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With over fifty years of practical experience, Alan has presented a range of seminars and workshops over the past three decades. Drawing on this experience, he writes in an inimitable style, with each article produced to provide solutions to problems that arise during everyday situations.

Alan is an Independent Expert Witness and Consultant dealing with Court cases and disputes throughout England and Wales, for and on behalf of individual clients and on the instructions of The Courts.

Subscribers are welcome to pose any related questions to Alan via email, and request Without Prejudice advice and guidance which may be given in the form of a written article.

Currently holding over one hundred and fifty features, each written either stand-alone or as part of a series, subscribers are welcome to request more articles on whatever horticultural management subject they desire!
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Cover Red-tailed bumblebee (*Bombus lapidarius*) on knapweed (*Centaurea nigra*).
(Photo: Natasha de Vere)

FROM THE PRESIDENT

The future health and well-being of the nation

The holiday season is upon us and horticulture up and down the land has made a recovery of sorts following the lift on people movement and the opening of garden centres and nurseries.

Garden centre sales are recovering, growing plans for hardy ornamental nursery stock growers are ratcheting up in anticipation of a Benelux/Brexit import slowdown, suppliers are stocking up in advance of the current punitive import tariff on horticultural goods and food producers are trying to get their harvest in, against a background of an ever-reducing labour force.

Prominent gardens up and down the country are experiencing lower gate receipts due to the imposition of masks, sensitivity of people contact and the challenges of underlying health conditions facing the over the over-70s, who are regular garden-goers. Parks and green spaces on the other hand are either entirely packed or closed due to concerns re: over-crowding and the spread of Covid-19 and, regrettably, protected ornamental growers were unable to make up for the significant early season losses, reported in all the media channels. Let's hope that autumn sees a continued recovery in the health of the nation.

Horticultural education will also take on new formats come September with fewer students. Video conferencing, webinars and online tutorials will be featuring in all colleges and universities and will become the new norm. The Chartered Institute of Horticulture has been hugely involved in further education (FE) and higher education (HE) in horticultural education since its inception.

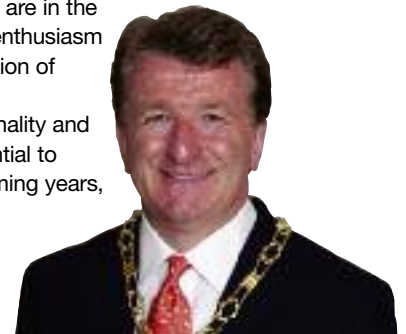
The loss of quality FE and in particular HE horticultural education is of great concern to this Chartered Institute. In the late 90s it was possible to enter six horticultural undergraduate choices in the UCAS application form and now none of those institutions offer undergraduate programmes in horticulture. It is patently obvious that a supportive review of FE and HE horticultural education is required by the CIH, as our colleges and universities need all the encouragement they can get.

The CIH will give this the highest priority in 2021 and will need your support!

Never before has the topic of food and non-food horticulture been more in the news. The UK and Ireland population desires healthy food that is seasonal and grown locally. Additionally, a healthy park and green space to roam, relax and enjoy recreational pursuits is required. Food and public green space have never been as high as they are in the current public consciousness, so we must harness this enthusiasm and convert it into a greater appreciation of the contribution of horticulture to well-being.

The continuing interest in food provenance and seasonality and the renewed interest in public green space has the potential to move all of horticulture up the political agenda in the coming years, so let's take this opportunity!

Gerald Bonner CHort FCIHort, President
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Write for *The Horticulturist*

Much of the content of *The Horticulturist* arises from voluntary contributions from members in the shape of ideas, articles and photographs.

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Novel ways to produce seed potatoes

HYDROPONICS Jenny Durrin sets out the University of Idaho's ground-breaking programme of hydroponic production of seed potatoes from tissue culture.

The University of Idaho established itself among the leading nuclear seed production programmes by maintaining tissue culture lines and gearing production to serving commercial seed potato producers across North America and internationally. The university's greenhouse-based production system gave commercial producers and researchers a source of seed potatoes with the lowest risk of diseases by maintaining strict disease control protocols and testing in tissue culture and nuclear seed production.

Using the term 'nuclear' in the context of plant production can easily be misunderstood. The term actually refers to the cell nucleus and to seed potatoes that originate from tissue culture lines.

Small stem node cuttings from plants grown in tissue culture are used to create individual plantlets by using nutrients including sugar, vitamins and minerals to encourage these plant pieces to form roots in agar plates. The plantlets are then planted into a variety of growing media to produce mini-tubers. These small potatoes are then planted in greenhouses or directly in fields to produce the first generation of seed potatoes.

The programme provides services to potato farmers and researchers in 12 or more countries most years including Canada, United Kingdom, The Netherlands, Australia, Japan, South Korea, China, Uruguay, Argentina and Ireland. Those services include shipping tiny plantlets on agar plates, producing small thumb-sized mini-tubers

and, uniquely, providing virus-cleanup services to provide disease-free tissue cultures. The laboratory ships 250,000 plantlets each year to seed potato growers and researchers.

The tissue culture that is at the heart of the university's seed potato programme provides the best way to ensure disease-free planting stock at the foundation of the state's certified seed structure. The potato germplasm lines are kept disease free by a process using the anti-viral drug ribavirin and heat treatment. The process typically takes six months to a year to complete.

Major production region

Established more than two decades ago, the University of Idaho programme became the



Top left: University of Idaho Seed Potato Germplasm programme Director Jenny Durrin prepares potato node cuttings for rooting on an agar plate.

Top right: Potato germplasm in tissue culture.

Above: A selection of potato varieties in tissue culture at the University of Idaho Seed Potato Germplasm programme. RB is Russet Burbank, the venerable elder of the lot.

major source for some of the most popular commercial cultivars or varieties in the US Pacific Northwest. This area is the major production region for fresh pack and processing potatoes in North America.

Idaho's potato production, which produced 13 billion pounds of potatoes in 2019, relies on strict protocols for the production of virus-free nuclear seed potatoes at its foundation. Some 60% of all potatoes produced in the US and 90% of potatoes grown in Idaho, can be linked to the University of Idaho seed potato germplasm programme.

A large commercial seed potato industry plants the virus-free first generation tubers in fields and multiplies the crop under strictly controlled conditions to avoid pests and diseases for two, and

sometimes up to six, additional generations. The stringent quality controls on seed potatoes help limit losses in major commercial potato production where diseases caused by viruses such as potato virus Y (PVY), which can reduce yields, cause necrotic spots on the tubers and sometimes create misshapen tubers; and bacteria, which are capable of destroying entire crops in the field or in storage.

The Idaho Crop Improvement Association (ICIA) is an important partner in maintaining the disease-free status of potato plantlets distributed for mini-tuber production. Plantlets from tissue culture batches/lots are tested for a variety of diseases including potato virus Y (PVY), potato virus A (PVA), potato virus X (PVX), potato virus S

(PVS), potato virus M (PVM), potato leaf roll virus (PLRV), red la soda virus (RLSV), or potato latent carlavirus, potato mop top virus (PMTV), potato spindle tuber viroid (PSTVd), Bacterial Ring Rot (BRR) or *Clavibacter sepedonicus* (formerly known as *Clavibacter michiganensis* subspecies *Sepeidonicus*); and *Pectobacterium* species.

