University Botanic Garden

Annual Report 2015-2016

CAMBRIDGE UNIVERSITY *Botanic Garden*

UNIVERSITY OF CAMBRIDGE

Director's Report

This year the Garden focused its attentions on the collections, putting processes and strategies in place to ensure that they are well curated and accessible to all. Our dynamic role supporting research and education in a range of Higher Education institutions around the world was recognised by the first HEFCE Higher Education Museums, Collections and Galleries award to any Botanic Garden.

My number one goal for Cambridge University Botanic Garden is that it is widely recognised as the go-to institution to access a spectacular range of living plant diversity for research and teaching purposes. This vision might sound grandiose, but actually it involves two simple tasks. The first is to make sure that our living collection (and the herbarium and library that support it) is as diverse as possible, strategically planned to meet the anticipated needs of the global plant science community, with all material properly validated taxonomically, all accessions carefully databased and properly labelled, and with procedures that make it simple for researchers to access the material they need. The second is to make sure that this wonderful collection and its many uses are visible, by shouting about it as loudly as possible whenever opportunity arises. This year we have been working particularly hard to ensure the collections themselves are up to scratch, and putting plans in place for the advertising work – through a new website – to happen next year.

The collections are the primary responsible of our Curator, Dr Sam Brockington, and, as he reports on pages 12–13, he has been focused this year on determining best strategies for future collection management. Our Cory Library, a wonderful collection of taxonomic, horticulture and historical books, was reviewed by an independent panel. The panel reached the conclusion that the books would be better protected and more widely available, particularly to taxonomists, if the collection was moved out of Cory Lodge and housed with the University's Herbarium Library, in the controlled environmental conditions of the Sainsbury Laboratory. The cataloguing and planning for this move is now under way. Sam also looked hard at our databasing and plant labelling facilities, and decided that change was needed. Our old label engraver was replaced with a new laser-operated machine this year. This has dramatically increased our rate of label production, and Sam's team are rolling out a programme to replace all missing and broken labels throughout the Garden. Labels are produced using the information contained on our database, a crucial function for any collection-based organisation. However, our system, a bespoke system called BGBase, which was designed for botanic gardens, had become increasingly clunky. Sam took the decision to buy a new system, BGIris, and migration of our data between the two is currently in progress. The new database will open up a wealth of opportunities for researchers, educators and the visiting public to search our collections directly. Sam's work is vital to our ability to support and facilitate the enormous breadth of research currently based around the Garden's collection (see pages 14–19 for an overview) and is playing an integral role in ensuring our collection is fit to meet the demands of the international plant science community.

The quality and extent of our role in supporting research requests and education needs from universities beyond our own was recognised this summer by the award of an annual grant of £150,000 to the Garden from the HEFCE Higher Education Museums, Collections and Galleries fund. This scheme supports work done by HE collections specifically to facilitate research and teaching in the wider HE context. Our application was focused around the high impact research we support in plant sciences internationally, and around the increasing demand for educational support from a variety of HE providers. This demand comes not only in the shape of requests for botanical education, comparative biology, horticulture and history of science, but increasingly from providers of PGCEs and other education qualifications, seeking support in teaching trainee teachers how to incorporate outdoor learning into the curriculum. Writing the application was a revelation – only by putting everything you do on paper do you realise how much of it there really is. The award itself was announced in September, and the extra funds will make an enormous difference to the proportion of research and teaching requests that we are able to meet. We were also particularly pleased to be the first Botanic Garden ever to receive funding from the scheme.

Horticultural developments this year are described by our Head of Horticulture, Sally Petitt, on pages 4–6. In brief, these have included the development of a new water feature in the New Zealand Terrace Garden, planning for the redevelopment of the Systematic Beds as part of the Monument Trust funded project to enhance their use for education and outreach, completion of the new plantings in the Autumn Colour Area, and the first season of our new Understanding Plants area. Our determination to continuously refresh and improve our plantings contributes to our role in attracting ever-growing numbers of visitors. In 2015-2016 we again set a new record for total visitor numbers, with 273,719 visitors passing through our gates alongside an additional 8,934 schoolchildren on arranged education visits and the many other course, tour and community groups that we welcome separately. The number of members of our Friends scheme also continues to grow, and we are grateful for the support that these regular visitors bring. The new displays in the Understanding Plants area of the Garden showcase research from the Sainsbury Laboratory and the Department of Plant Sciences, using a combination of eye-catching horticulture with imaginative interpretation material to really connect our visitors with the research that the Garden's collections support. We look forward to many more such opportunities in the future as our collection and its international importance grow alongside our visitor numbers.

Professor Beverley Glover, Director

The year in pictures...

The Garden welcomes its new Intake of Trainees in September

Apple Day attracts 4,041 visitors with a bumper crop of apple varieties to try and buy

'Marry Me' Monday – Leap Year 29 February. 1,658 visitors took advantage of the Garden opening for free

Beverley Glover kicks off the 'Science on Sunday' series with a talk on whether we can improve crop pollination by breeding better flowers

Our horticultural staff raises rare and endangered plants to exhibit in the Conflicted Seed + Spirit exhibition in the new David Attenborough Building

Ferns from the Garden's collection are wrapped and dispatched for RHS Chelsea Flower Show

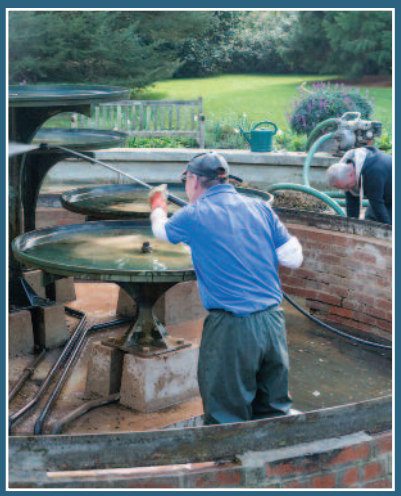
The new Understanding Plants area showcases plant science in action – with displays showing how plants tell the time and how they decide to branch

The Orchid Festival focuses on orchid displays and on some of the great Victorian plant hunters

A wet Twilight but just under 1,000 visitors enjoy our illuminations

The Garden hosts the International Garden Photographer of the Year exhibition

Festival of Plants in May includes talks, tours, pop-up science, Ask the Gardener and stalls. It is also the focus of a Cambridge TV documentary!



Horticultural staff get a good soaking whilst pressure washing the fountain

A total of 7,292 visitors basked in the evening sunshine at the Cambridge Summer Music Festival's Sounds Green events, every Wednesday in July

Research in the experimental glasshouses reveals that the cucumber mosaic virus (CMV) attracts bumblebees to infected plants by changing their scent

Horticulture

It has been another busy reporting period for the horticultural team who have worked tirelessly to maintain high horticultural standards, while also delivering new projects and developments throughout the Garden.

STREAMSIDE PLANTING

REINSTATED LAWN, GARDEN ROOM

This year we enhanced our steamside plantings, removing the clump forming and ever-spreading bamboo *Fargesia robusta* to improve access. *Cirsium rivulare* 'Atropurpureum', the giant rhubarb *Gunnera manicata*, and *Osmunda regalis*, royal fern, can all take advantage of the additional moisture available courtesy of the stream, and will fill out and flourish alongside the existing *Cercidiphyllum japonicum* 'Pendula.' Clearance of the herbaceous elements of the northern section of the Woodland Garden made way for new plantings of European woodland species, including *Cyclamen hederifolium, Lathyrus vernus, Helleborus atrorubens* and *Polystichum setiferum* 'Dahlem'. This was the first phase of plans to develop phytogeographical plantings within this area, and we will focus on the woodland floor species of Asia and America in future years. Both the streamside plantings and the European Woodland plantings provided opportunity to increase diversity at this focal point.

The Rock Garden

The spring months saw us re-soil and plant up an area of the North American Rock garden which had been fallow for the preceding year to allow treatment of the invasive *Equisetum arvense*. We developed an open, well-drained mix which will support populations of alpine plants. Once the empty beds had been back-filled by hand with 9 tonnes of compost and then allowed to settle we were ready to plant up this area. Visitors can now admire a wider range of alpine species representative of North America including *Townsendia formosa, Phlox stanburyi, Penstemon cardwellii* and *Triteleia hyacinthina*. This is part of a rolling programme of clearance, re-composting and re-planting on the Rock Garden with the next phase being the development of European Alpine plantings.

The Geoffrey and Eileen Adams Garden Room

With the completion of the Geoffrey and Eileen Adams Garden Room in the Schools' Garden, re-landscaping of the building site was required. Here we graded and levelled the disturbed ground and reinstated a new lawn between the Garden Room and the Superintendent's House. The incorporation of new shrubby plantings will create a green boundary at the rear of the Garden Room, while also providing a secluded garden for temporary residents in the Superintendent's House.

New canopy in the Arid Bay

Development work has continued in the Glasshouses, where we installed a protective canopy for the overwintering of cacti and succulents in our arid bay. This is installed in the autumn and removed in early spring and provides additional protection to species such as *Dasylirion texanum, Puya berteroniana* and the cow's tongue cactus, *Opuntia engelmannii* var. *lindheimeri*, which has grown in the shelter of the Glasshouses since 1895. Plants in this bay can tolerate the winter cold, but resent winter wet, and the further protection afforded by the canopy will enable a wider selection of succulents to thrive.

In the Glasshouses we took the opportunity to review the tropical understorey in the Palm House. Existing plantings were lifted and new compost incorporated. We replanted to not only improve our forest floor cover but also to enhance our collection. New plantings included *Margaritaria nobilis* from Panama and the Ecuadorian *Calathea libyana*, both of which also serve as a valuable research resource. As these plantings mature they will serve to emphasise the vegetation zones of a tropical forest.

NEW CANOPY IN THE ARID BAY

THE CIRCADIAN RHYTHM DISPLAY

In recent years we have provided late winter interest in the Glasshouses with an Orchid Festival, the theme of which this year was "Orchid Hunters". *Phalaenopsis* and *Cymbidium* hybrids stretched the lengths of the corridors, and these displays were enhanced by accompanying 'Did you know?' facts relating to the collection of orchids in the wild. Species orchids, including *Angraecum sesquipedale* and *Lenboglossum rossii*, were displayed throughout the Tropical Houses, and here we conveyed tales relating to some of the famed Victorian orchid hunters. Here a mock plant hunters' camp, complete with herbarium press and diary, evoked the sense of adventure and solitude often endured by plant hunters, while interpretation included tales of plant collectors, and also the impacts of over-collection on wild orchid populations. In the tropical Wetlands House packing crates and Wardian cases were filled with *Phalaenopsis* hybrids and their parent species, along with species orchids including *Cattleya harpophylla* and the hybrid *Rossioglossum insleayi* x 'Rawdon's Jester'. Associated interpretation panels highlighted the issues relating to the challenging transportation of orchids from the wild and the great number of losses during transit. An additional display here explained complex modern day propagation techniques, and outlined the value of these methods to orchid conservation.

