University of Leicester

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Botanic Garden Newsletter

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Desert house developments

In a quiet corner at the very northern end of the Botanic Garden sits the Desert House. This year, Alan Brown and Tony Morris, two volunteers from the Leicester branch of the British Cactus and Succulent Society, have helped with the maintenance of the collection of succulent species in the Desert House. This has enabled the collection to be better cared for and some of the bigger jobs undertaken more quickly and easily. For example, many of the climbing species and the taller specimens have now been cut back to preserve the integrity of the roof.

The biggest impact of the horticultural work carried out in the Desert House with the help of Alan and Tony can be seen just inside the entrance. Here, the large specimen of a Fan Aloe (*Aloe plicatilis*), which belongs to the grasstree family (Xanthorrhoeaceae), had grown to a height of over 2m since it was accessioned in 1987, but was in poor condition and so has been removed. Most of its trunk was rotten, it had no roots left alive in the ground and the rosettes of leaves were surviving by rooting directly into dead stem tissue. After nearly 30 years, it had also reached the roof, and was no longer able to flower properly. A new specimen was called for. However, in its native South Africa, only 17 wild populations of the Fan Aloe are known, and it is the only tree-aloe native to the Fynbos habitat, a type of heathland found in the Western Cape and itself of conservation importance, owing to its extraordinarily high species diversity. Since the collection and export of wild specimens of Fan Aloe threaten its survival, good conservation practice (backed by CITES law) demands that material should be sourced sustainably from nursery-propagated stock. Fortunately, a young plant had been grown in our service house from a cutting taken several years earlier, from the original plant with replacement in mind, and this is the specimen you now see when you visit. The planting in the immediate area has been reorganised, with smaller plants being moved forward and the large Puya cut back. Hopefully, when the young Fan Aloe flowers, it will now be seen in a better setting.

Aloe plicatilis (photo: James Gaither)

> *"only 17 wild populations of the Fan Aloe are known"*

Rachel Benskin (Botanic Gardener)
& Richard Gornall
(Director of the Botanic Garden)

Council for Learning Outside the Classroom

growing schools

Director's message

A new newsletter needs a few words of explanation. It is the first such publication by the Botanic Garden, and our aim is to showcase both the work that goes on here and the people who do it. Botanic Garden activity focuses on the importance of biodiversity, and in this context our mission is:

- to maintain the most diverse garden in the region, in terms of both plants, including special conservation collections, and landscape features.
- to underpin research and teaching at the University;
- to reach out into the wider community to demonstrate the contemporary significance of plants in a rapidly changing world.

A great variety of work goes on here and we need to ensure that this is both well-advertised and acknowledged. The Newsletter, compiled and edited in the Botanic Garden office, will help us keep all interested parties up to date with what we are doing. As such it will include not only pages reserved for the Friends of the Garden, but also a much wider range of material. Its scope will be absolutely everything to do with the Botanic Garden.

A word needs to be said about the Friends of the Botanic Garden former newsletter, which is now incorporated here. The Friends publication saw 234 issues produced over the period 1980 – 2012. The time is right to see it take on a new incarnation in these pages. It is a pleasure to record my thanks to all those who were involved in its production, especially Mary Walmsley, David and Elisabeth Watkin, Michael Parr and Jo Green.

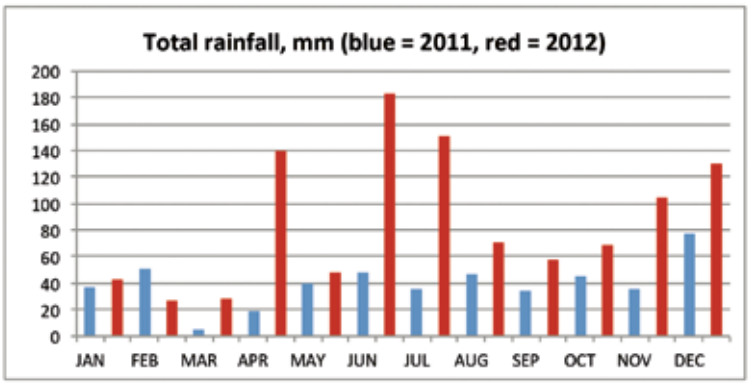
In this first issue, you will also find news and reports from the Botanic Garden, including the details of last year's weather; Dr Geoffrey Hall's article about the recently discovered ash dieback disease provides a topical account of what we know so far regarding the outbreak (and, yes, it is in Leicester!); and research at the Botanic Garden is featured in Prof. Paul Jarvis' account of his recent discovery of a master-regulator gene controlling chloroplast development. We hope that there will be something of interest to everyone.