Controlling seed potato quality is a major effort throughout the potato industry. Commercial seed potato growers also submit 400 tubers from later individual seed lots to ICIA for winter production in Hawaii. This is done to confirm the batch/lot of seed potatoes complies with standards for PVY or leaf roll virus. This winter seed production saves seed potato producers a growing season in Idaho.

Large-scale commercial growers produce



Left: University of Idaho Potato Agronomist Michael Thornton, a past president of the Potato Association of America, at the Parma Research and Extension Centre in western Idaho.
Below: A greenhouse fitted with ebb and flow trays grows a crop of mini-tubers.
Right: Large trays are installed for ebb and flow hydroponic production.
Far right: Potato harvest at the University of Idaho Aberdeen Research and Extension Centre incorporates modern and traditional methods from mechanised harvesters to burlap sacks to store the tubers.



ware/edible potatoes for fresh-pack and processing beginning with the third generation of certified seed potatoes. Growers typically will rely on the certified seed potatoes from the original nuclear seed potatoes for field production through as many as six generations. Growers generally encounter more pathogen problems within each subsequent generation beyond the original nuclear seed potato stock. From an original pound of nuclear seed potatoes, approximately 30 mini-tubers – about the size of a kumquat – are produced, subsequently growers could eventually harvest several hundred thousand pounds of potatoes.

Breeding lines

The University of Idaho seed potato germplasm programme maintains 300 varieties and breeding lines in its facility. About 100 varieties are named and commercially grown. The remainder are breeding lines or varieties from private collections the university maintains under contract. The varieties maintained by the programme range from the venerable Russet Burbank, which was selected by noted American horticulturist Luther Burbank more than a century ago, to 35 varieties developed by potato researchers in Idaho, Washington and Oregon.

Although the bulk of the plantlets produced through tissue culture are rooted in agar at 15 per cent and sold to commercial seed potato producers, the university's programme also produces about 4,500 pounds of mini-tubers annually in greenhouses secured from insect-vectored diseases.

Like commercial growers, the university traditionally relied on soilless media to grow mini-tubers: we now use 100% perlite on its own. A question about the presence of the fungal pathogen, powdery scab, in some media led programme director Jenny Durrin and colleagues to explore alternate media and hydroponic production. The programme now uses a pot-based ebb and flow hydroponic system that employs flood irrigation and a 100% perlite growing media.

Hydroponic technique

The university developed the technique after exploring nutrient film hydroponic production, which has been successfully applied to seed potato production elsewhere. However, interviews with seed-potato growers showed a potential concern among some with that particular method. The nutrient film method bathes potato plant roots with a constant flow of solution, and the plants continuously set mini-tubers. The mini-tubers are then picked throughout the growing cycle several times a month, and subsequently stored. As a result, seed-potato producers receive batches of mini-tubers with varying emergence dates that can complicate further production as seed-potato producers begin to multiply future seed crops.

The potential difficulties with staggered harvest dates led the Idaho team to continue its traditional pot-based approach to mini-tuber production. That decision, in turn, resulted in a search for an alternative growing medium with the least risk of harboring a pathogen. The search revealed perlite as the best option. Perlite is manufactured by

mining volcanic ash, then baking at temperatures of 900°C. The treatment 'pops' the volcanic glass like popcorn and sterilises it. The material is packaged at about 50°C, further discouraging contamination. The perlite is mined and processed in Idaho, adding to the material's economic appeal and the ability to track its source.

The original interest in shifting to hydroponic production to meet quality concerns saw a redesign of the greenhouses used to grow the crop. Although production remains in 3.78 L plastic pots, the earlier greenhouse benches designed to drain away water were replaced with industrial-sized trays. The 4m x 2m trays are 30cm deep. The trays are flooded daily with nutrient solution as needed for the potato plants' optimum growth. The nutrient solution is changed as the plants' growth stage advances to encourage the plants to set tubers and divert energy to their growth. As harvest approaches, the concentration of nutrients and the frequency of watering are diminished.

Ebb and flow system

The ebb and flow system provides greater flexibility in tailoring the nutrient composition of the solution. The University of Idaho is still perfecting the ebb and flow system, and once finalised and fully refined, the next major plan for the programme will involve a switch to a contained environment growing system that leaves the greenhouse behind.

To avoid the variability of lighting inherent in greenhouse production at 46° North latitude in Moscow, Idaho, where seasonal swings in the



earth's tilt reduce day length and light intensity, the new production facility would be housed in metal buildings illuminated entirely by artificial lights. That production system will require research to optimise the lighting regimes, nutrient regimes and other treatments that could provide different results based on the variety of potato grown. The University of Idaho team is committed to these studies which are underway.

The shift to the pot-based ebb and flow hydroponic system has increased the quality of the mini-tubers and offered the potential for increased volumes. Early positive results suggest the contained environment system could eventually expand the growing schedule from two to three crops a year.

Broad-based support for the seed potato germplasm programme led the university to conduct a fundraising campaign for a new laboratory building to house the programme. The \$5.2 million project will further isolate the tissue culture programme to increase protection against inadvertent contamination. The new laboratory is scheduled to begin operation in 2022.

The project is funded by the Idaho Potato Commission, which represents the state's potato growers. The commission funds marketing and research by Idaho's state government, by the Northwest Farm Credit Services (a major agricultural lender) and by private growers, to promote Idaho's best known crop. The economic importance of the potato industry to the Northwestern states led to the creation of a sophisticated, interconnected network of agricultural universities and the US Department

of Agriculture Agricultural Research Service (USDA-ARS), along with grower-funded potato commissions and crop improvement associations. Known as the Potato Variety Management Institute (PVMI), the collaborative group develops new potato varieties that offer better nutrition or reduce inputs of water, fertiliser and pesticides for production. State and federal potato researchers collaborate on plant breeding and agronomic research to improve crop quality, develop agronomic methods specific to each variety and develop storage guidelines.

The majority of the new potato varieties marketed through the PVMI are russets – the oblong tubers with textured brown skin are favoured for baking and processing into French fries. The Russet Burbank remains the single most popular variety grown in Idaho because the long, blocky shape of the tubers makes them ideal for French fry production and for its famed table qualities.

The value of the region's potato industry has fueled a powerful network of publicly-funded and business-based partners. The University of Idaho maintains a system of research and extension centres across the southern portion of the state and the Snake River Plain, which is the main potato growing area. The research centres range from high-elevation Teton in the shadow of the Grand Tetons at 1889m to Parma on the western edge of Idaho at 670m. The research network is valued for its ability to test potato varieties and growing methods under different environmental conditions.

Ultimately, that complex network comes down

to a reliance on germplasm, a mass of cells from which emerge plantlets then mini-tubers and eventually transition into commercial seed potato production. One of the deepest dives into the myriad of interconnected parts that make up the potato production system was created by an economic consultancy, The Context Network. In an analysis of the seed potato industry, the consultants noted that a federally-funded potato breeding programme selected 800 pounds of mini-tubers for increase by the University of Idaho programme. In turn, the university seed potato germplasm programme produced 8,000 pounds of foundation seed for transfer to private industry. The commercial seed-potato producers in turn multiplied that ten-fold to 80,000 pounds of certified mini-tubers. And in turn, those commercially produced mini-tubers were increased through field-based certified seed production practices to ultimately yield in following years 49.5 billion pounds of potatoes used for processing into French fries and other products or sold in grocery stores and restaurants for direct consumption.