We have been conscious of the lack of carnivorous plants in the public Glasshouses, and added planters of carnivorous species to each of the Glasshouse porches. Corten steel containers were selected to complement the immediate environment, and to be at a height accessible to schoolchildren. Newly introduced plantings here include the Venus fly trap, *Dionaea muscipula, Cephalotus follicularis* and the trumpet pitcher *Sarracenia flava.*

The Glasshouses act as a magnet for pests and diseases, and efforts to prevent the spread of these, or to deter them, are relentless. For many years we have adopted an Integrated Pest Management system, in which the majority of our controls are biological. We were pleased this year to reap the rewards of our concentrated efforts, and have seen a decline in pest and disease issues throughout the public and non-public glasshouses. We will continue to monitor and implement appropriate control methods.

New Zealand Terrace

Since the planting up of the Terrace Garden with New Zealand species in 2010 – 2011 we have wanted to incorporate a water feature. In 2016 this became a reality courtesy of a Giving in Memory donation by the family of James Lavelle Mangan. Hard landscaping was limited to the lower reaches of the Terrace Garden, and involved the rebuilding of the dry stone back wall to ensure it was structurally sound to bear the weight of a stone spout, and also to hide essential power and water circulation mechanisms. Once the feature was installed we were able to reintroduce new plantings associated with natural wet gullies in their native New Zealand, such as the tree fern, *Cyathea dealbata*. With the water feature complete we were also able to incorporate benching in an adjacent wall, and an additional bench at the top of the Terrace Garden, on which visitors can enjoy the ambience of this area.

Understanding Plants Area

With greater emphasis on research within the Garden, we were keen to develop public displays which reflected projects within the Department of Plant Sciences and also the Sainsbury Laboratory. The Genetics Garden and adjacent areas provided an obvious location in which to develop such displays, in an area now known as Understanding Plants. In autumn 2015 we undertook extensive preparatory works to remove the dominant collection of x *Cupressocyparis* cultivars at the western end of the Chronological Bed, along with the hawthorn *(Crataegus monogyna)* hedge which enclosed the Genetics Garden. This allowed a period of soil re-settling prior to the shaping of new beds and the re-turfing of these areas. Several research projects are now showcased in these areas, each concept being demonstrated through the considered selection of plants grown and accompanying interpretation. The Circadian Rhythm Display consists of two curved beds, one of which includes plants which flower in the morning, and the other of plants which flower in the evening. These represent the research work of the Department of Plant Science's Professor Alex Webb, who is looking to further understand how plants synchronise and regulate their circadian clocks. Professor Ottoline Leyser's Sainsbury Lab group is looking to understand how plants branch, and a display of sunflowers demonstrated how branching can be encouraged by the removal of the main shoot, which diverts auxin to lower shoots and encourages branching further down the stem. Two additional displays have been created to demonstrate what makes flowers attractive to pollinators, and these also provide clues to maintaining wild pollinator populations.

HELIANTHUS ANNUUS 'TAIOYO'

THE AUTUMN GARDEN

The Autumn Garden

We have been progressively developing the landscape and plantings in the Autumn Garden to provide greater impact during the autumn months. In 2016 new plantings were implemented on the northern boundary of this area. The main criteria for plant selection here was foliage and fruit interest, but consideration was also given to providing a long-term screen for both the Algae Innovation Centre and neighbouring buildings on our northern perimeter. A mix of ground cover shrubs including *Rubus rolfei* 'Green Carpet' have been integrated with taller shrubs such as *Euonymus oxyphyllus, Hydrangea quercifolia* and coppiced forms of *Amelanchier lamarckii. Betula papyrifera, Liquidambar styraciflua* 'Lane Roberts' and *Acer cappadocicum* 'Rubrum' will develop to provide height in the future and a backbone to the scheme. We have retained a mature *Fagus sylvatica* planted as a memorial to Reginald Cory, along with specimens of *Alnus cordata*, and *Cercis siliquastrum* to provide immediate structure. Elsewhere in the Autumn Garden we removed a prominent but failing specimen of *Populus* x *canadensis* 'Eugenii' for safety reasons. This has been replaced with a small grove of dawn redwoods, *Metasequoia glyptostroboides,* which will provide a focal point to the entrance way to the Autumn Garden. Herbaceous plantings were also further developed and a bed containing *Verbena bonariensis, Calamagrostis* x *acutiflora* 'Karl Foerster' and *Echinacea purpurea* 'White Swan' provided a much admired seasonal herbaceous highlight in this area.

The Discovery Area

Work began this year to develop a Discovery Area at the back of the Scented Garden. Horticultural efforts have focused on the elimination of persistent weeds throughout the area, and also the shaping of small land forms to provide topographical interest. Plantings will include a shrub boundary which will meld with the Scented Garden, and naturalistic swathes of vegetation, giving way to an open glade beneath the existing mature sycamore, *Acer pseudoplatanus.* We anticipate that this area will provide a venue for children to explore the canopy of the conifer thicket, observe plant material through magnifying lenses, and connect with plants and nature informally.

Throughout the Garden we have continued to focus on maintenance, upkeep and horticultural standards. Concentrated effort went into turf and lawn maintenance, and particularly reparations to damage caused by chafer grubs (the soil-dwelling larvae of chafer beetles, *Phyllopertha horticola* and *Hoplia philanthus),* and the subsequent damage caused by grub-foraging badgers. Treatment at its simplest involved rolling the lifted turf back over the bare patches of earth, but in most cases required staff to top dress areas with soil and to re-seed with grass seed. In late summer we resorted to an application of nematodes *(Heterorhabditis bacteriophora)* to treat the chafer grubs. Although chafer grubs are still present the application had some success in attacking the immature grubs, and so removing the youngest generation. Further treatments in the near future will be necessary to build upon this initial success. Elsewhere, attention was focused on reparations to our gravel paths. Rising visitor numbers inevitably impact upon some elements of our landscape and infrastructure, and this is particularly evident on gravel paths. Extensive refurbishment of the Lynch, Middle, South and North Walks was carried out in the spring to ensure ease of access for visitors to all areas of the Garden.

Volunteers and Work Experience

We were joined by pupils from three local schools for work experience during the year. We also welcomed two PhD students, Karine Janjuhazyan and Manik Grigoryan, to the Garden from Yerevan Botanic Garden, Armenia, as part of an on-going collaboration between Lydian International, the Armenian Institute of Botany in Yerevan, and ourselves to conserve an Armenian endemic, *Potentilla porphyrantha,* which is threatened by a mining project. During their time with us Karine and Manik gained practical horticultural experience from our own team of skilled horticulturists, and also developed their understanding of botanic garden and collection management, public awareness, conservation, tree management, environmental controls and field work. The plan is that Karine and Manik will be able to utilise these skills to enable them to cultivate *Potentilla porphyrantha,* and also to aid development of Yerevan Botanic Garden.

The horticultural team have been assisted in recent years by four regular volunteers who work in our Alpine and Woodland, Glasshouse and Demonstration and Display Sections. During the year we were delighted to welcome two additional volunteers working in the Glasshouses and on the Systematic Beds. The contribution of each of these individuals is invaluable in enabling us to continue to deliver the horticultural standards which visitors have come to expect.

Sally Petitt, Head of Horticulture

Estates

Station Road Development

The Botanic Garden has seen an increase in numbers of visitors arriving by bicycle, with changes to city roads and cycle paths providing greater cycle accessibility for Botanic Garden visitors. Existing cycle parking arrangements at the Station Road entrance were only for eight bicycles and had proven inadequate during the summer. A modest improvement to increase capacity and position was required. This work has increased cycle parking for up to thirty bicycles with more space for longer child-carrying variants and children's scooters.

The new cycle park also provided an opportunity to provide a safer route to work for our Sainsbury Laboratory colleagues, who now have a dedicated illuminated pathway through the Garden to the Laboratory. A dedicated, secure pedestrian access point to the Laboratory was constructed from the new fenced cycle parking area, enhancing safety and security for laboratory staff and garden visitors.

We have also seen an increase in the number of visitors who are of limited mobility, requiring a loan of one of our mobility scooters on arrival to the Garden. The Garden had no mobility scooter storage at the Station Road entrance, so a permanent, secure location was constructed adjacent to the rear of the existing ticket office, to store and issue mobility scooters from. This means that our Visitor Services team no longer have to transport mobility scooters from alternate locations within the Garden and our visitors do not have an unnecessary wait.

STATION ROAD NEW CYCLE PARK

STATION ROAD SLCU PATH

Fenland Bridge Repairs

During the year it was noticed that the timber on the Fenland Bridge was starting to suffer. There was evidence of decking failure, and maintenance was urgently required. Closer investigation revealed both dry and wet rot, rendering the bridge unsafe. Repair work was commissioned and extensive repair work undertaken to strip all of the old timber and replace with new, which should serve the Garden well for the next ten to fifteen years.

Carl Tatterton Head of Estates and Operations Manager

FENLAND BRIDGE NEW DECKING

FENLAND BRIDGE TIMBER REMOVED

Education

BOTANICAL ILLUSTRATION COURSE

Lifelong learning

Our adult courses programme delivered 53 courses over the reporting period and saw 587 adults taking part in our range of short courses. We continue to attract significant numbers of new attendees, by ensuring a wide range of topic areas which include plant science and botany, horticulture, garden history, botanical art, photography and a wide range of plant based creative workshops. During 2016 we themed a selection of our courses to focus on Colour, to tie in with the Fitzwilliam Museum's bicentenary exhibition of the same name. These included a session led by Professor Beverley Glover and Dr Sam Brockington on the science of colour in plants and botanical illustration courses led by tutors Gael Sellwood and Georita Harriot focusing on the use of colour and on techniques used in illuminated manuscripts.

The Science on Sunday talks series, which we piloted in 2015, continued for a second series in 2016. It launched at the University's Science Festival and the six short talks delivered by researchers from the Department of Plant Sciences, the Sainsbury Laboratory and by our own Director and Curator, together attracted over 200 participants.

Working with Schools

The Geoffrey and Eileen Adams Garden Room in the Schools' Garden has transformed our capabilities for delivering events, activities and learning for both schools and families. With all our resources now in one place, we use this purpose built, warm and welcoming space to support all the learning we deliver for schools and families. Over the last year we have welcomed 333 school visits to the Garden, giving a total of 8934 children the opportunity to visit the Garden with their school. The availability of the room has made it easier to offer unassisted school visits for larger groups, providing a dedicated space for children to eat their lunch and for the whole class to have a base for the day as they explore the Garden with their teachers.

During the next year we will begin work to revamp our offer for schools. Our schools officer Bronwen Richards will revise and add new resources to create a set of six core, themed, activity sessions. These themes will explore a range of curriculum links, the science and heritage of our site and above all encourage students to 'learn to look'. We hope the new format will make it easier for schools to make the most of their visits to our Garden, supporting curriculum needs and curiosity, and providing a solid base of activities to promote our offer to schools.