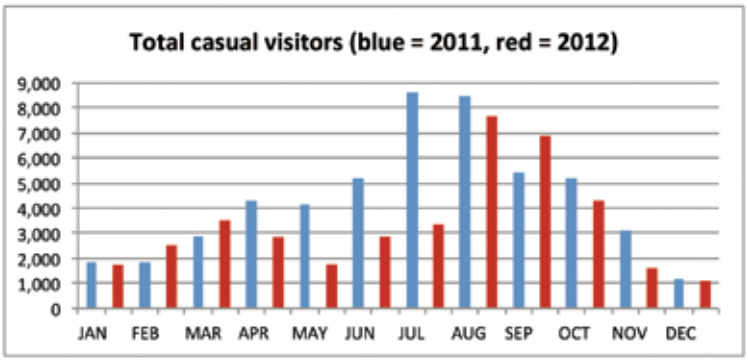
R. Gornall

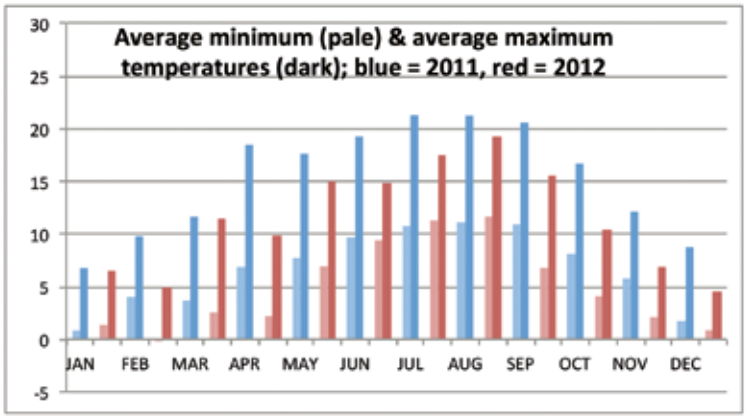
Botanic Garden weather: from one extreme to another

The obvious thing to be said about the weather in 2012 is that it was very wet. A record 1051.1 mm of rain fell, which is very nearly the amount that falls in some tropical rainforests. One thing that made it such a shock was that it followed an exceptionally dry 2011, which had 472.9 mm of rain.This is only a little more than half the annual average rainfall and approaches figures for parts of the sub-Saharan region.

With respect to the numbers of people visiting the Botanic Garden, it is perhaps no surprise that in dry 2011 we hosted 52,235 casual visitors whereas, in wet 2012, that figure was reduced to 40,109. The reduction is not as great as might have been expected however: clearly there are hardy souls who are prepared to go out whatever the weather. Nevertheless, the correlation between reduced visitor numbers and periods of increased rainfall is evident from the respective graphs. Temperatures in 2012 were a couple of degrees lower on average than in 2011, as might be expected given the lack of sunshine. What the consequences of this erratic rainfall will be for plants in the Garden remains to be seen.







Chloroplast development: new research breakthrough

Plants derive all their energy from sunlight, which they use to make food molecules (e.g. sugars) using little more than carbon dioxide from the air and water as raw materials. The chemical process that enables this remarkable self-sufficiency is called photosynthesis, and it is something that only plants and certain bacteria are able to do. Animals, including humans, cannot photosynthesise, and so must obtain their energy and food molecules by consuming plants or other animals that consume plants. As a result, essentially all energy within biological systems on Earth is derived from sunlight through photosynthesis. All life on our planet depends on this process.