Jenny Durrin (pictured on previous page)

Jenny's experience includes plant tissue culture, plant virology and nematology. She has worked with potatoes in a laboratory and greenhouse setting for the past decade. In her current position as director of the University of Idaho Seed Potato Germplasm Programme, she maintains tissue culture of over 300 potato varieties including public, private and research lines. She strives to provide seed potato growers and researchers with quality pre-nuclear seed they can rely on. She earned her baccalaureate and master's degrees from the University of Idaho.

Planting for pollinators





CONFERENCE 2019 In her paper ‘Planting for pollinators’, presented to the CIH Annual Conference in December 2019, **Lucy Witter** highlighted the work that she and colleagues are carrying out at the National Botanic Garden of Wales.

Nestled into the Welsh countryside of rural Carmarthenshire the National Botanic Garden of Wales (NBGW) is both a beautifully maintained gardens and an internationally recognised institute for scientific research and conservation. This year marks the gardens’ 20th birthday, having opened its doors to the public on the 24 May 2000, giving access to the 230ha site.

From its expansive horticultural collections in the Great Glasshouse to the rare Welsh native plants in Waun Las National Nature Reserve, the Botanic Garden comprises over 6,000 plant taxa, managed by Curator Will Ritchie and his dedicated horticultural team. Overlooking the Gardens stands the Science Centre, home to the Botanic Garden’s herbarium, conservation genetics laboratory, library and the National Seed Bank of Wales.

Led by Head of Science, Dr Natasha de Vere, the science team carries out research to conserve plants and habitats at national and international scale. The NBGW’s science team also investigates the foraging behaviour of wild and domesticated pollinators, to inform planting plans for pollinator conservation.

In celebration of its 20th birthday, NBGW has launched its Saving Pollinators Assurance Scheme, which aims to provide consumers with a range of pollinator-friendly plants that have been grown using environmentally sustainable horticulture. These plants have been grown locally in Welsh nurseries without the use of synthetic insecticides or peat compost and have been proven to support pollinators by the Botanic Garden’s scientific research.

The Garden’s scientific research uses a combination of molecular, observational and review based techniques to investigate which plants are preferred by pollinators. The Garden’s botanical diversity makes it an excellent site for this work, as pollinators have a wide range of resources available to them throughout the season. Researchers and conservation volunteers carry out monthly floral surveys to record all flowering plants, in order to assess what proportion of available plants are being used by pollinators.

DNA barcoding, in which a short section of DNA is used to identify a species, is a key research focus for the garden. The Botanic Garden’s plant DNA barcoding expertise is recognised internationally having made Wales the first nation in the world to DNA barcode all of its native flowering plants, contributing open access resources to the Barcode of Life Database (BOLD) (de Vere *et al* 2012). Since then, it has continued to barcode the remaining species which are only present in other parts of the UK thus completing the reference library for the entirety of the UK. This means that unknown plant DNA sequences can be compared to the database to identify the plant species. This technique enables plants to be identified, even when morphological identification

is difficult or not possible, such as by roots, seeds, pollen grains or environmental samples. There are many applications of DNA barcoding, including diet analysis, tracking illegally traded wildlife and the authentication of food products (Staats *et al* 2016 and Hawkins *et al* 2015).

At the Botanic Garden, DNA barcoding is used to identify pollen collected from wild pollinators and managed honeybees, to investigate their foraging behaviour. This provides a broader picture of pollinator foraging behaviour, compared to observational techniques which give a snapshot of information (Bell *et al* 2016). The research is of vital importance since pollinators provide an important ecosystem service and have declined dramatically in the last 50 years (Potts *et al* 2010). Wild pollinator decline is attributed to multiple factors including climate change (Settele *et al* 2016), pests and diseases (Fürst *et al* 2014), pesticide use (Woodcock *et al* 2016) competition for resources between wild and introduced insect pollinators (Goulson & Sparrow 2009) and the loss and fragmentation of habitat for nesting and foraging (Baude *et al* 2016 and Aizen & Feinsinger 2003).

The loss of floral resources is considered one of the main causes of wild pollinator decline (Scheper *et al* 2014). As agriculture has continued to intensify, our gardens and urban green spaces are providing increasingly important habitats for pollinators (Baldoock *et al* 2015). It is vital that we maintain and create flower rich areas using the right plants to attract the greatest diversity of pollinator species. Gardens can provide important habitats for insects and other wildlife, when the right plants are selected (Cussans *et al* 2010). Whilst there are many lists available to advise on the best plants for pollinators, research has highlighted that many are based upon anecdotal evidence and tend to generalise across all pollinator groups (Garbuzov & Ratnieks 2014). Pollinator foraging research at the Botanic Garden focuses on solitary bees, hoverflies, bumblebees and the honeybee, providing a strong evidence base to inform planting decisions to attract pollinating insects.

Meet the pollinators

Perhaps one of the least understood groups of all the wild pollinators are the solitary bees, a diverse group of bees of over 240 species in the UK (Falk 2015), that range from tiny furrow bees (*Lasioglossum* sp.) to the much larger leaf-cutter bees (*Megachile* sp.). As the name suggests they do not live in social groups, but the female acts alone, provisioning a single egg with pollen and nectar in a suitable space and seals the chamber closed with a variety of materials depending on the species, including leaves and mud. The female then repeats this process until the space is full of a number of eggs. The majority of solitary bees are ground nesters, while others are aerial nesters, using hollow plant stems or cracks in walls, or



solitary bee hotels. Solitary bees depend on floral resources being available in close proximity to their nesting site, as many are unable to travel far from their nest.

Hoverflies are also important pollinators as adults (Doyle *et al* 2020) and can be predators of garden pests in their larval stage (Rocha *et al* 2018). There are around 270 species of hoverflies in the UK which inhabit a range of habitats depending on the species, including shallow pools, standing deadwood and sap-runs in trees (Ball & Morris 2015). Many hoverflies mimic wasps and bees, therefore they are often misidentified or unknown. Adult hoverflies are important pollinators of both crops and resources in the wider ecosystem.

Unlike solitary bees and hoverflies, both bumblebees and honeybees live in social groups, with up to 300 individuals in a bumblebee nest (Benton 2006) and up to 40,000 individuals in a honeybee nest (British Beekeepers Association). There are 24 species of bumblebees in the UK, with just seven species that are commonly seen in gardens. Bumblebees can emerge from hibernation as early as March, so it is important that resources are available to them throughout their life cycle, into October. There are even cases of winter-active bumblebees in the south of England where temperatures are warm enough for the buff-tailed bumblebee to forage throughout our coldest months. Plants such as mahonia are a great resource when little else is

available during these months. There is just one species of honeybee in the UK (Falk 2015), which is managed by beekeepers for the production of honey, wax and propolis as well as providing important pollination services.