We have also continued to support schools learning through a combination of outreach, careers days and by offering support for individual students with extended project qualifications. In the last year we have continued our support of a wildlife garden led by science teachers, at Parkside Federation's Coleridge campus; delivered a tree planting day at a primary school in Sawston; visited green ambassador students at the new University Primary School and supported a plant DNA barcoding project at the University Technical College. Alongside

this we have continued to run our garden pass scheme for local sixth form college students who are studying A levels in science, geography, art or photography. We have also supported regional careers events, including one at RHS Hyde Hall where we delivered our popular forensic botany workshop, encouraging students to solve a crime using their plant knowledge.

Our work with older (16-21) students continues to be supported by our collaborative work with the Gatsby Plant Science Education Programme (GPSEP) and the Sainsbury Laboratory. This has been greatly assisted by our schools officer Bronwen Richards being embedded in the GPSEP student engagement project for 2 days a week. Over the reporting period this project has delivered another series of excellent Masterclasses for sixth formers and a second Careers with Plants day which was hosted jointly by the Garden and the Sainsbury Laboratory. 58 Yr 8/9 students from local state schools took part in the day, which included workshops on 'How Plants tell the time' led by Gareth Steed (PhD candidate in Professor Alex Webb's group) and another on 'Careers to help you survive the zombie apocalypse' led by the RHS. Students and their teachers enjoyed guided tours of both the Lab and the Garden and took part in a speed dating style 'What's my job?' session at the beginning of the day which gave students the opportunity to interact with a range of people working across industry, research and horticulture. 60% of students who attended felt that they had 'found out a lot' about careers in plants, and 78% reported that they were now more interested in a career in plants.

Alongside working with students we continue to support teachers too, through the CPD training sessions we run through the RHS's Campaign for School Garden and through learning outside the classroom placements for PGCE primary students from the University's Education Faculty. We hope to further develop this area of our work in the next year.

A year in the Schools' Garden

A knock-on effect of the opening of our new classroom is the opportunity it has given us to repurpose our Polytunnel – to be used, well, as a poly tunnel. This sounds obvious, but actually it had for many years been a combined shed, classroom and general storage area for many of our school garden equipment, with little room or appropriate set up for using it as an effective growing space.

This year we have invested in greenhouse staging and next year we will re-cover the tunnel and fit doors at each end so that this space can be used more productively to grow plants for the Schools' Garden and provide us with a proper plant growing facility to share with our education visitors.

Out in the Schools' Garden's beds we have focussed this year on square foot gardening, crop rotation and getting the new landscape around the Garden Room established. The area of grass outside the room has now bedded in and is regularly being used by visitors and families attending our family events. In particular our mini mower and mini wheelbarrows have been a regular feature out on this lawn and we plan to extend their ranks next year as part of our play in the Garden initiatives for young children. Our loyal Schools' Garden team, Alan Langley and Alistair Cochrane, have done a sterling job in raising flowers and vegetables from seed, helping us engage our gardening club team with creating their own mini vegetable plots.

Developing interpretation and understanding about plants

Our Interpretation associate Alison Murray has been working with us since early 2015 to review and plan our future approach to interpretation, and develop new displays to showcase current plant science in the Garden. Working with Alison the experimental horticultural team re-designed the Genetics Garden to showcase a series of displays to highlight plant science research taking place within the Department of Plant Sciences and the Sainsbury Laboratory. This new 'Understanding Plants' area explores key questions in current plant science. Over the next year, more new interpretation signage will appear around the Garden as a result of this two year HEIF5 funded post.

Events and Festivals at the Garden

During the University's Festival of Ideas garden historian Dr Twigs Way delivered a fascinating talk on Conflicts in Garden History and we joined our colleagues at the Polar Museum for an Explorers and Collectors day, making mini Wardian cases for children to take home. On Apple Day later in October we were joined by The Barrow Band who brought our visitors their unique blend of plant history and education messages about the value of eating a range of vegetables and fruit through a catchy repertoire of fruit and veg songs. Our craft activity for the day created mini apple shakers to allow our young visitors to join in with the Barrowband's performance, which was part of a UK wide tour funded by the Arts Council. Apple themed dressing up again proved hugely popular with Snow White, Isaac Newton and our giant apple costume providing opportunities for selfies on the storytelling throne to a backdrop of singalongs with the Barrowband.

978 people grabbed a torch and explored our Glasshouses during our annual evening event for families as part of the Cambridge wide event 'Twilight at the Museums'. The event coincides with our annual orchid display, which this year focused on the stories of Victorian orchid hunters. With the Glasshouses specially lit up for the evening, visitors were challenged to become plant hunters for the night, track down special plants and collect stamps on Wardian case trail postcards. Staff and volunteers joined in the fun by dressing up as Victorian plant hunters - roaming the glasshouse range talking to visitors about the adventures of orchid hunters.

At our Festival of Plants in May we were joined by education colleagues from Kettle's Yard, The Museum of Archaeology and Anthropology and The Polar Museum, who set up stalls in our Garden Room to deliver a range of plant-based activities inspired by their own collections. Lorena Bushell, from The Museum of Archaeology and Anthropology, took a Fijian theme, talking to our visitors about how Fijian people used material from trees such as *Ficus tinctoria* and *Broussonetia papyrifera* to create richly patterned barkcloth. Children tried out pattern making and wove colourful raffia Fijian warrior armbands to take home. Lucy Wheeler from Kettle's Yard led a printing with plants session, working with artist Rachel McGivern. The Polar team's activity was based around wanting to know if people could keep up with plants. They arrived with a huge bag of clothing and equipment to sit alongside a selection of plants from our collection, which we had chosen to demonstrate how plants are adapted to survive in extreme environments. Families were then able to compare human responses to these extreme climates with plant adaptations; repelling water; avoiding wind damage; building layers of insulation. Our own stall offered a display of Carnivorous plants and we worked alongside Alan Langley and Alistair Cochrane out in the Schools' Garden, giving advice to visitors about growing their own vegetables and composting.

STORYTELLING IN THE SCHOOLS' GARDEN

Families at the Garden

Throughout the year our family events and trails provide opportunities for informal learning about plants in the Garden. Our regular monthly family Saturday events became free from Jan 2016. We had previously charged a fee for children to take part in these sessions but had found that the numbers of families attending these sessions were dwindling. So we took the decision to pilot this as a free offering. New posters and flyers were distributed and we gained a good following on social media and local news outlets, which are now regularly promoting these events. The result has been a big increase in the number of children and families attending. The average number of children attending each session between Jan and September was 90 – well ahead of the average attendance in the previous year of around 30.

This year we added three new trails to our growing collection. The first 'Find Me: Plants' will be used alongside our 'Find Me: Wildlife' trial in the periods between new seasonal trails being developed. A 'Planthunter Challenge' trail, which focused on the adventures of David Douglas, tested powers of deduction and map reading. And finally 'Doodle Plants' offered a series of plant themed colouring sheets that were available for children to use over the summer holidays. During the summer, as part of the University's 'Summer at the Museums' programme, we teamed up with our library manager Jenny Sargent as she delivered 'Once upon a time in the Garden' storytelling sessions for under 5s, in the Schools' Garden.

Outreach and community engagement

The weekly community gardening club which we established at Hanover and Princess Court is continuing to develop well, with a regular group of residents joining us to tend the communal planting areas as well as creating their own planting beds for growing flowers and vegetable crops. This work has been led by our Community Officer Sally Lee, with help from volunteer Yasmeen Farooqui who has drawn up a series of planting plans to help the residents make the most of the spaces around the site, and by our own trainees who helped us deliver a community bulb planting day in October. We are slowly gaining new members to the group and the weekly sessions are a hive of horticultural activity with residents not only helping each other out with gardening, but sharing their home grown produce, seeds and recipes. These efforts were rewarded again by the community garden winning an award through Cambridge City Council's residents gardening competition. We have also begun work to help raise the profile of the trees across the site which surrounds the flats. Some of these trees have been badly damaged and vandalised in the past and so we are working with the City Council tree team to find ways of encouraging people to value them more. Using labels printed by the Garden's new labelling machine we have installed 23 labels on trees on the site and plan to develop tree care initiatives over the coming year, and plant some new trees chosen by the residents.

Each year we aim to run a project working with the Young Carers Group from the charity Centre 33 - this local charity supports young people who care for a relative. This year we ran this in collaboration with Sarah-Jane Harknett at the Museum of Archaeology and Anthropology and sculptor and mosaic artist Anne Schwegmann-

Fielding. Using percent for art funding we ran a series of workshops based in the Garden Room to make mosaics for installation in the Schools' Garden. This 'Lost and Found Mosaic' project focused mostly on pottery found (largely by Paul Aston of our Horticulture team) across the Garden while digging, but material was also donated by college and local community gardens. Sarah-Jane from MAA helped us sort through this treasure, explore its history and use, and Anne worked with the children to design mosaics using the materials alongside traditional mosaic tiles. The new mosaics will be installed in the Schools' Garden in the autumn of 2016.

Alongside these two larger projects we have continued to support St George's Care home with seasonal visits running plant based activities for their residents, monthly walks with the Thursday group from the Centre at St Paul's supported by volunteers Yasmeen Farooqui and Jenny Egbe, and hosting walks and running activities with a range of therapeutic groups including Wintercomfort, Arts on Prescription, Gardening for Health and the City council's exercise referral scheme.

Feedback matters

Throughout this year we have added new evaluation processes to help us to continue to review the effectiveness of all our programmes. Feedback forms (for written or art based comments) and a mini postbox are now in the Garden Room, feedback postcards are included in the backpacks, the schools programme is being evaluated using an online qualtrix questionnaire sent to teachers, and the courses programme using more traditional paper based feedback forms. We are committed to regularly reviewing our work in this way to ensure that we are working effectively with all our audiences.

Staff and Conferences

In the summer we waved a temporary goodbye to our Family and Community officer Dr Sally Lee, who has gone on a period of adoption leave until the autumn of 2017. This leave period will be covered by Hannah Elkington who joins our team from the Essex Wildlife Trust. The Education team continue to support BGEN with Flis Plent on their board of directors and the education team attending and delivering activities at the 2015 annual conference which was hosted at Westonbirt Arboretum. Bronwen Richards also delivered a session on the work of the Student Engagement Project as part of the BGEN training programme at an event based at the South London Botanical Society and attended the Science and Technology Fair at Murray Edwards College.

Volunteers

We have continued to recruit new volunteers over the last year and are hugely grateful to those who have joined our merry band of dedicated volunteers who assist us with family sessions, school visits, our gardening clubs both at the Garden and at Hanover and Princess Court. We simply couldn't do this work without them and we thank them wholeheartedly for all their work this year.