In plants, photosynthesis takes place within tiny structures inside plant cells called chloroplasts. Typically, each plant cell contains about 100 chloroplasts, and each chloroplast is a about 5 micrometres across (roughly 1/5000th of an inch). The chloroplasts contain large quantities of a green pigment called chlorophyll, and it is this pigment that enables them to absorb sunlight energy for photosynthesis – and it is also what makes plants appear green.

Research in my laboratory is focused on understanding how chloroplasts work. They are remarkably complex structures, and it is estimated that each one contains as many as 3000 different types of protein. Most of these are not made inside chloroplasts, but instead are made elsewhere in the cell and must be imported by the chloroplasts. We have been studying how these proteins are targeted to chloroplasts.

Professor Paul Jarvis inspects Thale Cress (*Arabidopsis thaliana*) plants growing in a controlled environment chamber at the University of Leicester. One of the many advantages of this plant species for research (known to many as a mere weed) is its diminutive stature, meaning that many plants can be grown in a limited amount of space.

Recently, as reported in the November 2nd issue of the journal *Science*, we made a significant breakthrough in this area. We identified a new gene, called *SP1*, that controls which proteins are imported into chloroplasts. Because the imported proteins are largely responsible for the functions of chloroplasts, the *SP1* gene is very influential, and is essentially a master-regulator of chloroplast development. The extensive plant growth facilities at the Botanic Garden played an important role in this research, as the identification of the *SP1* gene required the systematic screening of many thousands of plants.

> *"The extensive plant growth facilities at the Botanic Garden played an important role in this research"*

Chloroplasts are not only responsible for photosynthesis, but actually have many other roles. For example, during the ripening of fruits such as tomato, bell pepper and citrus, chloroplasts undergo a striking change, converting into different structures called chromoplasts that are rich in red, orange or yellow pigments called carotenoids. These are responsible for the characteristic colours of many fruits, and are important dietary nutrients, as provitamin A and as antioxidants.

Our discovery may find important applications in crops. By manipulating the activity of the *SP1* gene, it should be possible to control different aspects of plant growth and development. For example, it may be possible to speed up or slow down fruit ripening. Doing so might help to prolong the shelf-life of certain fruits, reducing waste, or enable farmers to expedite fruit ripening, perhaps to avoid inclement weather or to ensure that the crop is ready when the growing season is limited. Moreover, because the *SP1* gene also governs other aspects of plant development, such as how quickly leaves age, it could also be used for other purposes such as keeping crops alive for longer.

Chloroplasts from three different varieties of Thale Cress, superimposed on a photograph of the corresponding plant varieties. The images illustrate how differences in chloroplast development can have a profound effect on the health and appearance of the plants. The striking difference between the varieties at the bottom left and bottom right is entirely due to altered activity of the *SP1* gene.

Concerning possible applications in fruit ripening, Professor Douglas Kell, Chief Executive of the Biotechnology and Biological Sciences Research Council, which funded the project, said: "The ripening process can happen quickly, and it can take just a few days for a fruit or vegetable to be considered inedible. This discovery brings us one step closer to greater control over ripening so that we have greater flexibility for farmers when supplying produces in the best condition."

So far, the research has been conducted primarily using a small model plant called Thale Cress (*Arabidopsis thaliana*). We are now in the process of transferring the technology into tomato, and we will know within a year whether the technique truly has promise in relation to fruit ripening. If it works as expected, it will be several years more before our discovery finally finds applications in the field, to the benefit of farmers and consumers.