Investigating the foraging preferences of honeybees

Dr Laura Jones, Science Officer at the Botanic Garden used DNA metabarcoding to investigate honeybee foraging preferences. Samples of honey and pollen were collected from the Botanic Garden's hives throughout the season and from beekeepers across the UK. Using the DNA from the honey, its floral sources were identified.

The results of research based at the Botanic Gardens highlighted the importance of native and near native species as foraging sources during the spring (de Vere *et al* 2017). Woody plants such as willow (*Salix* sp.) and gorse (*Ulex* sp.) were found to be important sources of early forage for honeybees. Plants that are often considered by gardeners as weeds, including dandelion (*Taraxacum officinale*) and bramble (*Rubus fruticosus*) were also shown to be important sources of forage for honeybees.

Dr Jones also analysed honey samples from across the UK in 2017 to investigate the most important floral resources used by honeybees. This study was compared to a nationwide survey of honey samples in 1952 (Deans 1958, 1957). The investigation revealed an increase in the use of bramble (*Rubus fruticosus*) and a decrease in

the use of white clover (*Trifolium repens*) compared to the historical study. It also showed an increase in the use of the non-native invasive Himalayan balsam (*Impatiens glandulifera*) and the widely grown crop, oilseed rape (*Brassica napus*). These results reflect changes in the availability of forage across the landscape which are likely due to a reduction of clover leys and an increase of oilseed rape in the agricultural landscape, and the spread of Himalayan balsam (*Impatiens glandulifera*).

Investigating the foraging preferences of wild pollinators

PhD researcher Abigail Lowe uses DNA metabarcoding techniques to study the pollen carried by bumblebees, honeybees, solitary bees and hoverflies. For Abigail's research, insects are collected monthly across the Botanic Garden and Waun Las National Nature Reserve and the pollen is removed for subsequent analysis. This project aims to discover which plants pollinators use, as well as specific questions such as whether native or non-native plants are preferred, and whether there is any difference between pollinator groups. In addition, Abigail has been monitoring species richness and diversity of hoverflies and bees at the Botanic Garden site and surrounding nature reserve across two years to assess how these change between habitats. The answers to these questions can help us inform gardeners and landowners on how to manage land in order to



Top left: View of the Great Glasshouse at the National Botanic Garden of Wales.
Far left: Saving Pollinators Assurance Scheme.
Left: Solitary bee (*Andrena haemorrhoa*) on hawkbit (*Crepis* sp.).
Above: Hoverfly (*Eristalis tenax*) on willow (*Salix* sp.).

All photos: Creative Commons / Natasha de Vere

increase pollinator populations and prevent further decline.

Investigating seed mixes for wild pollinators

PhD researcher Lucy Witter has been investigating commercially available seed mixes to find out if they can provide sufficient resources for a diversity of wild pollinators (bumblebees, hoverflies and solitary bees). At the Botanic Garden there are two sites at which trial plots have been sown, these consist of four different seed mixes: two marketed as 'pollinator friendly', one native mix and one designed for aesthetic purposes. These are being studied using observational methods and DNA metabarcoding techniques to determine what proportion of species from the pollinator friendly seed mixes are being used compared to the resources in the surrounding environment.

In addition to this research, Lucy has undertaken a systematic review of published literature containing data on interactions between UK native wild pollinators and annual and biennial flowering plants. These data have been used to inform the development of two pollinator friendly seed mixes (one native and one non-native) at the Botanic Garden. The experimental seed mixes were sown and surveyed at the Botanic Garden's trial sites and compared to commercially available seed mixes using observational surveys. Visitors were also asked their opinion on the attractiveness of the seed mixes, in order to

understand the public's aesthetic preferences and investigate how this compares to pollinator preferences. The results of this study will help to create an evidence-based seed mix specifically targeted towards groups of pollinators.

Gardening for pollinators

When planning your garden, choose a variety of plants grown without peat and pesticides which flower from early spring into autumn, providing resources throughout the season. There are many local nurseries that pride themselves in growing plants using environmentally sustainable techniques and which are attractive to pollinators. The Botanic Garden's Saving Pollinators Assurance Scheme, is a platform for these growers, highlighting the plants they grow which are attractive to pollinators, based on scientific research. The scheme is currently being piloted across Wales and it is hoped that this will be extended to the rest of the UK in the future.

In addition to growing the best plants for pollinators, it is also important to create hibernation and nest sites too. Whilst a small number of gardeners may shudder at the idea of leaving an area of the garden a bit 'messy', our native wildlife will be eternally grateful. Building a bee hotel, creating log piles, reduced mowing and adding an area of leaf litter creates important nesting and hibernation sites for insects and other wildlife. Besides, it's the perfect excuse to put your feet up and enjoy watching all the wildlife in your garden!

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Lucy Witter

Lucy is a PhD researcher based at the National Botanic Garden of Wales, registered with Aberystwyth University and funded by KESS2. Lucy is part of the Botanic Garden's Saving Pollinators Research Group, led by Dr Natasha de Vere which investigates the foraging behaviour of wild and managed pollinators using DNA metabarcoding. Prior to joining the Botanic Garden's research team, Lucy worked as a graduate trainee with the Bumblebee Conservation Trust, increasing flower rich habitat for bumblebees.

For more information about the NBGW research and conservation projects please visit botanicgarden.wales or follow them on Twitter @walesbotanic.





Growing for the future

CONFERENCE 2019 In his paper ‘Growing for the future, the potential of plant science’, presented to the CIH Annual Conference in December 2019, **Dr Bill Parker** summarises some of the opportunities and challenges associated with realising the current and future potential of plant science in food production.

It is ten years since Sir John Beddington, the then government Chief Scientific Advisor, used the phrase ‘The Perfect Storm’ to describe the combination of environmental threats facing the world and the potential impacts these could have by 2030 (Beddington, 2009). The ‘threats’ he articulated ranged from food security and climate change, to environmental pressures such as loss of biodiversity, water supply and finite fossil-fuel based feedstocks.

Ten years on and now 2030 is starting to look uncomfortably close, yet all the challenges John Beddington envisaged remain valid today and arguably some new ones have been added, the global pandemic caused by Covid-19 being just the latest. Nonetheless, in seeking to find ways to adapt to or mitigate these threats, it is clear that plant science has a major role to play in helping to

calm the storm.

The importance of plant science has been particularly highlighted in a recent report from the UK Plant Sciences Federation (*Growing the Future*, 2019). In the foreword to the report, John Beddington reflected on his ‘perfect storm’ view by commenting on the ‘key requirements for plant sciences to mitigate the formidable challenges humanity will face as we approach the third decade of the 21st century’. Advancing plant science is therefore critical to the well-being of the planet, including improving the yield and nutritional content of crop plants, novel approaches to plant protection, the development of plant-based products and processes, and climate change mitigation and adaptation, particularly through plant-based carbon capture.

Plant genetics

The advances in plant science over the last 30 years have largely been founded on a massive leap forward in the understanding of plant genetics. It is around 150 years since the father of modern plant genetics, Gregor Mendel, conducted his ground-breaking work on the heritability of the traits of pea seeds in the 1850s. However, many of the key advances in the tools available to plant scientists to understand and manipulate plant genetics have only come to the fore much more recently. This has opened a new and potentially powerful toolbox.