Flis Plent, Head of Education

Curation

THE HEREFORDSHIRE POMONA, PUBLISHED BETWEEN 1876 AND 1885, ON DISPLAY AT APPLE DAY

The emergence and spread of novel plant pathogens, Brexit, which threatens to slow the movement of plants as well as people, and the introduction of the Nagoya Protocol, ensure that the future acquisition of plant material will be challenging. Consequently, curation of the living collection over the past year has focussed on the policies and procedures that operate in and around our living collections, rather than attempting to influence the composition of our living collections. The past year has seen us complete the first draft of a Garden collections policy manual, which we hope to publish in 2017. Additional notable achievements have been the renovation of the labelling workshop, and the purchase and installation of a new laser-based labelling machine, a Trotec Speedy 100, designed in Austria, and a fine example of Teutonic engineering. It is blazingly fast, allowing us to rethink the whole label making process, with good effect. Our label technician Mar Milan has just made over 1000 labels in the first 3 months, our normal annual output in a quarter of the time. We are now well positioned to carry out major projects, including the 4500 labels we need to change to update the Garden to the latest internationally accepted classification scheme. Our first project with the new machine involved labelling our IUCN threatened plants, to highlight their significance to members of the public.

Curation has also been closely involved in the re-design of the systematics beds, and responsible for developing the principles that will determine how the new order beds will be laid out. We have sought to develop a set of curatorial principles that allow for modernisation while preserving key heritage elements. Our approach will update all beds to the latest understanding at the family level, which, in the hierarchy of classification, is the most accessible for the majority of visitors and students. However, above family classifications, at the order level, historical placements will be allowed to persist, with some orders appearing in the wrong place as per our contemporary perspective. Such incongruences will form the focus of interpretation and illustrate the different ways of looking at plant classification. In practice our proposal will entail replanting three of the five sections, to include verification, propagation, wholesale rotavating, chafer grub treatments, and re-turfing. Once turf has settled, we will cut new beds to the revised rationale, improve the soil and replant, returning the order beds to their recognisable and much loved gardenesque style.

The Garden's herbarium was moved to the basement of the Sainsbury lab in the early half of 2015, where it was shelved within the University Herbarium. Following this move we decided that it was high time that the Garden's herbarium was fully catalogued, and so we employed David Freeman to begin this process. David first sifted through the ~12,000 herbarium sheets, and extricated all the herbarium specimens that had exceptional heritage value, including sheets prepared by Henslow and the Garden's first curator, Andrew Murray. These rare specimens, which numbered about 450, were then photographed at high resolution to be made available digitally and

THOMAS MOORE'S *FERNS OF GREAT BRITAIN AND IRELAND,* PUBLISHED 1855

OUR NEW LABEL MAKER

on-line. David then began to database the more ordinary accessions, and has managed to catalogue around 2500 so far.

It has been a busy year for our library and archives. In October 2015, a library review board was created, and, chaired by the Curator, they met several times through the year to discuss options and possibilities for the future of the library. The review process culminated in the decision to relocate the library to join the Herbarium Library in the basement of the Sainsbury Laboratory. Moving the library will potentially allow for some creative uses for the ground floor of Cory Lodge. We have continued with our goal to boost the visibility of the Garden's collections, and the librarian Jenny Sargent has completed a project to increase the amount of information about the collection that is available on the University's libraries catalogue and can be searched publicly online. A display of rare books at Apple Day in October proved popular, as did an evening event for Garden Friends, who were treated to a display and presentation about some of the treasures from the library and archives. A radio interview on the Flavour programme for Cambridge Community Radio provided further opportunity to share the collection with a wider public audience. In January 2016, we created the role of Archive Volunteer, and were lucky to employ the services of Graham Harrison. After carrying out a top-level survey of the archive material housed in Cory Lodge, Graham has proceeded to examine and list the collection in more detail, and continues to create an enormous amount of useful data that increases the potential for discovery, access and use of these fascinating collections.

The library collections have continued to play a role in supporting the Garden's outreach and educational activities and engaging visitors. The library hosted researchers working on a variety of projects, ranging from investigations in plant lore and botanical language, to a survey of the library's early Chinese and Japanese publications. In June, postgraduate students from the University's Faculty of History and Philosophy of Science visited to view items from the collection that supported their learning on the faculty's 'Science in Print' seminar series, which explores the structure and production of printed material from the hand press period and the understanding of the book as a unique physical object. There were several successful collaborations with the Education department. For example, Thomas Moore's enormous folio publication *Ferns of Great Britain and Ireland* (1855) was on display for those attending the popular 'Nature Printing' course. Another collaboration was aimed at younger visitors: *Once upon a time in the Botanic Garden* was a drop-in storytime session led by the Library Manager as part of the 'Summer at the Museums' programme.

Dr Sam Brockington, Curator

Research

The diversity of roles the Garden plays in Research, both across the University and more widely, always amazes our visitors and Friends. Pages 16–19 of this Annual Report provide a summary of Research conducted in 2015-2016. As well as our primary role in providing access to plant collections and offering horticultural support for botanical projects, the Garden also provides underpinning facilities supporting research in Architecture, Biochemistry, Chemical Engineering, Geography and Zoology. We welcome requests for material and resources from colleagues from all academic and research organisations, and are delighted to be able to support such a diversity of projects.

Conserving the world of plants for a better future

Each year in this annual report I select a subset of our supported research to discuss in more detail. This year's focus is on the role our collections and facilities play in conservation, particularly of plants but also of other organisms. The most obvious conservation role of a botanic garden, just like a zoo, is in the *ex situ* conservation of endangered species. Our collection is rich in plants which are threatened in the wild, with 45 of our accessions listed as critically endangered in IUCN Red Lists, 152 as endangered and 58 as vulnerable. By holding and maintaining these accessions we act as a repository of germplasm, which may be called upon in the future for reintroduction projects. Perhaps more immediately, these species allow us to engage our visitors with the importance of conservation and natural biodiversity, and provide opportunities for education programmes focused around a sustainable future. What is perhaps more surprising is the diversity of other roles the Garden plays in conservation research.

Keeping it local

The Botanic Garden is a member of Botanic Gardens Conservation International (BGCI), a global network of plant collections with concern for the protection of the world's plants. BGCI's mission is to collect, conserve, characterise and cultivate samples from all of the world's plants as an insurance policy against their extinction in the wild and as a source of plant material for human innovation, adaptation and resilience. Here at CUBG our part in this effort focuses on conservation close to home. Working with the network of nature reserves and conservation charities across the east of England, we have developed programmes to protect some of our local endangered flora.

One such project involves the Fen Orchid *(Liparis loeselii),* a very rare small orchid with creamy yellow flowers found in only three sites in the UK and rare over most of the rest of its range in Europe and North America. For the last seven years we have been working with colleagues at the plant conservation charity Plant Life and the Royal Botanic Gardens, Kew to safeguard and increase the population of the Fen Orchid, which is classified as endangered due to the decreased number of isolated sites remaining and its low population numbers. In the UK, the Fen Orchid is confined to calcareous Norfolk fens where it grows on moss as an epiphyte (a plant that grows on another plant for support). Historic records show the plant once grew in much of East Anglia, including fens close to Cambridge such as Wicken, Burwell and Cherry Hinton. The drainage of fens for agriculture and the decline of traditional management on remaining fens have led to a significant decline in populations, with numbers perhaps down to a few hundred individual plants. Traditionally, fens were cut for animal bedding, for thatch and also burned to promote new growth for grazing. This maintained an open fen vegetation, allowing the Fen Orchid to thrive. Without this management many surviving fens have since become dominated by dense vegetation, shrubs and small trees which have crowded out the plant.

Working with our partners, we set out to establish a propagation programme to develop a Garden-based population that could be used for reintroductions. Unlike the seeds of most plants, orchid seeds do not have their own food supply. To germinate and grow, orchid seed needs to parasitise a fungus from which it draws nutrients. To address this, we have worked on capturing fungi to help us germinate seeds. Fen Orchid seeds were placed in packets with a very fine mesh out in the fens near existing plants. Improved habitat management has allowed plant population sizes to increase to a point where it was also possible to collect a small number of plants for vegetative propagation at the Garden. After obtaining a licence from Natural England to collect plants in 2013, four plants were collected from one site along with the moss they were growing in. These plants were brought back to the Garden and kept in a tank with a trickle ground water feed. Both the moss and the plants grew well in these conditions and the orchids produced flowers and new offshoot bulbs. New bulbs were separated from the parents and grown on. Following this success, a further twenty plants were collected in 2014 and are all growing well in the Garden. These plants are also reproducing by developing new bulbs that will be separated from the parent plants. We now hope to build up the population to provide a backup population for the wild populations and a source for re-introductions.

Plans are now underway to investigate re-introducing the plant into sites where they once grew. In the winter we carried out a trial relocation within one of the existing sites, and the first trial re-introduction will be carried out later this year using a limited number of plants. We will monitor the plants to establish if the population is sustained or increases. If this is successful, it will be wonderful to once again see this rare orchid in all suitable surviving fens in East Anglia and to have played a significant part in reducing the likelihood of its extinction in the UK.

Facilitating tropical forest conservation

A temperate Botanic Garden might not seem an obvious place to facilitate research into tropical forest conservation, but our tropical glasshouse has played an important role in the validation of equipment to analyse tree diversity and the role that tropical forests play in gas exchange and as carbon sinks that mitigate the effects of climate change. Work by Professor David Coomes, from the Department of Plant Sciences, with the Atmospheric Chemistry Group in the Chemistry Department, has tested out a new gadget to measure gas emissions from rainforest canopies. Plants produce a

FEN ORCHID IN FLOWER

TALLEST TREE IN THE TROPICS

volatile hydrocarbon called isoprene that diffuses from leaves into the air. This can be a problem, because isoprene causes ozone to form in the lower atmosphere. Ozone not only acts as a potent greenhouse gas but also adversely affects human health. Some plants, including oil palm, emit vast quantities of isoprene while others emit none at all. Using Eucalyptus plants in the tropical house, a portable device to measure isoprene emissions was tested. This revealed that isoprene production was very closely influenced by temperature, but that simulated herbivory (holes made in leaves with a paper punch!) had absolutely no effect. This supports the theory that isoprene is produced to protect cells from high temperature and not as a defence against herbivores. The gadget is now collecting pioneering information on isoprene emissions from rainforest canopies in Malaysia.

In a related project, David Coomes uses laser scanning technology that allows forest carbon storage to be measured accurately from aircraft, along with analyses of drought status and species present. To make full use of remote sensing, a clear link between the reflective properties of leaves and the identity of species on the ground needs to be established. Working with trees at the Botanic Garden, light spectra reflected by different species at close range were compared to the data obtained from long range sensing. Using some of these techniques, a British aircraft surveyed 300 square kilometres of Sabah Malaysia in 2014, in order to quantify the impacts of industrial agriculture on ecosystem functioning. An early discovery from this survey is the tallest tree yet found in the tropics – standing at 89 m tall (www.cam.ac.uk/research/news/minecraft-tree-probably-the-tallest-tree-in-the-tropics) in one of Sabah's national parks. Projects such as this are vital in understanding and conserving the tropical forests which act as the lungs of planet earth, and it is a privilege for the Botanic Garden's collection to be used for calibration and analysis of techniques which will be applied in the field.