Professor Paul Jarvis
(Department of Biology, University of Leicester)

Ash Dieback Disease

Ash dieback disease causes leaf loss and crown dieback in affected trees, and it may lead to death, especially of young trees which are highly susceptible. It has seriously affected a high percentage of ash trees in continental Europe, most notably in Poland (80% infection), and in Scandinavia (90% infection) and the Baltic States. It was first recorded in Britain in February 2012, in a consignment of infected trees sent from a nursery in the Netherlands to a nursery in Buckinghamshire. Early reports in Britain were all from nurseries or recent plantings, and in June it was found in ash trees planted at a car park in Leicestershire that had been supplied by a nursery in Lincolnshire. The first report from established woods was in October 2012 from East Anglia. Its extent in the wider environment was unknown at that time, so extensive surveys were undertaken which show that it is present throughout Britain at 323 sites (at 19 December 2012), and that most infections in established woods are in eastern and southern England.

It is caused by a microscopic fungus, although there was confusion about its identity at first. Unlike flowering plants, the fungus has two names; one for the stage in the life cycle that produces spores by asexual reproduction, *Chalara fraxinea*, described in 2006, and another for the stage that produces spores sexually, *Hymenoscyphus pseudoalbidus*, described in 2010.

The confusion arose because an almost identical fungus, called *Hymenoscyphus albidus*, that grows on ash leaf litter but which is non-pathogenic, was thought to be the sexual stage. Further studies showed that the two species of *Hymenoscyphus* are different, but can only be separated by DNA sequencing. The asexual stage of *H. albidus* is so far unknown, but is likely to be very similar to *C. fraxinea*.

From June to late autumn, *H. pseudoalbidus* produces spores in fruiting bodies that are formed on the mid-rib of dead leaves and shoots in the year following the initial infection.

> *"the old ash tree in the Botanic Garden may not be at risk"*

The spores are dispersed by the wind and the disease can spread up to 20-30 km per year; longer-distance spread occurs via infected plants produced for the nursery trade. The spores infect leaves and produce the *C. fraxinea* stage that grows in the leaf tissues, stems and trunk. Soon, the leaves start to turn black, the stem changes colour to brown and purplish, and cankers appear, visible as characteristic diamond-shaped lesions on stems. The fate of the tree then depends on its age and location, weather conditions, and the presence of honey fungus or other secondary infectious organisms. Young trees are especially susceptible and usually die

1. Distribution map of confirmed infections

Credit: Forestry Commission

Credit: Cotswold Fungus Group

2. Fruiting bodies of the sexual stage, *Hymenoscyphus albidus*

Credit: Holdenrieder, ETH, Zürich

3. *Chalara fraxinea* in laboratory culture

Credit: Woodland Trust

4. Diamond shaped lesion on ash stem

Credit: Forestry Commission

5. Blackened leaflet midrib

How to identify *Chalara* ash dieback in the field:
http://www.youtube.com/watch?v=8sI7hgFZ-4g&feature=youtu.be

The Forestry Commission has produced a website that allows you to report infected trees:
http://www.forestry.gov.uk/website/treedisease.nsf/TreeDiseaseReportWeb#

The AshTag app for IOS and Android allows mobile device users to submit photos and locations of sightings to a team who will refer them on to the Forestry Commission: **http://www.ashtag.org**

within two years, but trees from 5-40 years old may take up to five years to die. In contrast, trees over 40 years old have not yet been shown to die of the disease. So the old ash tree in the Botanic Garden may not be at risk of infection, but will need to be monitored for signs of the disease.

There is much genetic variability among British Ash trees and some may well be resistant. Not all trees die of the disease: in Poland 15-20% have survived.

This is in contrast to the situation for Dutch elm disease, where the native population of elms had a low level of variation and was decimated by the disease. Although Common Ash and the European Narrow-leaved Ash are susceptible, some Asian species show low susceptibility, whereas a few other species may act as carriers of the disease.

Although British nurseries do grow ash trees, seed gathered from British trees is sometimes sent to nurseries in continental Europe to be cultivated before being reimported as seedlings. Although some trade bodies have been asking for a ban on imported ash trees since 2009, this was not imposed until October 2012 after infected trees were found in established woodland owned by The Woodland Trust, which has since campaigned vociferously for action to protect British woodlands. The Government was reluctant to act because *H. albidus*, which had been thought to be the cause, is widespread in Britain. It only acted when the new species, *H. pseudoalbidus*, was identified as the source of the disease. On 29 October 2012, emergency legislation was passed, restricting imports of ash plants and seeds to prevent any more accidental introductions and their spread within Britain. *C. fraxinea* is now a quarantine pest.