Crucially, the cost of sequencing a genome has tumbled from \$100 million in 2001 to well under \$1,000 by 2015, and it can be done virtually in a morning. This unlocks vast potential – for



Far left: Working on a novel product (photo: John Innes Centre).
Left: Potato late blight is still the most serious disease in potatoes (photo: Bill Parker).
Above: Artemisia research has identified hybrid varieties with improved agronomic characteristics (photo: Centre for Novel Agricultural Products at York).

example bread wheat has one of the most complex plant genomes, containing an estimated 16 billion base-pairs in its DNA. We have barely scratched the surface of what this means in terms of genetic resources. Techniques for gene editing, of which the best known is CRISPR cas9, have only been in existence since about 2005. These tools now enable plant scientists to start to unravel the complexities of biosynthesis pathways, and to develop a deeper understanding of how gene function is mediated by the environment. Practical applications of this knowledge include understanding overwintering responses that promote flowering crops and plant adaptation to challenging environments (heat and drought in particular) which will be crucial to crop resilience as the climate changes in the coming decades.

High value plant-based products

Although plants have considerable potential for bio-remediation of contaminated landscapes and use as bioenergy crops, perhaps the most exciting area is in the development of modern plant-based medicines. A good example is enhancing the production of artemisinin, a known anti-malarial drug used in artemisinin combination therapies (ACTs). Malaria is a disease caused by various

species of the blood parasite *Plasmodium*, which in 2018 alone caused 405,000 deaths worldwide. Artemisinin is effective against one of the more serious malarial parasites, *Plasmodium falciparum*, and is produced by the sweet wormwood plant *Artemisia annua*. However, production has been hampered by poor seed supply and low yields. Recent research has mapped the genome (Graham *et al* 2010), identified hybrid varieties with improved agronomic characteristics (Townsend *et al* 2013) and investigated the biosynthesis pathways of artemisinin to facilitate artificial production (Paddon *et al* 2013).

Improved nutritional properties of crops

It is well-known that plants contain a wide array of natural compounds, some of which have health benefits. For example, novel varieties of purple tomatoes contain high levels of anthocyanins, and Beneforte broccoli contains high levels of glucoraphanin – both of these may have benefits in reducing the risk of cancer. However, substantiating health claims for novel or even traditional crops can be difficult and expensive, and there may be ethical or consumer concerns where genetic modification has been used.

A case in point is 'golden rice', which has been genetically modified to biosynthesise beta-

carotene, a precursor of vitamin A, in the edible parts of rice. This is intended to correct vitamin A deficiency in areas of the world where rice is a staple food. However, there has been considerable ethical debate over its introduction (eg Potrykus, 2010), and despite the early 'enhanced' varieties being produced as long ago as 2005, it took until 2018 for golden rice to be approved as a foodstuff in Australia, New Zealand, Canada and the US.

Improved plant protection

The traditional pesticide-based plant protection 'toolbox' to reduce losses from pests, weeds and diseases is under increasing pressure for reasons ranging from environmental issues, loss of efficacy due to resistance, the sheer cost and time involved in achieving product registration and public antipathy to pesticide use. This is focussing attention on Integrated Pest Management (IPM) as a way of reducing the need for conventional pesticide use.

The cornerstone of IPM is prevention, which usually starts with growing crop varieties with effective and durable resistance to the specific pests and diseases that affect them. This has been the objective of traditional plant breeding for many years, and although this type of work continues to be important, it is a slow and imprecise process



that often struggles to keep pace with resistance-breaking strains of diseases in particular.

The introduction of genetic modification and now gene editing techniques has enabled plant breeders and researchers to breed for resistance traits in a much more informed and quicker way. For example, potato late blight (the cause of the Potato Famine in Ireland, which started in 1845 and ended in 1852, when the crop recovered, by which time millions had died or emigrated) remains the most serious disease of potatoes and conventionally requires intensive fungicide programmes to control. Although conventional potato varieties with potato blight resistance exist (eg Kiezebrink & Shaw, 2006), work has also been done to engineer blight resistance into popular potatoes varieties (eg Witek *et al*, 2016), including using genes from the wild potato relatives *Solanum americanum* and *S. venturii*.

In addition, tuber quality has been improved by 'silencing' genes involved in browning upon bruise damage and to avoid cold-induced sweetening, an important determinant of 'fry' colour. However, current European Union (EU) regulations mean that crop varieties produced by gene modification or gene editing cannot be grown in the EU, and during the transition period the same restrictions still apply in the UK.

Resilient agricultural systems

The production of crop varieties that will be resilient in the face of changing climate pressures presents both some fundamental challenges and some novel solutions. Resource use efficiency is

key to balancing the need for environmental quality with the need for food, thus reducing demand for agricultural land area and scarce resources. Fundamentally, increasing the efficiency of photosynthesis in crop plants or engineering non-leguminous plants to fix nitrogen could revolutionise crop production, but although much work has been done, exploitable outcomes have been challenging to achieve. For example, the highly efficient form of photosynthesis used by C4 plants is associated with alterations to leaf development, cell biology and biochemistry. Transferring these traits into less efficient C3 plants, which include virtually all staple food crops, is a long-term undertaking and may take many years to realise.

Nonetheless, easier solutions can be found, such as switching from traditional rice paddy cultivation to direct seeded rice (DSR) grown in dry fields, potentially using less water, less labour

and cutting greenhouse gas emissions. However, work is still on-going to generate new high-yielding 'DSR-adapted' rice varieties using the latest genetic technologies. Often such work requires worldwide collaborative scientific effort. Other solutions now becoming more common include growing high-value salad crops or herbs in closed-system 'urban farms' under LED lights tuned to wavelengths that maximise crop growth – which in itself requires an understanding of plant physiological responses to light.

Turning the promise into reality

While the plant science required to realise the potential benefits is challenging, the broader societal background also presents further challenges which must be resolved if progress is to be made. These include questions of whether the balance of public funding between fundamental (discovery) research and the applied research required to exploit new discoveries is right.

At the moment in the UK, the balance of public funding is heavily towards the discovery end of the research spectrum, while the funding to exploit new science is limited. This should not be a question of 'either/or' – all parts of the science spectrum need adequate funding to ensure that the national investment made in discovery research can be capitalised on quickly. Plant science in particular also faces the challenge of public trust in new genetic technologies, which inevitably knocks on to questions of whether legislation can keep up with the science. The 2019 ruling by the European Court of Justice that crop





varieties produced by gene editing should be regarded as genetically modified, even though they may not contain any 'foreign' DNA, is a case in point. It is not yet clear whether the departure of the UK from the European Union will change this position.

Informed ethical debate is required as the public should have a chance to take a view on any new technology being introduced into everyday life. However, this is always difficult when the grey boundary between science, politics and vested interests (on all sides) in society come into play. Nonetheless, outside of Europe and the UK, the broader picture of the commercialisation of modern plant genetic technologies is one of burgeoning interest from investors. It is easy to find companies across the world looking to deliver new crops and new products by exploiting plant science based on genetic manipulation, whether through gene modification or gene editing. This includes technology developed through research in the UK that has had to find a home outside the current European legislative framework.