As a relatively small Botanic Garden on the global scale, we have dedicated our own efforts in conservation to our local endangered species – after all, if Cambridge University Botanic Garden isn't concerned about endangered fen orchids, who will be? However, our role on the global stage is much greater than this, simply because our collection supports research that itself seeks to understand and conserve biodiversity from the tropics (as described here) to the poles (such as the Antarctic snow algae grown in the Algal Innovation Centre in our research plots). Our commitment to supporting conservation projects will not waver, and the importance of our role in these efforts will only grow as the world becomes increasingly concerned about the loss of biodiversity globally.

Professor Beverley Glover, Director and
Dr Samuel Brockington, Curator

Research supported and facilitated

The Botanic Garden maintains and makes accessible the living plant collection of the University of Cambridge. Research and teaching is supported through the plant collections of over 8000 species, the Experimental Section which provides supported glasshouse and open ground research plots, and through use of the 40-acre landscape. In addition to home-grown research the Garden supports a wide range of projects throughout the University of Cambridge and collaborates with a great many external partners.

Cambridge University Botanic Garden

Professor Beverley Glover, Director:
Research programme focussed on the evolution and development of flowers, plant/pollinator interactions, and plant surface properties, funded by the BBSRC, NERC, EU Marie Curie Actions, Leverhulme Trust, Isaac Newton Trust, and the Herchel Smith Foundation. Material maintained at CUBG, analysed in the experimental plots, or accessed from living collection, for projects including:

- Stamen evolution in *Solanum,* with Dr Sandy Knapp (The Natural History Museum) and Gwen Davis (PhD student).
- The relationship of floral morphology to pollination success in *Vicia faba,* with Dr Jane Thomas (National Institute of Agricultural Botany) and Emily Bailes (PhD student).
- Molecular evolution of key developmental pathways in plants, with Dr Sam Brockington (Curator, CUBG) and Dr Chiara Airoldi (post-doc).
- Development and evolution of insect-mimicking petal spots in *Gorteria diffusa,* with Dr Paula Rudall (RBG Kew), Dr Allan Ellis (Stellenbosch University) and Greg Mellers (PhD student).
- Development, function and evolution of iridescence in plants, with Dr Paula Rudall (RBG Kew), Professor Richard Bateman (RBG Kew), Professor Ulli Steiner (Adolphe Merkele Institute, Switzerland), Professor Jeremy Baumberg (Department of Physics, University of Cambridge), Dr Silvia Vignolini (Department of Chemistry, University of Cambridge) and Dr Edwige Moyroud (post-doc).
- The effect of plant viral infection on pollinator attraction, with Dr John Carr (Department of Plant Sciences, University of Cambridge), Dr Alex Murphy (post-doc), and Sanjie Jiang (PhD student).
- Evolution and development of nectar spurs in *Linaria,* with Dr Mario Fernandez-Mazuecos (post-doc) and Erin Cullen (PhD student).
- Interactions between petal surface and pollinator claw morphology, with Dr Walter Federle (Department of Zoology, University of Cambridge) and Jonathan Pattrick (PhD student).
- Petal epidermal cell morphology and the association with insect pollinators in *Nicotiana,* with Gabriela Doria (PhD student).
- The relationship of floral morphology to pollination success in cauliflower, with Syngenta, Alice Fairnie and Rachel Newhouse (undergraduate students).
- Corona development and evolution in Apocynaceae, with Dr Lize Joubert (visiting scientist).
- Provision of liverworts, mosses, ferns, lycophytes and cycads for undergraduate teaching.

Dr Sam Brockington, Curator:
Research programme focussed on the evolutionary genomics of the order Caryophyllales, funded by NERC, the NSF and the Isaac Newton Trust, and using material grown in the experimental glasshouses, and across the living collections:

- Sequencing transcriptomes in Caryophyllales is being done in collaboration with Stephen Smith (University of Michigan) and Michael Moore (Oberlin College, Ohio).
- Reconstituting the betalain pathway in heterologous host systems with Alfonso Timoneda (MSc student) and Hester Sheehan (post-doc).
- Understanding how Caryophyllales switch from betalain pigments to anthocyanins with Tao Feng (Visiting Scientist, Wuhan Botanic Gardens).
- Sampling material for genomic sequencing projects in Caryophyllales including *Simmondsia chinnensis* and *Delosperma napiforme.*

In collaboration with Tim Pankhurst, Plantlife Fenland Officer based at CUBG:
Maintaining collection of fen plants for conservation including:

- Comparative anatomical examination of *Dryopteris cristata* (Crested buckler fern).
- Testing viability of *Viola persicifolia* (Fen violet) seeds from Wicken Fen.
- Regenerative strategies and reintroduction stock for *Liparis loeselii* (Fen orchid) and *Dactylorhiza incarnata* ssp. *ochroleuca* (Yellow early marsh-orchid), with Pete Atkinson (Plant Records Officer) and Pete Michna (Experimental Supervisor)

Department of Plant Sciences, Cambridge

Professor Sir David Baulcombe, FRS
(RNA Silencing and Disease Resistance Group)
Use of experimental glasshouses to propagate the progeny of *Solanum lycopersicum* x *S. pennelli* hybrids through to the F4 generation, to investigate transgressive segregation in hybrid plant populations. Transgressive segregation results in plants that have heritable properties that are outside the range of the parents, and this work aims to understand the molecular biology of this important trait so that it can be harnessed more efficiently for crop improvement. Additional tomato lines grown for analysis of epigenetic markers. Also growing *Zea mays* for analysis of inheritance of key traits.

Dr John Carr (Plant Virology Group)
Use of experimental glasshouses and experimental plots to grow tomatoes *(Solanum lycopersicum)* and common bean *(Phaseolus vulgaris)* for a variety of projects concerned with the effect of virus infection on plant fitness, plant interaction with herbivores and plant interaction with pollinators. Most notably the glasshouses are used to maintain tomatoes with a colony of bumblebees to explore how different tomato genotypes attract pollinators. The Experimental Supervisor, Pete Michna, also provides valuable support in finding and identifying various aphid species.

Professor David Coomes
(Forest Ecology and Conservation Group)
Measuring silica content of rice leaves taken from the Tropical Wetlands House and comparing them with spectral readings from a field spectrometer to develop a simple non-destructive method for testing responses of plants to herbivory and other stressors.

Professor Howard Griffiths (Plant Physiological Ecology Group)
Maintaining collections of succulent plants for analysis of those with Crassulacean acid metabolism. The diversity and evolution of epiphytic bromeliads from the neotropics are being investigated. The compromise between water use and carbon gain is also being used to infer evolutionary origins and biomass production potential in succulents and grasses. In grasses, many savanna species have evolved the C4 pathway to enhance productivity, and the selection pressures leading to changes in leaf vein anatomy and metabolic partitioning are being investigated. These processes led to the development of highly productive crops such as sugar cane, sorghum and maize. *Agave tequilensis, Aechmea, Guzmania* (Bromeliacease); *Jatropha, Kalanchoe, Mesembryanthemum* and rice plants all are maintained at the Botanic Garden. Various moss species are also used from the collection in the Garden and cultured in shade for analysis of moss metabolism.

Dr David Hanke (Plant Growth Substances Group)
High quality tubers of *Solanum tuberosum,* cvs Majestic, Desiree, Maris Piper, Estima and Mayan Gold are grown and harvested for Luke Browning (PhD student) working with David Hanke on an industry funded project to develop diagnostic tests for tuber dormancy. Wheat plants are also grown for Farhat Nazir (PhD student) to study the control of seed dormancy by hormones in relation to pre-harvest sprouting.

Dr Ian Henderson
(Genetic and Epigenetic Inheritance in Plants Group)
Growing wheat plants for a range of projects exploring plant sexual reproduction and the processes that generate variation between generations. Specifically, projects focus on the meiotic cell division where gametes are generated with half the number of chromosomes of parent cells.

Professor Julian Hibberd (Molecular Physiology Group)
Rice, millet and wheat are grown for anatomical analysis, RNA isolation and deep sequencing as part of a project to understand the genetic differences between the more common C3 photosynthesis and the more efficient C4 photosynthesis.

Dr Uta Paszkowski (Cereal Symbiosis Group)
The mutually beneficial arbuscular mycorrhizal (AM) symbiosis is the most widespread plant-fungal association between roots of terrestrial plants and fungi of the Glomeromycota, in which the fungus receives photosynthates from the plant and enhances its mineral, particularly phosphate, nutrition. This research focuses on the identification and characterization of molecular mechanisms underlying the development and functioning of AM symbioses in the crop plants maize and rice. Maize and rice lines are grown in the Botanic Garden's research glasshouses for genetic characterization and seed amplification.

Professor Alison Smith and Dr Matt Davey
(Plant Metabolism Group)
The Botanic Garden has provided space for a new Algal Innovation Centre glasshouse facility, to allow different algal species to be grown to establish what role algae can play in the development of a low carbon economy.

Dr Edmund Tanner (Tropical Ecology Group)
Growing tree seedlings under shade for studies of forest dynamics. Exploring competition between weed and crop seedlings for root allocation in different soil types.

University of Cambridge

Dr Siobhan Braybrook (Sainsbury Laboratory)
Use of over 100 accessions from the living collection for a project exploring the diversity of leaf epidermal cell shapes found in plants.

Dr Sebastian Schornak (Sainsbury Laboratory)
Plants engage with fungi to improve access to nutrients such as phosphate. We sample liverwort species from the Botanic Garden *(Lunularia cruciata* and *Pellia endiviifolia)* and stain them to detect fungal structures. We found that *Pellia endiviifolia* harbours fungal structures. Comparing early land plant symbiosis with the root symbiosis of higher plants will allow us to highlight evolutionary aspects of symbiosis establishment in different parts of plants.

Dr Raymond Wightmann (Sainsbury Laboratory)
CUBG Alpine and Woodland Section is working with Dr Raymond Wightman (Sainsbury Lab) using the Alpine Department's *Saxifraga* collection to study hydathode development using cryoSEM microscopy and to analyse their secretion products with Raman microscopy.

Nick Butterfield (Department of Earth Sciences)
Ten accessions of early diverging land plants supplied for teaching.

Professor Nick Davies (Department of Zoology)
Use of the landscape to study how distance from cover influences feeding behaviour of blue tits and great tits under threat from attack by sparrowhawks. Both blue and great tits preferred feeders closer to the safety of cover, especially after presentation of a mount of a sparrowhawk, and blue tits, which were often displaced by the larger great tits, were forced to take more risks when foraging in order to get sufficient food. Studies of Dunnocks in the Garden over several decades, monitoring nests and breeding behaviour.

