island in the world yet is poorly understood biologically. To bridge this gap, Kew's Tropical Important Plant Areas (TIPAs) programme in New Guinea aims to identify the most important areas for plant conservation by 2020 in the Indonesian half of the island. Rodrigo will speak about his New Guinea research, focusing on patterns in botanical exploration in space and time, the geographic distribution of plant species, patterns of rarity and the performance of protected areas in conserving plant species under climate change. He will also attend workshops and search out scientific partners to develop joint UK/USA grant applications.
- The **69th National Congress of Botany** will be held in the city of Cuiabá, Mato Grosso, Brazil from 08 to 23 July 2018 (http://www.69cnbot.com.br/cnb). The Congress (CNBot) is an annual meeting of botanists aimed at researchers, teachers and students, both undergraduate and postgraduate. The theme for this year is "Floristic and socio-environmental diversity in the Amazon, Cerrado and Pantanal". In the absence of a Bolivian Congress, this event will enable Kew to showcase its Bolivian Tropical Important Plant Areas (TIPAs) programme to a wider audience and to attend alongside Kew's partners at the Noel Kempff Mercado Natural History Museum, Santa Cruz, Bolivia. Three Kew Science staff members have received awards to attend the Congress.

- **Dr. Bente Klitgård**, Senior Research Leader (Americas team), awarded **£800** to part-fund her participation at the Congress. Bente will promote Kew's Tropical Important Plant Areas (TIPAs) programme and give an oral presentation on the preliminary findings from the programme.
- **Sue Frisby**, Curator Botanist (Americas team), awarded **£800** to part-fund her participation at the Congress. Sue will give a poster presentation illustrating a new species of Compositae (i.e. Asteraceae, the aster or sunflower family) from Bolivia, thereby contributing to and enhancing the Americas team's Bolivia TIPAs project. Sue will also publicize the development of Neotropikey, an interactive online plant identification resource.
- **Rosie Clegg**, TIPAs Assistant (Americas team), awarded **£800** to part-fund her participation at the Congress. Rosie is responsible for a team of eight volunteers and for collating data for the Americas team's Bolivia TIPAs programme. In her role as data coordinator, she will help promote the TIPAs programme and after the Congress will make the short hop over the border into Bolivia to participate in project fieldwork.

- The **XII Latin American Botanical Congress** (XII LABC) will be held in Quito, Ecuador from 21 to 28 October 2018 (http://www.clb.org). Held once every four years, the Latin American Botanical Congress (LABC) is one of the most important botanical conferences in Latin America and provides an unparalleled opportunity to interact with scientists not only from Central and South America, but worldwide, with expertise in a huge diversity of research fields. LABC is an important venue for showcasing RBG Kew research projects in Latin America where Kew is currently a partner on projects in more than 20 countries. Four Kew science staff members have received awards to attend the Congress.
  - **Dr. Bente Klitgård**, Senior Research Leader (Americas team) awarded **£1,750** to part-fund her participation at XII LABC. Bente will contribute several aspects to the Congress including serving as a member of the Scientific Committee; organizing and presenting a symposium on Neotropical legume diversity, a key plant family in the region and an area of Kew excellence and also promote Kew's Tropical Important Plant Areas (TIPAs) programme and give an oral presentation on preliminary findings from the programme.
  - **Dr. Alex Monro**, Research Leader (Americas team) awarded **£1,750** to part-fund his attendance at the Congress. Alex will contribute several aspects to the Congress including organizing and chairing a round table discussion on Kew's TIPAs programme and making two oral presentations – the first on the TIPAs approach to prioritizing areas for conservation and the second on vascular plant diversity of La Amstad World Heritage property that sits astride the Panama-Costa Rica border (see also Alex's award in section A on page 3).
  - **Dr. Jaume Pellicer**, Senior Research Leader (Character Evolution team), awarded **£1,420** to fund his attendance at the Congress and give an oral presentation on his latest research findings in the field of plant genome size in the Asteraceae (i.e. Compositae), the aster or sunflower family, in a symposium dedicated to the evolution of Asteraceae, including the role of plant genomes to infer evolutionary pathways (phylogenomics).
  - **Dr. Oriane Hidalgo**, Career Development Fellow (Character Evolution team), awarded **£1,420** to fund his attendance at the Congress and present an invited lecture on his recent research findings in evolutionary developmental biology of the inflorescence (the structures supporting the flowers) traits and phylogenomics in Asteraceae (i.e. Compositae), the aster or sunflower family. It also provides Oriane with the opportunity to network with other international scientists to discuss and exchange ideas on the evolutionary significance and the implications of plant genome size diversity.

Section E: Restricted fund for the preservation of wild flowers at RBG, Kew and Wakehurst Place

The trustees have made two awards for projects running in 2018, both from the Marjorie Hurley Fund, bequeathed for the preservation of wildflower sanctuaries at Kew's world-leading botanic gardens.

- **Sandra Bell** awarded **£500** providing continued support for Honeybees for Pollination at Kew. It is widely recognized that pollinating insects are under threat as never before. Honeybees make ideal pollinators in the UK as their numbers can easily be increased by good care and they are generalist feeders visiting a wide range of plants, inadvertently pollinating them while taking nectar or pollen. The funds will be used for routine care including the provision of hives, the annual cycle of medication against hive pests such as the *Varroa destructor* mite and the provision of winter feedstuff such as syrup. Thanks to the ongoing support of Bentham-Moxon Trust there are now five thriving hives of honeybees on the Quarantine House meadow, having grown the numbers of bees steadily since the project started in 2013. One of the hives houses the sensor which feeds signals to the Hive, the major installation just off the Broad Walk at Kew, driving the light and sound experience enjoyed by visitors and contributing to the success of this feature, which is now scheduled to remain at Kew for much longer than originally planned. The sensor also gathers data used in collaborative research with Nottingham Trent University.
- **Sandra Bell** awarded **£2,025** to conserve Kew's most vulnerable native wildflowers. Kew's Mission states: "We want a world where plants and fungi are understood, valued and conserved, because our lives depend on them". This project seeks to implement the spirit of Kew's mission in our own backyard – the Gardens themselves. Over the last few years populations of two species of wildflowers have been rescued from development sites within the Gardens and are maintained and bulked up in cultivation for replanting in safer areas. These are Coltsfoot (*Tussilago farfara*) and Sweet Violets (*Viola odorata*). Whilst both are common nationally they are lost in the immediate local area. Meadow Saxifrage (*Saxifraga granulata*) and Wild Clary (*Salvia verbenaca*) are both rare in the Gardens and gone from the surrounding area. New colonies of both have been established from seed on the Quarantine Unit meadow and these are to be increased by preparation and further seed sowing. Further seed collections of Kew's rarer wildflowers will be made and the seeds divided between Kew for immediate use and The Millennium Seed Bank for storage to ensure there will be native wildflowers at Kew for the benefit of future generations and for wildlife.