Conclusions

Fundamentally, the future of plant science is an optimistic and exciting one. The advances in tools and techniques to investigate plant function and environmental interactions will continue. These will open up a new range of ways in which plants can mitigate the environmental and social challenges that we face. This could be enhanced by a more balanced (or at least a more joined up) approach to the UK public research funding

landscape for plant science to help drive new discoveries into practical application. Neither should we overlook the need for international collaboration in our modern, inter-connected world. We also need to continue a broad and balanced debate about the benefits and potential pitfalls that new genetic technologies can bring.

Finally, we should find ways to encourage and inform the next generation of plant scientists through an engaging, inclusive and accessible plant science content within biology curricula.

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Above left: Plant science in action (photo: The Gatsby Foundation).

Above: High value salad crops are responding to growth under LED lights (photo: Stockbridge Technology Centre).

Below left: Scanning electron micrograph (SEM) of plant structures (photo: Centre for Novel Agricultural Products).

Dr Bill Parker

Bill is Head of Technical Programmes at the Agriculture & Horticulture Development Board (AHDB). Following a degree in Applied Zoology and a PhD in insect migration, Bill joined the then government agricultural advisory service (ADAS) in 1984 as an Advisory Entomologist, gaining experience in a wide range of research and consultancy projects on crop pest management. Subsequent to the privatisation of ADAS in 1997, he progressed through various roles including Head of Crop Protection and Head of Horticulture. In 2009, he joined AHDB as Director of Horticulture, responsible for a wide-ranging programme of applied research and knowledge exchange activities. In 2015 he became Director of Research, covering AHDB's crops and livestock research programme. He became Head of Technical Programmes in 2019. Bill was an independent member of the Advisory Committee on Pesticides (ACP) from 2008 to 2013, and Chair of the UK Insecticide Resistance Action Group from 2009 to 2014.





TRAINING Sam Agnew looks back on his experience as Horticultural Training Advisor for East Anglia with the Agricultural Training Board and examines the need for and provision of high-calibre young managers in the rapidly expanding vegetable and fresh produce industries.

Training for the future

I joined the Agricultural Training Board (ATB) in 1972 after four successful years as Training Officer running a pilot scheme for the Hampshire Nursery Training Group, which had about 600 employees involved in nursery stock, glasshouse production and garden centre sectors.

Training groups

The ATB was just beginning to encourage the formation of employer-led training groups in agriculture to provide skill and some supervisory training for their members. It was keen to establish horticultural specialist training groups. These groups had to have sufficient employers and staff to be able to employ the services of a full-time or part-time Training Officer. The ATB would provide small grants and a very comprehensive back up.

In the following 12 years or so 14 Horticultural Groups were successfully established around East Anglia to cover main concentrations of horticulture, such as the Lea Valley, vegetable growers in the Fens, five Land Settlement Estates and also specialist sectors such as fruit, mushrooms, wine production and landscape contractors.

I was Advisor to all Management Committees to help recruit and then nurse and train the Training Officers. An additional crucial role was to help identify instructors. ATB provided a free one-week residential instructional techniques course for new instructors, along with some training material to assist them in the delivering of courses.

These East Anglian Specialist Horticultural Training Groups were producing 700-800 one-day skilled courses per annum in later years, plus recruiting trainees to attend supervisory and management courses at the ATB Training Centre

near Coventry. The Training Officers met monthly, under my leadership, to receive updates on training, identifying instructors and solving problems. We also had a very successful team-building tour of Holland to see horticulture in that country.

Need for quality managers

It became clear during my work with the directors of two large vegetable growers in the Fenland Training Group, Greens of Soham and Shropshire and Sons (now trading as G's Fresh), that they were experiencing great difficulties in recruiting high quality managers to meet the demands of this very rapidly expanding fresh food industry.

'Why don't we grow our own managers?' was the suggestion that we heard often. It appeared to me that the existing training groups were not designed to meet the challenge of recruiting, possibly employing and managing career development to meet the need for future managers.

A small grant was obtained to carry out research, make suggestions and have discussions with other producers to try and establish what was needed. I worked very closely with Greens of Soham on this task. It emerged that the following might be supported by large employers:

- Recruit very good new graduates who appeared to have real potential
- Establish a company to employ and manage them
- Give the management trainees the opportunity to work in four management positions over, say, a two-year period
- Trainees to be well supervised, motivated and receive off the job management training.

The key employers with whom we were in discussion suggested other large mainly vegetable producers who might be interested. A number of

meetings took place, especially to discuss financial implications, plan budgets, elect a committee and employ a manager.

Management Development Services (MDS) was launched in 1986 and I was elected Chairman. However, it soon became clear that if MDS was going to fly it had to be led by a large employer with financial skills and clout, not an ATB employee with limited financial ability. So I stood down and remained on the Committee for some time. I then had little contact with MDS after the closure of ATB and my career moved on. However, it was very nice to be invited to a black tie dinner to celebrate the tenth anniversary and on-going success of MDS.

Reconnection

After a CIH Eastern Branch Meeting in the Lea Valley in August 2019 I had a discussion with Branch Committee Members about subjects and venues for future Branch meetings and it was agreed that MDS might be of interest to members and perhaps could be combined with a visit to G's (see report in *The Horticulturist* Volume 29, No 1).

Organising this meeting gave me an opportunity to catch up with MDS, which I am pleased to report now employs around 60 graduates and has over 50 members, including Sainsbury's, British Sugar, Fyffes Group Ltd, Bomford, Lingarden, Empire World Trades Ltd, as well as the familiar names I dealt with all those years ago. MDS

Above far left: G's trainees visiting fields at G's España. **Above top middle:** Communication Day at G's España. **Above bottom middle:** Planting lettuce in East Anglia. **Above right:** G's Adventure Training in Spain.

All photos: G's



department managers/directors are involved. This day involves numeracy and literacy assessment and profile building, plus in-depth interviews.

A plan is drawn up for each successful graduate management trainee to have the opportunity to work in four different management positions in up to four different parts of G's business with some placements being overseas. These placements could be in crop production, transport, engineering, marketing, sales, finance or any other sector of a modern business.

Off-job training is a vital part of trainee development and includes an Adventurous Personal Development Training Expedition held in Spain last year, seminars, lectures and master-classes. Day-to-day coaching and mentoring is carried out by trained managers in each department or company. All this is provided on a full salary with holiday and other benefits.

Where motivation is strong, trainees may progress to the Chartered Management Institute or other specialist qualifications.

This whole management training process allows senior managers and directors to assess the potential of each trainee and almost all are offered permanent management positions at the end of their period of training.

Employers/managers looking for new staff will know that these trained graduate managers with this experience and education behind them will be a great asset to any business, business, and will be able to demonstrate:

- a high level of leadership skills
- adequate work organisation ability
- the ability to motivate
- problem-solving skills
- excellent verbal and written communication
- the ability to delegate
- sophisticated IT skills
- the ability to discipline/encourage to improve performance
- reasonable financial skills
- be good at giving instructions.