Professor Paul Dupree (Department of Biochemistry)
Use of the experimental glasshouses to grow rice plants as part of a study to understand plant cell wall growth and mechanics. Supply of *Drimys winteri* from the collection for cellular research. Supply of *Phyllostachys viridiglaucescens* for PhD student Carolina Fejao.

Dr Peter Leggo (Department of Earth Sciences)
Exploring zeolite and diatomite as soil improvers using *Brassica napus*.

Dr Ruth Reef (Department of Geography)
Use of the experimental plots to explore the effects of varying carbon dioxide concentration on the growth and diversity of salt marsh plants.

Willow Silvani (Institute of Continuing Education)
Conservation Science and Ecological monitoring projects including insect trapping and pond dipping.

External collaborations

Dr Julia Mackenzie (Anglia Ruskin University)
Our research studying the breeding success of blue and great tits in the Botanic Garden continued this year with the usual nest box monitoring and colour ringing of adult birds. We had a total of 16 boxes that made it to the nestling rearing stage this year – a bit lower than in previous years, most likely due to the inclement and variable weather we had in spring. Blue tits in particular seemed to be hit hard and delayed laying and egg incubation until the weather got warmer. Overall, 6 boxes were occupied by great tits, 10 boxes by blue tits and 1 box by coal tits. A total of 34 great tit, 59 blue tit and 2 coal tit nestlings were weighed and ringed, and out of those, 31/34, 33/59 and 2/2 nestlings fledged respectively. With regards to adult birds, 7 great tits and 11 blue tits were newly colour ringed and 5 blue tits were re-trapped (i.e. caught again already having colour rings present). We now have over 12 years of data and hope to be able to continue gathering this valuable data.

Stephanie Maher (Anglia Ruskin University)
The Botanic Garden was surveyed for solitary, ground-nesting bee aggregations. The characteristics of these aggregations were then measured to help us understand where these species prefer to nest and how to better provide for them. This involved taking soil samples to determine nest site characteristics.

Cristina Martin-Hernandez (Anglia Ruskin University)
Data were collected relating to niche partitioning in bumblebees, mainly *Bombis terrestris* and *Bombis pascuorum,* with a video recorder to measure the time they spent on the flower feeding from the nectar. The aim of the research was to see whether the tongue (proboscis) length of the bumblebee is related to the time they expend on the flower. Data were also collected on the distribution of the different species of bumblebees by having fixed transects that were followed twice a week.

Dr Sophie Mowles and Jenny Hastings (Anglia Ruskin University)
Birds from the thrush family (robins, black birds and song thrush) were recorded while they are foraging at the Botanic Garden to investigate the effects of anthropogenic noise and level of manicuring on the vigilance behaviour of foraging birds.

Dr Silvia Perez-Espona (Anglia Ruskin University)
Three accessions of *Ephedra* supplied for microsatellite development.

Corine Arnold (John Innes Centre,Norwich)
Oat, barley, and wheat for powdery mildew susceptibility tests

Phillip Buckham Bonnett (University of York)
Research project focused on the interactions between ants, plants and aphids. The work supported was designed to test the hypothesis that plant growth will be reduced in the presence of ants due to their effects on aphid populations. The interactions of two ant species with aphids, ladybirds and herbivorous beetles on bean plants distributed throughout the gardens were analysed. The plant material was then harvested for further analysis in the lab.

Dr Julian Doberski (U3A Cambridge)
Nine accessions supplied for practical class teaching.

Rosie Earwaker (Cambridgeshire County Recorder, bees, wasps and ants)
Analysing hymenoptera populations and working on a small book on the bees of the Botanic Garden.

Rachel Fosberry (Oxford Archaeology, Cambridge)
Twenty-five accessions supplied for archaeological research.

Kevin Hand (National Bat Monitoring Conservation Trust)
Surveys of bat populations in the Garden.

Kingfisher Bridge, Upware (Cambridge)
Twelve accessions of *Senecio* supplied for re-introduction experiments.

Don Nguyen (John Innes Centre, Norwich)
Selaginella samples provided for metabolic profiling.

Professor Giles Oldroyd (John Innes Centre, Norwich)
Eleven accessions of liverworts supplied for research into evolution of mycorrhizal symbioses.

Dr Maria Manuela Ribeiro (University of Minho, Portugal)
Material of three accessions of *Quercus* supplied for DNA analysis.

Royal Botanic Gardens, Kew
Two accessions of *Liparis loesellii* supplied for fungal isolation and micropropagation

Jonathan Shanklin (Cambridge Natural History Society)
The annual Cambridge Natural History Society fungal foray took place on 24 October 2015. Approximately 20 members and students attended. 33 fungi were recorded, of which 29 were identified to approximate species level. Of these, eight had not been recorded during previous forays. A draft of a paper on the forays was written for Nature in Cambridgeshire.

Plant Material provided to other Gardens

Alpnegium
Eight accessions through the index seminum

Antwerp Botanic Gardens
Ten accessions through the index seminum

Botanic Garden of the University of Latvia
Onopordum acanthiu

Botanic Garden, Tartu University, Estonia
Eight accessions through the index seminum

Botanic Garden Institute, Vladivostok, Russia
Two accessions through the index seminum

Botanischer Garten der Philipps- Universität
Six accessions through the index seminum

Botanischer Garten der Universitat Ulm
Ratibida columnifera

Chelsea Physic Garden, London
Twelve accessions for display

Giardino Botanico, Milan, Italy
Sixteen accessions through the index seminum

Hortus Botanicus Universitatis, Dumbrava, Romania
Three accessions through the index seminum

Jade Garden, Chuncheon, Korea
Three accessions through the index seminum

Jardin Botanique de Luniversite Pasteur, Strasboug, France
Two accessions through the index seminum

Jardin Botanique de la Ville et de l'Universite, Bescanson, France
Eight accessions through the index seminum

RHS Wisley
Forty accessions mostly *Lavandula*

RHS Hyde Hall
Nine accessions for cultivation

Plant material accessioned

During the period 1st October 2015 to 30th September 2016 the Garden accessioned 1108 plants, of which 156 were of wild origin. We accessioned 97 seed lots, databased 2165 herbarium specimens, and digitally imaged 670 herbarium sheets.

Publications by Botanic Garden staff and associates

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Funding

The Botanic Garden has had a very exciting and busy year, consolidating aims and purpose, and continuing to build on previously laid foundations. More visitors and Friends have been encouraged to the Garden, to share in the wide range of events and activities on offer, increasing vital revenues to support general operations. Trading income this year has funded a new cycle park at the Station Road Gate and contributed towards signage around the Garden. Other trading funds have been committed for known future development.

We have been fortunate to receive donations and various legacies, which along with Gift Aid have contributed to the installation of 'Sylvia's Library', a collection of horticultural and science focused books and magazines in the Cafe for Visitors to enjoy, and the redesign and landscaping of both the Autumn Colour Area and the New Zealand Terrace Garden. Donations, certain legacies, Friends subscriptions and Gift Aid helps to fund projects that directly benefit our visitors, enabling the Garden to do so much more than funding would otherwise allow. Other legacies and reserves have been invested in the newly formed 'Research Fund', the annual distribution of which supports valuable science and research at the Garden.

The Geoffrey and Eileen Adams Garden Room for schools, in its first year, is proving hugely popular in attracting more schools to the Garden to learn about plant science and horticulture. Any surplus income after running costs will in the future contribute towards the pay costs of an Education Officer.

As previously reported, the Monument Trust is funding a three year redesign of the historic Systematic Beds. A Project Manager was recruited in November to plan the re-development of the area, in consultation with the Monument Trust, Garden staff, the University and other key members of the plant science community.

With external funding (HEIF5), the Garden recruited an Interpretation Officer to focus on scientific communication within the Garden and through a variety of media, to include interpretation of the new 'Understanding Plants' area, and other displays of current scientific interest, enhancing activities and the visitor experience.

Perennial, the Gardeners' Benevolent Society, continued to generously fund the salary of an additional trainee who participated in the Garden's one year horticultural trainee scheme, which now offers seven places to those wishing to pursue a career in horticulture.

Volunteers and Friends again played a vital role at the Garden, contributing an enormous 3,282 hours of their time to a range of activities, sharing a wealth of knowledge and expertise which we acknowledge with grateful thanks.

INCOME		**£k**	**£k**
Funding Source	**Details**	**2015-16**	**2014-15**
University Support	Pay	696.3	694.1
	Non Pay	90.1	89.8
	Non Recurrent	0.0	0.0
Trust Funds	The Cory Fund	515.6	493.3
	Other Trust Funds	15.5	14.5
Admissions Income	Gate takings (to include tours,guidebooks etc)	421.8	391.2
Earmarked Funds	Friends (to include income for events, activities)	209.8 See breakdown below	203.7
	Other Specific Donations and Trade (to include Trading events)	296.3	431.4
Projects Grants/Funding		372.2 See breakdown below	330.9
Education Running Costs, Courses and Events		53.3	48.4
Donations – General (to include Gift Aid)		38.7	51.1
Other/Miscellaneous income		4.7	5.9
Total Income		**2,714.4****	**2,754.4****

Breakdown of Income (Friends: Earmarked Funds)		
Friends of the Botanic Garden – Subscriptions	200.6	195.3
Friends of the Botanic Garden – Outreach programme	7.0	7.0
Friends General Donation and 25 Fund	1.4	1.5
Other	0.8	0.0
Total	**209.8**	**203.7****
Breakdown of Income (Project Grants/ Funding)		
Community Art Project - % for Art	1.2	0.2
Connecting Collections (Funded by University of Cambridge Museums)	5.0	5.0
Interpretation (HEIF5 Funded)	40.5	0.1
Mill Stone Plaque (to be funded from CUBGA* and Garden Reserves)	0.0	0.8
Perennial – Funding towards Trainee Programme	20.0	19.8
Global Food Security Project	0.0	5.0
New Zealand Rock Garden (Donation)	4.7	0.0
Monument Trust	300.8	300.0
Total	**372.2**	**330.9**

Expenditure		£k	£k
Expenditure Type	**Funding Source**	**2015-16**	**2014-15**
Pay	University Support	685.4	627.2
	Trust Funds	450.7	468.9
	Admission and Tours	354.8	315.2
	Earmarked Funds: Friends	74.2	65.2
	Earmarked Funds: Other	64.3	52.5
	Specific Project Grants/Funding	55.1 see detail below	27.9
	Education Courses and Events	18.4	14.8
		1,702.8**	1,571.7
Non Pay	University Support	99.0	139.1
	Trust Funds	31.7	13.5
	Admission and Tours	60.4	35.8
	Earmarked Funds: Friends	86.2	23.8
	Earmarked Funds: Other	48.4	132.3
	Specific Project Grants/Funding	32.6 See detail below	317.2
	Education	36.7	40.0
	Gatsby Plant Science and Education Programme	9.0	2.9
	Donations – General	27.6	0.0
		431.5**	711.7
Total Expenditure		**2,134.3**	**2,283.4**