Ash is a habitat for many other living organisms: 66 species of fungi , including three very rare Red Data List species, along with lichens, flies, beetles and other invertebrates, are associated with ash trees and these are at risk if ash trees decline substantially. Ash is the third most common broadleaf native tree species in Britain after oak and birch, and ash woodlands have high conservation value. Their open canopy and short time in leaf allow a lot of sunlight through to the woodland floor allowing a rich and varied ground flora to grow, which provides food for a wide variety of insects and birds.

Dr Geoffrey Hall
(Leicestershire Fungus Study Group)

New course: identifying the wildflowers of Leicestershire & Rutland

2013 sees the launch at the Botanic Garden of a new kind of plant identification course, aimed at absolute beginners, and focusing on the wildflowers we see locally.

We aim to show you what grows where, how to find and identify common species and how, armed with this knowledge, you can get more involved in local nature conservation.

There are five self-contained modules, each lasting for one month and covering a different habitat and group of plants: spring flowers of woodlands and glades; summer meadow flowers; aquatics and riverside plants; "weeds" of town and garden; and trees, deciduous and evergreen.

Each module starts with a tuition session at the Botanic Garden, followed by visits to local sites, where you can try out your new-found skills with the help of the local botany group, membership of which is included in the package, along with a tour of the local Herbarium and lots of free goodies to help you get started. You can also submit your finds to us and we will help you identify what you have seen.

Our introductory price is only £50 per module, with a further 10% discount if you are a Friend of the Botanic Garden, a member of Leicestershire & Rutland Wildlife Trust or the Botanical Society of the British Isles.

For further details, or to reserve a place on the course, please contact Louise Marsh at botanicgarden@le.ac.uk

Louise Marsh

Friends of the Garden

Chairman's Notes

A Happy New Year to all, and welcome to the new style Newsletter. The committee has decided to join with the Botanic Garden in producing an expanded newsletter which, in addition to "Friends" information, will in future also contain items of a more diverse nature that feature all aspects of the work of the Botanic Garden.

As I hope you will agree, the resultant combined effort enables us to produce a newsletter that will do justice to the subject. The ability to reproduce photographs in colour will hopefully encourage more people to submit their photographs for publication. We, the Friends, will still maintain our own section within the periodical, and we will still contribute articles and pieces of information just as we have done in the past. I do hope that you find the new style acceptable and indeed an improvement.

We have a busy year coming up. We will again, as reported elsewhere, be having two Crocus Sunday charity events at the end of February and the beginning of March; and our annual Plant Sale and Family day will be on the 30th June.

A very interesting programme of visits has been arranged during the summer months to other gardens and venues and I would urge anyone who has not joined us on these visits before to give it a try. Those on the committee responsible for organising the visits work very hard to ensure that the programme caters for a wide variety of horticultural interest, and I believe the season contains something for everyone.

Finally, my best wishes to all for 2013 and if anyone has any comments, criticism or suggestions please do not hesitate to contact me.

David Chambers
davidchambers@btinternet.com

Have You Paid Your Subscription?

If you have not already paid your 2013 subscription, please complete the enclosed form. Your new membership card will then be enclosed in the next newsletter.

Thank you

Lecture review: "Birmingham Botanical Gardens, Past and Present"

The Birmingham suburb of Edgbaston has two Botanical Gardens: Winterbourne is run by the University and I had assumed that The Birmingham Botanical Gardens were managed by the City Council but, as we learned from Philip Aubry, they are actually independent. The only other one in Britain that is in this category is the Chelsea Physic Garden.