More info

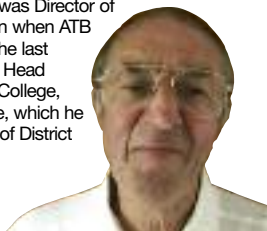
MDS and the scheme run by G's is a great way for ambitious and talented graduates to receive an excellent training in preparation for senior positions and offer of employment on completion.

G's: Contact Matt Price on matt.price@GS-fresh.com, 01353 727344, 07436 006320, GS-fresh.com.

MDS: info@mds-ltd.co.uk, tel: 01775 76611, mds-ltd.co.uk.

Sam Agnew BA FCIHort FRAgS CGIA NSch

Sam's early career was in the Nursery Stock sector with Slieve Donard Nurseries, Northern Ireland and Hilliers and Sons, Winchester. Following a period at Writtle Agricultural College he widened his experience in the glasshouse industry in Germany and Holland. For seven years he was Manager of the States of Jersey Demonstration Experimental Farm and for a time he ran an organic holding in Scotland. The Nuffield Scholarship took him to Japan and five other countries to study horticultural training methods. Sam was Director of the West Anglian Region when ATB closed. He then spent the last decade of his career as Head Gardener at Homerton College, University of Cambridge, which he combined with the role of District Councillor.



Growing the managers

John Shropshire, Chairman of G's Group Holdings Ltd

"G's in-house Management Training Scheme for both business and farm management graduates has been successful over many years in developing and retaining talented people for permanent roles within the company. During their four diverse placements, the graduates have the opportunity to try different roles, with the aim of developing managers of the future by exposing them to as many parts of the business as possible. In this way the trainees develop into a well-rounded colleagues with a good in-depth knowledge of the company. During this time the company trains and builds good relationships with the trainees and is well placed to find the right fit role for both the graduate and G's, which is mutually beneficial for the future success of both the employee and employer. The MDS scheme gives graduates the opportunity to try a variety of roles within a diverse set of member companies in the agricultural/food sector, which is why the scheme is so attractive to those graduates who know that they would like to work within the food industry, but as yet are undecided as to which sector or which type of role. As a founder member, G's have been able to provide secondments to some excellent graduates in a variety of roles over the years. This also gives G's the opportunity to see if those graduates are the right fit for the company, whilst mentoring and developing them during their time with us."

Katie McDaid, one of G's management trainees

"I chose to join the MTS because of the wide opportunities it presented in various sectors of the fresh produce industry. I also liked the opportunity to work abroad. My favourite part so far is that I have been able to take full responsibility for a key customer account"

Peter Cox, Sales Director, JJ Barker Ltd

"Those who successfully complete the MDS programme are able to make a positive contribution within the most progressive companies in the fresh produce sector; you only have to look at the quality of current and past trainees to realise that MDS really does work."

David Richardson, Journalist, author, BBC presenter, Financial Times

"Such levels of ability and maturity in people so young is remarkable in any business. In agriculture and horticulture it is a revelation."

employs five staff at its office in Peterborough.

It was such a great pleasure to renew my friendship with John Shropshire OBE, C Hort F CIHort and to hear about the huge expansion of the Shropshire empire and the success of G's Fresh, which he heads up. John is today responsible for 8,000 staff in a very complex organisation with many sites around the UK as well as Poland, Spain, Senegal, the Czech Republic and US.

On our tour of the Ely site it was inspiring to see the large area of organic production and great attention to conservation issues, as well as the highly mechanised giant glasshouse raising 130 million celery and lettuce plants annually. The modern mushroom unit and factory were also impressive to see.

G's Management Training Scheme

Matt Price, Head of Learning and Development, gave CIH members an overview of how he manages the in-house Management Training Scheme and MDS. He explained how, due to the size and opportunities within such a large company, he recruits and manages G's own programme for up to 15 trainee graduate managers using a similar criteria as MDS.

Matt came to G's after a career in the Services. He joined the RAF as a Physical Training Instructor and later specialised as an Adventure Training Instructor leading expeditions around the world. He says his passion is management training, especially teaching outdoors.

Recruitment of management trainees is achieved by advertising directly in universities and in national magazines and this is followed up with a telephone interview.

The next important step is to invite potential trainees to an in-house assessment day, where



Kairaku-en, a garden to enjoy with others

YHoY REPORT To use his CIH YHoY travel bursary **Richard Moore** journeyed to Japan to discover more about a particular garden, Kairaku-en. To fully understand it today he dug deep into its history.

偕 楽 園

Ever since I first visited Kairaku-en a few years ago I was struck by its beauty. Kairaku-en is one of the ‘Three Great Gardens of Japan’ and is famous for having one of the largest collections of Japanese plums in the world. This is one of the first trees to flower, putting on an incredible show and filling the air with a heavenly scent. The beautiful landscape of the garden is also home to a tranquil bamboo forest, a peaceful woodland of Japanese red cedars and the historic Koubuntei building of Ibaraki Prefecture’s Daimyo, Tokugawa Nariaki.

The maintenance of this historic garden was the first attraction for me. The trees, many of which are old and weathered, are so intimately cared for that year after year they still produce the most wonderful display of flowers. The pines that sit on top of a steep escarpment are each a work of art looking out over the valley below and the bamboo forest is carefully maintained to ensure that it doesn’t become too crowded and that the right amount of light is able to shine through.

Flowing behind the continued maintenance of the garden is the history and story of how and why Kairaku-en was created and how it has evolved and developed over time.

My research objectives were to:

● Review the history of the garden in order to better understand how it has developed over time.

● Investigate the way in which garden maintenance is approached in the garden.

● Study and gain an understanding both of the techniques used and the thinking behind the pruning and maintenance of Japanese plums and Japanese pines.

History

Kairaku-en is intrinsically linked with a historic school named the Kodokan just 2.5km away from the park. Kodokan opened in 1841 as a school teaching traditional academic and military arts and Kairaku-en was opened the following year intended as a place for the students to relax to ensure they could study effectively. Both were founded by Nariaki Tokugawa and Kairaku-en is possibly the first garden in Japan intended for improving mental health. The inspiration behind the creation of Kairaku-en can be found in one phrase inscribed in the Kairaku-en records; ‘tension and relaxation’ deriving from Chinese Confucianism explaining the importance of having a balance between our busy work life and relaxation and the importance of slowing down.