Breakdown of Expenditure (Specific Project Grants/Funding)		
Community Art Project - % for Art	3.1	0.1
Connecting Collections – University of Cambridge Museums	4.5	4.0
Pergola Project	0.0	0.9
Interpretation (HEIF5 Funded)	29.0	9.3
The Geoffrey and Eileen Adams Garden Room – Schools Room	11.9	310.2
Mill Stone (Funded by CUBGA* and from Garden Reserves)	0.0	1.5
Perennial – Funding towards Trainee Programme	18.6	19.1
Subtropical Courtyard Project (funded from donations)	0.0	0.9
Mediterranean Bed Project (funded from donations)	0.0	2.2
Systematic Beds Interpretation Project (funded by the Friends and from a specific donation)	0.0	4.1
New Zealand Rock Garden (funded from a specific in memory donation)	1.4	0.0
Monument Trust Systematic Beds Project	19.1	0.0
Total	**87.6**	**352.2****
Total Income less Total Expenditure:	**580.0**	****471.0**
Less: Earmarked funds held for future planned expenditure	-564.1	-414.0
Funds reinvested by Cory and Trust Fund Managers	-41.0	-1.0
Fund invested to form the 'Research Fund'	-808.2 See Note 1	0.0
Funds remaining for discretionary use	**-833.3****	**56.0**

Notes

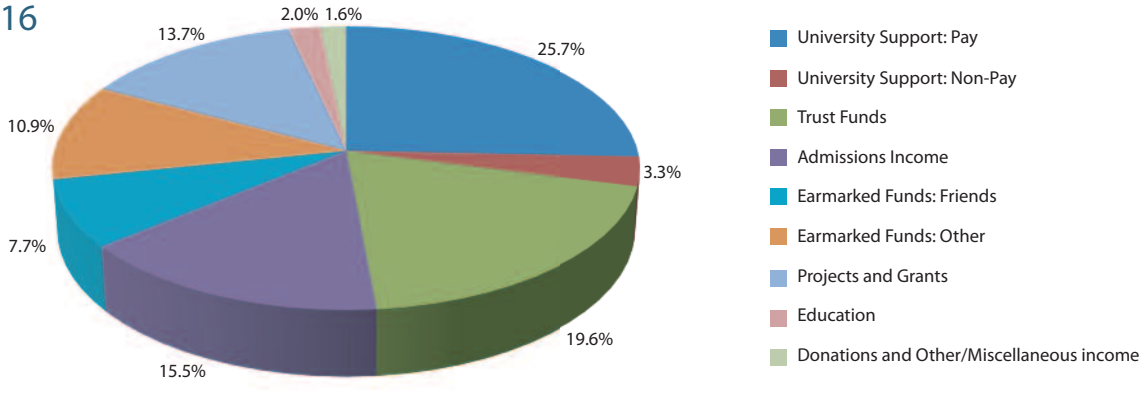
1. To increase much needed income, legacies and other committed reserves not required within a 3-5 year period were temporarily invested in the University's Endowment Fund to form the 'Research Fund', the annual distribution of which will be used to further science and research at the Botanic Garden in the short term.

* Cambridge University Botanic Garden Association – CUBGA

** Calculations include minor rounding errors

Figures shown include internal transfers demonstrating the origin of funding.

Income 2015-16



Syndicate and Cory Managers

Four meetings of the Botanic Garden Syndicate were held during the year under the Chairmanship of Dame Fiona Reynolds. Syndicate members were Professor Sir David Baulcombe, Professor Paul Brakefield, Professor Nick Davies, Dr Laurie Friday, Mr Donald Hearn, Professor Nick Jardine, Professor Ottoline Leyser and Dr Mike Rands. We are grateful to Professor Chris Howe and Dr Ian Henderson for the provision of one year's sabbatical leave cover for Professor David Coomes and Dr Ian Furner, respectively. The Secretary was the Garden's Director, Professor Beverley Glover. The Syndicate were pleased for the opportunity to meet the Botanic Garden staff following their July meeting.

The Cory Managers met four times during the year under the Chairmanship of Professor Sir David Baulcombe (Head of the Department of Plant Sciences). Managers for the year were Mr Michael Allen, Professor Howard Griffiths and Dr Alan Munro with Mr Jonathan Appleton as the representative of the University's Director of Finance.

Botanic Garden Staff – October 2015 to September 2016

Director
- Professor Beverley Glover

Curation
- Curator: Sam Brockington
- Plant Records Officer: Pete Atkinson
- Plant Records Assistant: Mar Millan
- Cory Library Manager: Jenny Sargent

Administration
- Administrator: Wendy Godfrey
- Finance Officer: Rachel Agnew
- Deputy Finance Officer: Anouska Arthur
- Finance Administrator: Elaine Dalton
- Assistant Administrators: Richenda Whitehead and Caty Cooke
- Education Administrator: Emma Daintrey
- Friends Administrator: Sacha Watson
- PA to Director: Jane Adams

Visitor Services
- Head of Visitor Services: Nicci Steele-Williams
- Deputy Head of Visitor Services & Team Leader (Tuesday-Thursday): Laura Welford
- Team Leader (Friday-Monday): David Evans
- Visitor Services Assistants: Andrew Bryant, Amanda Wilkins, Lucinda Fudge, Hannah Winter, Susan Baker, Sam Kuper (to July 2016), Andrew Cameron (to July 2016), Kate Smith (to August 2016), Alice Watkins, James Oliver, Kathryn Villanueva (from August 2016), Eleanor Dobbs (from August 2016).

Development
- Head of Development and Publicity: Juliet Day (to December 2015)
- Marketing Assistant: Helen Needham (from December 2015)
- Monument Trust Project Manager: Juliet Day (secondment from December 2015)

Education
- Head of Education: Flis Plent
- Education Officer: Sally Lee
- Education Officer: Hannah Elkington (Adoption leave cover from September 2016)
- Schools Education Officer: Bronwen Richards
- Interpretation Associate: Alison Murray

Estates
- Head of Estates and Operations Manager: Carl Tatterton
- Estates Manager: Philip Starling

Horticulture
- Head of Horticulture: Sally Petitt
- Alpine & Woodland Section: Supervisor – Paul Aston; Assistant – Simon Wallis
- Demonstration & Display: Supervisor – Peter Kerley; Assistant – David Austrin
- Experimental Area: Supervisor – Pete Michna; Assistant – Sally Hughes
- Glasshouse Section: Supervisor – Alex Summers; Assistant – Alan Langley
- Landscape & Machinery: Supervisor – Adrian Holmes; Assistant – Alistair Cochrane
- Systematics Section: Supervisor – John Kapor; Assistant – Julie Clos
- Trees & Shrubs Section: Supervisor – Mark Crouch; Assistant – Ian Barker
- Trainee Horticultural Technicians: From September 2015 to September 2016: Adam Bullen-Cutting, Emma Lainchbury (to February 2016), Kathryn Bray, Martine Borge (to January 2016), Owen Harlow, Paul O'Connor (to December 2015), Richard Choksey. From September 2016: Graham Hale, Robyn Young, Barbara Griffith, Toby Warren, Bryony Langley, William Greenfield, Robert Bradshaw.

Botanic Garden staff activities

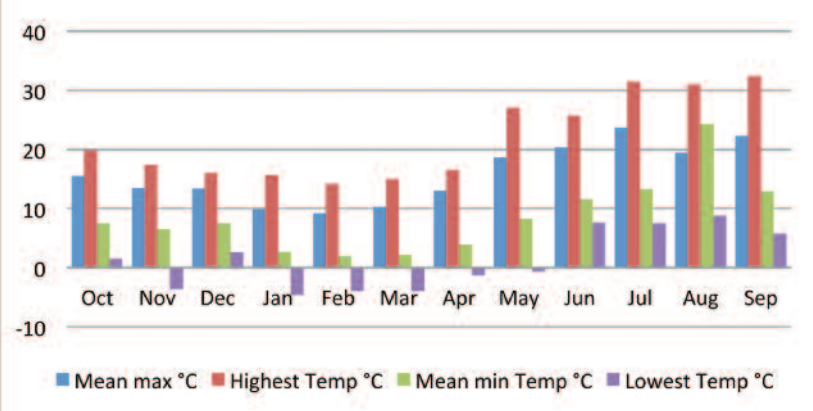
The following members of staff have contributed to external organisations and groups in connection with their posts:

- Professor Beverley Glover: fellow of Queens' College; trustee of the Royal Botanic Garden Edinburgh; member of the Science Advisory Committee of the Royal Botanic Garden Edinburgh; member of the Council of the European Society for Evolutionary Developmental Biology member of the Botanical Society of America; member of the British Society for Developmental Biology; Fellow of the Linnean Society; member of the Linnean Society's Education Committee; member of the Systematics Association Council; External Examiner for Botany at Trinity College Dublin; Patron of the Cambridgeshire Gardens Trust; Vice-President of the Cambridgeshire Beekeepers' Association; member of the Advisory Board of New Phytologist; member of the Editorial Board of Current Opinion in Plant Biology; member of the Natural Environment Research Committee's Peer Review College; serves on the Royal Society's Small Grants Panel; co-organised the UK Plant Evolutionary Biologists Meeting 2016; gave invited lectures at Duke University and the University of Edinburgh; took part in an "in conversation" with landscape architect Tom Stuart-Smith as part of the Department of Zoology's 150th anniversary celebrations; gave keynote talks at the European Society for Evolutionary Developmental Biology meeting in Uppsala, the New Phytologist Symposium on Plant Developmental Evolution in Beijing and at the Human Frontiers Science Programme Intergovernmental Conference at the Royal Society; gave invited talks to the Cambridge Natural History Society, the University of the Third Age plenary programme, at Hills Road Sixth Form College, to the Institute of Agricultural Management, to the Cambridgeshire Beekeepers' Association, and to the Hants and Wilts CamSoc.
- Dr Samuel Brockington: member of the European Society for Evolutionary Developmental Biology; member of the Botanical Society of America; Fellow of the Linnean Society; co-organised the UK Plant Evolutionary Biologists Meeting 2016; gave invited talks on betalain pigmentation at the UK Plant Evolutionary Biologists Meeting 2016, on the use of phylogenomic patterns in trait detection at the European Society for Evolutionary Developmental Biology meeting in Uppsala, at the GSPC Targets at Annual Plant Network Conference, Manchester, at the Museums as Method Conference 2016 and gave a Flash Presentation at the High Value Chemicals from Plants Conference, York 2016.
- Daniel Jenkins continued as a member of the UK Biology Education Research Group and the Royal Society of Biology's Education Policy Advisory Group.
- Flis Plent is director on the board of BGEN, with responsibility for their training programme.
- Juliet Day joined the Executive Board of PlantNetwork.
- Carl Tatterton continued as a trustee of the Hobson's Conduit Trust.
- Helen Needham joined the Great Days out in Cambridge committee.
- Sally Petitt continued on the Advisory Committee of the Chelsea Physic Garden and as Trustee of the Merlin Trust, and became a member of the Borde Hill Garden Council.
- Alex Summers continued as a member of the RHS Tender Ornamental Plant Committee.
- Simon Wallis continued as a member of the RHS Joint Rock Garden Plant Committee.