In his lecture on 6th December, Philip, who retired as Director of the Garden in 2005, described its fascinating history. In 1829 a group of business men decided that they would like to join in the Victorian fashion for plant collecting and establish a private garden. They chose a farm on the outskirts of the city and asked J C Loudon to design the planting and the greenhouses. His layout survived but the owners could not afford his glasshouse design and they parted company. Initially the garden was primarily for the enjoyment of the businessmen and their friends. This arrangement was replicated in many cities in the 19th century.

Over the intervening years there have been periodic financial problems, despite the owners of the land requiring only a nominal rent. To increase income, a ballroom was built and it became a leading facility for large social functions. Early in the 20th century animals were added (we were shown a slide of an alligator) but now only an aviary remains. When the city was building the International Conference Centre, the council supported developments in the Gardens to provide an additional attraction for delegates. Then in 1998 the G8 summit was held at the Botanical Gardens, prompting replacement of the potholed tarmac on the terrace with limestone. Now the finances are again being challenged as the demand for functions has fallen and the caterers' lease is due for renewal.

We were given a virtual tour of the 15 acres of gardens, including the four glasshouses, formal bedding, a massive rockery, a children's play area, the bandstand and of course the café and shop. Due to diminished income the number of staff has fallen from approximately 50 to about 25, which still sounds very generous compared with our Garden! The Gardens are supported by over 5,000 members (friends) who provide about 50 volunteers.

This was a most interesting lecture, not least because the issues parallel some of those affecting the University of Leicester Botanic Garden.

David Watkin

Friends of the Garden

Forthcoming lectures and visits

Winterbourne House and Garden
Wednesday May 22nd 2013 Birmingham

Winterbourne House and Gardens are described as hidden gems located near busy central Birmingham. The Arts & Crafts style estate was built in 1903 for John and Margaret Nettlefold, whose family firm was the world's biggest manufacturer of nuts and bolts. The ground floor shows how the decor would have appeared when the Nettlefolds lived there over 100 years ago, with beautiful Arts & Crafts furniture and antiques.

Margaret designed the 7 acre garden inspired by the books and designs of Gertrude Jekyll. After a period of restoration it was Grade 2 listed by English Heritage in 2008. The garden offers colour and interest throughout the year and is home to a walled garden, colour themed borders, an original sandstone rock garden and streamside planting. You will find collections of plants from China, North and South America and the Alpine areas of the world. We will be given a guided tour of the gardens and have ample time to browse or to visit the house. There is a small tearoom providing light lunches or you may bring a picnic.

We shall leave Glebe Road at 8.00am and depart from Winterbourne House at 4.00pm. The cost of the trip is £20.75. Non-members of the Friends should add £2. Please send your booking form to Dianne Bang by 8th May 2013

Gardeners' World Live Show
Wednesday 12th June 2013 Birmingham

This will be the first time we have visited this popular show. Many of our keen gardeners will now have assessed their gardens and know where the spaces for additions are or where changes need to be made. Come along and be inspired by the show gardens and tempted by the many nurseries exhibiting here. There are numerous catering facilities at the show, offering a wide range of food and drink options. Our tickets have to be paid for in advance of the show, well before the end of May, and after that we cannot offer the reduced group price.

We shall leave Glebe Road at 8.00am and depart from Birmingham at 4.00pm. The cost of the trip is £29, senior citizens £27.25. Non-members of the Friends should add £2. **Please send your booking form to Dianne Bang by 12th May 2013**

Next lecture

Thursday 14th February: *"Roses, Old and New"* by Ann Bird

For nearly 40 years Ann Bird has been a rose enthusiast, having started from scratch in a neglected, long, narrow garden which she later redesigned as three 'rooms'. She became the first woman president of the Royal National Rose Society, overseeing the planting of the Society's new Garden of the Rose at St Albans. Ann was a founder member of the RNRS Historic Roses Group in 1990, and later became its chairman. She gardens in Market Harborough.