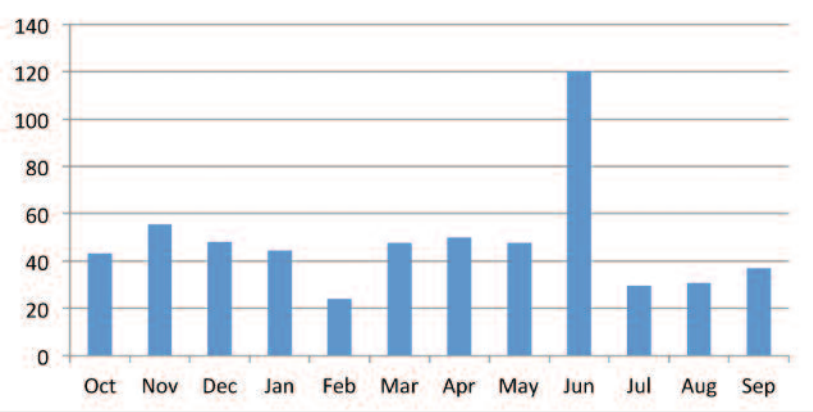
The Cambridge Certificate in Practical Horticulture and Plantsmanship
- Congratulations to Adam Bullen-Cutting, Kathryn Bray, Owen Harlow and Richard Choksey on their successful completion and award of the certificate.

Weather

Monthly Temperatures



Rainfall (mm)



This academic year has been very warm with the warmest December and January on record along with plentiful hot days in summer and early autumn.

October 2015 was relatively dry and mild with 43.1mm of measurable rain. The highest maximum was 19.9°C on the 1st and lowest minimum 1.5°C on the 25th and there were three light ground frosts. November was very mild and windy with 9 recordings of gale strength winds over 40mph, with some moderate damage to specimen trees. There were three air frosts and seven ground frosts, the hardest recorded at -7.1°C. Some snow fell on the 21st but did not settle. December was one of the mildest on record with only 4 light ground frosts. On the 18th we had a new record high for December at 16°C. There were four ground frosts, the coldest -3.2°C.

January was mostly cold with 23 ground frosts, the lowest -10.5°C on the 19th. In contrast, a new record high for January was recorded on the 24th at 15.7°C but also the coldest temperature of the year was recorded at -4.6°C. The rain measured in at 44.4mm and there were two snow days, on the 14th and 17th. February was predominantly dry and mild. The highest maximum was 14.2°C on the 21st and lowest minimum, -4.0°C on the 16th. We measured 23.9mm of rain. There was one isolated hail shower on the 5th, a brief sleet shower on the 14th and a gale on the 8th. March was an average month. There was 47.6mm of measurable rain, two snow showers on the 2nd and 5th and a hail shower on the 6th. Temperatures ranged from 14.9°C to -4.0°C. There were 7 air frosts and 20 ground frosts, the lowest -9.9 on the 8th. A severe gale on the 28th caused some damage to the glasshouse range.

April was milder and wetter than average with several wintery showers, 50mm of measurable rain and 4 brief hail showers. The highest maximum was 16.5°C recorded on the 13th and the lowest minimum, -1.3°C on the 28th. May was notable for two significant rainfalls at the end of the month. 47.6mm of rain was recorded in total, with 15.4mm and 12.4mm recorded respectively on the 30th and 31st. The highest maximum was 27°C on the 8th and the lowest minimum, -0.6 on the 1st. June was mild and humid but with some severe weather storms and 120.4mm of measurable rain. A hail storm on the 25th produced some hail stones larger than 1cm diameter. The hail piled up in banks across the Garden and caused flash floods on some of the paths. Along with heavy rains there were also 6 instances of thunder.

July was predominately dry with some rain and warm days. There was 29.5mm of measurable rain and the ground became very dry with deep cracks appearing. Temperatures varied throughout the month between 31.5°C on the 19th and just 7.5°C on the 6th. There was one roll of thunder heard on the 20th. August was mostly dry and warm, with most days feeling humid. There was 30.6mm of measurable rain and two very hot days on the 23rd and 24th where 30.7°C and 31.0°C were recorded respectively. Thunder was heard on two occasions. September was a very warm month with the hottest day of the year recorded at 32.4°C on the 14th. The coolest night was 5.8°C on the 23rd. There was 36.9mm of measurable rain.

Sally Hughes Experimental Assistant

Thank You

Gifts, donations and support received in Annual Report period 1 October 2015 – 30 September 2016.

In Memory Gifts
- The family of Geoffrey and Eileen Adams for the purchase of two children's benches, £500
- The family of Edna Florence Leader for the purchase of Spring bulbs, £325
- The family of Paul O'Connor, £200
- Donation from a friend in memory of Jane Howorth, £100

Legacy Giving
- Reverend Jeremy J Bunting, a legacy of £20,000
- Patrick Haynes, a legacy of £3,000
- Sylvia Norton, interim legacy payment, £25,000

Individual Gifts and Donations

We would like to thank all those Friends of Cambridge University Botanic Garden who continue to make significant gifts over and above the annual renewal subscription. We would also like to thank all visitors who choose to make donations, however small, to support the work of the Garden.

Grants, Trusts and Societies
- From the Monument Trust, a grant payable over three years to support Understanding Plant Diversity, a project to reinvigorate the research, teaching and public engagement value of the Systematic Beds, £300,000 (Year 2 towards total grant of £900,000)
- Perennial, for the employment of an additional horticultural trainee, £19,968
- HEFCE HEIF5 grant to support and enhance interpretation £40,416

Corporate and other support
- Sainsbury Laboratory Cambridge University, for Festival of Plants, £1000
- Department of Plant Sciences, for Festival of Plants, £500
- University of Cambridge Museums, Strategic Enablement grant, £5,000
- University of Cambridge Museums, Training grant, £500

Donors to the Cory Library
- David Austrin
- Nigel Goodman
- Owen Harlow
- Lady Christine Jennings
- Pia Östlund
- Richard Price
- Helen Stearn
- Antoinette Williams
- The estate of Sylvia Norton
- The estate of Oliver Rackham
- The family of Paul O'Connor
- The late Mrs José Dent
- The Fritillaria Group of the Alpine Garden Society
- The Qur'anic Botanic Garden

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The Leys School
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Thomson Webb & Corfield
Transversal Corporation Limited
Trustonic
Tucker Gardner
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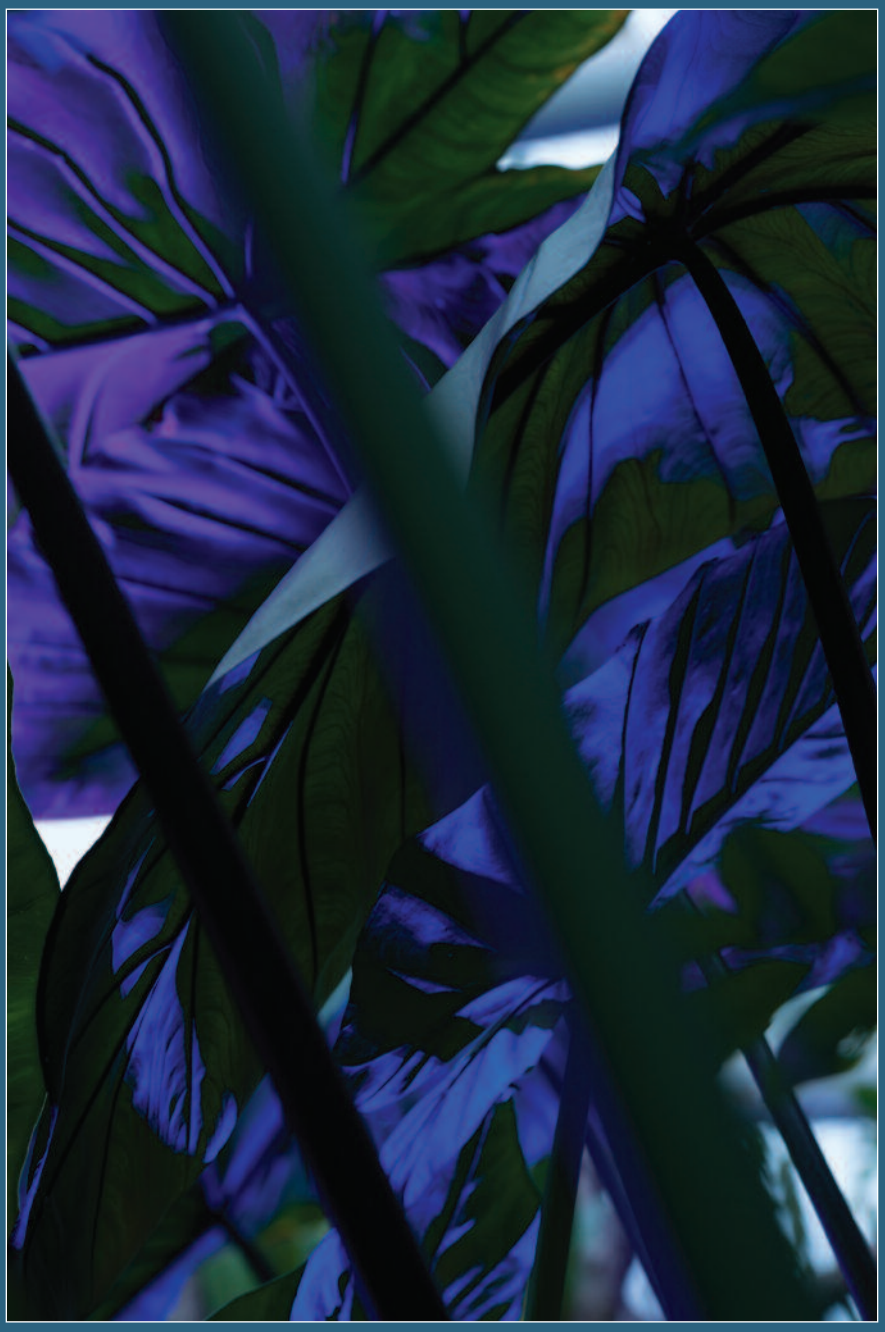
WSP I P B

… and thank you to everyone who visited the Garden
- Visitor numbers through ticket offices (including Friends, groups and paying visitors) 273,719
- Adult Education course participants 589
- Educational visit participants 8,934



Front, back cover & Twilight: Howard Rice
Tallest tree: Stephanie Law
Sounds Green: Lloyd Mann
Other photos: CUBG Staff

The paper used in this publication has been sourced from sustainable sources.

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