Venue: Ken Edwards lecture theatre 3 on main campus at 7.30pm

Garden visits 2013 dates for your diary

22 May
Winterbourne House and Garden, *Birmingham*

12 June
Gardeners' World Live Show, *Birmingham*

13 July
Greys Court and Scotlands Lodge Garden, *near Henley on Thames*

17 August
Hampton Court Palace and Gardens, *London*

17 September
Upton House & Garden and Pettifers, *near Banbury*

Crocus Sunday volunteers

This is my usual plea for volunteers for Crocus Sundays, 24th February and 3rd March. If you can spare an hour between 10am and 4pm on those dates to stand at the gate and welcome visitors, and tell them where to find the crocus and other seasonal delights, then I would be delighted to hear from you.

Please reply to me, tel. 01455 272953 or email: janejones17@btinternet.com

Jane Jones
The Bath House,19 Stanton Road,
Sapcote, Leicester, LE9 4FR

Friends of the Garden

Friends of the University of Leicester Botanic Garden Annual General Meeting

Thursday 7th March 2013 at 7.30pm
Ken Edwards Lecture Theatre on the main University campus

AGENDA

1. Apologies for absence
2. Minutes of previous meeting (8th March 2012)
3. Matters arising
4. Membership secretary's report
5. Chairman's annual report
6. Treasurer's report
7. Director of Botanic Garden's report
8. Election of committee and officers for 2013-2014*

a. Re-election to committee

Sally Towers	Richard Yates
Catherine Watt	Jane Jones

b.

Chairman	David Chambers
Hon. Treasurer	David Watkin
Hon. Secretary	Gay Dent

9. Any other business

*Any further nominations should be sent to Gay Dent,163 Coleridge Drive, Enderby, Leics LE19 4QJ, by 15th February

The AGM will be followed by a light hearted talk by Eric Webster entitled ***Lesser Known Uses of Plants***. He taught media studies – photography, video and the use and processing of images. He has a life-long interest in plants and is a member of the Alpine Garden Society

Crocus Sundays: spring flowers at the Botanic Garden

24th February and 3rd March 2013, 10am-4pm

To celebrate a spectacular display of beautiful Woodland Crocus throughout the Sandstone Garden in front of Beaumont Hall, the Friends of the Botanic Garden have arranged two 'Crocus Sundays'. A short walk in the fresh air will take you past borders where you can see colourful Hellebores and Winter Aconites. You might still be able to see some Viburnums, Witch-hazels and the related Persian Ironwood if they are still in flower.

Tea, coffee and home-made cakes will be served in Beaumont Hall, where you can see displays on our crocus research.

Entrance to the Garden is by donation to the University of Leicester Cardiovascular Research Centre Appeal, Glenfield Hospital.

Please come to the Glebe Road entrance where you will be welcomed and shown where to go by Friends of the Garden.

4th March 2013, Leicester Literary & Philosophical Society

8pm at the Hugh Aston building lecture theatre, De Montfort University

"Exploring and explaining the world of plants – a history of botanical discovery", a lecture by Richard Gornall (Director, University of Leicester Botanic Garden)

Botanic Garden Lecture:

16th May 2013, 8pm

"Withering - the English Linnaeus and the flowering of pharmacology"

Venue: **University of Leicester main campus**
Ken Edwards lecture theatre 3

Everyone welcome, admission free

The 2013 Botanic Garden Lecture will be given by **Dr Peter Sheldon**, a retired Senior Consultant Rheumatologist to the University Hospitals of Leicester, and Clinical Senior Lecturer in Immunology to the Leicester Medical School. His topic focuses on William Withering, a physician and a learned botanist, whose pioneering work on the medicinal properties of plants led to a more scientific approach towards their exploitation as treatments for disease. Dr Sheldon's long-term interest in both Withering and medicinal plants, particularly Foxglove, Meadowsweet and Wintergreen, led to the publication of two books: *The life and times of William Withering, his work, his legacy* and *The fall and rise of aspirin: the wonder drug.*

University of Leicester

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University of Leicester Botanic Garden- a world of plants
Public entrance: Glebe Road, Oadby, LE2 2LD
Opening hours: every day 10am-5pm
Entrance free except for special events
More information at: www.le.ac.uk/botanicgarden

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