Nariaki was also very fond of Japanese plums and was very knowledgeable about herbal medicines and so Kairaku-en was originally planted with hundreds of Japanese plums and



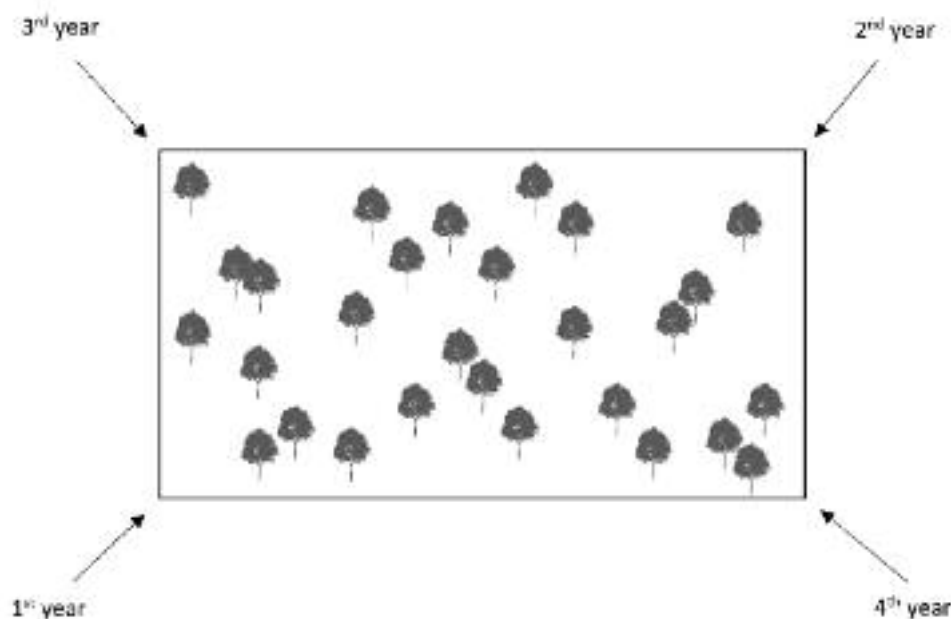
Left: The middle gate (中門) leading to the Koubuntei from the cedar forest.

Above: A blue tag indicates that this tree is to be pruned hard to encourage strong vigorous growth.

Above right: An ornamental Japanese plum in full flower.

Right: A diagram to show the direction in which the pruning of the Japanese plum trees is carried out in subsequent years.

All photos and diagrams taken and created by the author unless otherwise cited.



other plants with medicinal properties allowing him to research and develop medicines. Nariaki appreciated how practical and useful these trees were – pickled plums are a popular food in Japan and served as emergency food for the military or during food shortages as well as for medicinal use in addition to the aesthetic beauty of the flowers signalling the beginning of spring.

The garden developed early on when new cultivars of Japanese plum were introduced alongside the high-yielding crop species, not for their fruits but for their ornamental blossoms. The high density of trees creates an incredible display of flowers with a mixture of colours due to the variety of different cultivars. In addition to this, as the trees were originally planted closely together, the lack of space between many of them has unintentionally led to many of the trees growing into unusual, interesting shapes adding to the character of the garden.

Garden maintenance

Like many gardens in Japan the gardens and grounds at Kairaku-en are maintained by different gardening companies employed on a yearly basis primarily for financial reasons enabling councils to choose the most cost-effective option. As a result of this the planning of garden maintenance is extremely important to ensure that year by year the garden is maintained correctly ensuring the same standard of care is kept and continued. When it comes to the more technical jobs which

require a high amount of skill the risk of these jobs being poorly executed is mitigated by planning each activity effectively so that teams have a clear set of rules to follow for particular jobs. This is essential for tasks such as pruning where a new team of gardeners, unfamiliar with the plants, will need a system in place to ensure that the correct trees are pruned according to a plan which looks years into the future.

At Kairaku-en the most important yearly job is the pruning of the thousands of Japanese plums (Ume). The main pruning of these trees takes approximately two months starting in mid-November and finishing at the start of January with a team of around 15 gardeners. Whether the team of gardeners have experience with pruning Japanese plums or not, the system put in place at Kairaku-en ensures that each tree is treated correctly. Not only is each individual tree put on a database with a record of its location in the garden, size, flower type etc., each tree is inspected and tagged with coloured tags indicating their pruning regime.

The pruning of the Japanese plum trees of which there is over 2,000 in total has to be finished before they flower and before the Ume Matsuri (Plum Blossom Festival) which is held from 15 February until 31 March. In the summer the vigour of some trees is then later adjusted with light summer pruning, no large cuts are made in the summer.

Each year the direction from which the Japanese plum trees are pruned changes to ensure

consistency in their maintenance. For example, this year the team started pruning the trees from the south west corner of the garden and moving steadily in a north easterly direction. Next year however, the team will begin in the north east corner of the garden and work back moving south west, and so on.

The main reason is that due to the large number of the trees they cannot all be pruned at the same time and those which are pruned first in mid-November may react slightly differently due to being pruned earlier than the final trees to be pruned. Secondly, as the team has to ensure the trees are finished before the Plum Blossom Festival the team may not have as much time to spend on the trees closer to the date of the festival and so by alternating the direction in which the team moves through the garden the trees will benefit and the maintenance should become more uniform.

Other than the pruning and maintenance of Japanese plum trees, there are many other areas of the park and gardens that require a high amount of care and continued maintenance such as the Bamboo Forest, Japanese pine pruning and fence repairs and construction.

Japanese plums (梅)

There is an incredible number of Japanese plum (*Prunus mume*) varieties with 91 different cultivars identified at Kairaku-en and an amazing 951 trees which have not yet been verified in the



Above: This tree required specific pruning in order to reinvigorate weaker, old growth. In order to do this, we cut two large branches towards the top of the tree (Red) as these branches are guilty of sapping lots of energy from the plant resulting in unbalanced growth. The branch crossing over towards the right-hand side (Blue) is planned to be removed next year to improve the balance of the tree, however, its being left for the current years flower display as it is close to the pathway where visitors will have a nice view of the blossom.



Above: A view across the Ume orchards in full flower (photo: Michihito Sakurai).
Left: A large Japanese plum tagged with a blue label which requires some heavy pruning (shown in red) to encourage vigorous, stronger branching whilst thinning out congested areas.
Right: Richard at the top of a ladder pruning some large branches.



garden. Because of this Kairaku-en has become an important garden for the conservation of many heritage varieties of Ume, some of which only exist here and are therefore of high value. The genus *Prunus* is in the *Rosaceae* family, subfamily *Amygdaloideae*, most closely related to the subfamilies *Maloideae* and *Rosoideae* containing apples and roses. *Prunus mume* is the species commonly referred to as the Japanese plum, Chinese plum or Japanese apricot. However, the species originates from China and was introduced into Japan in the 6th century AD.

Japanese plum care and maintenance

One of the main differences between the care of Japanese garden trees and western style garden trees is the way in which the trees are looked at and considered. In western-style gardens we often spot flaws in the way a tree is growing and perhaps subconsciously wish for a 'perfect' specimen as you'd find in a tree nursery. Japanese gardeners treat trees very differently instead working with the landscape and the natural growth of trees, caring for them for as long as the tree still has life, even supporting them with several crutches if needed.

As a result the trees at Kairaku-en and elsewhere have so much character and more of an emotional connection can be felt with them as there is such a strong bond between humans and nature in this way of working.

As previously explained, each tree is tagged to indicate how it is to be pruned and so with my instructor, I worked on a variety of trees to enable me to learn how each tree is considered and pruned. Of all the things that I was told, repeatedly, was the importance of thinking at least five years ahead and to understand that it is often unwise to try and create a perfect tree in one season as the timing of each cut has a great impact on the subsequent growth of each plant.

Cut-paste is very commonly used in Japan, and is especially important for Japanese plums, which are susceptible to a wide range of diseases such as plum pox virus (PPV). For various reasons cut-paste isn't often used in the UK. Now, having seen it being used in Japan and positively benefiting the health of a wide range of trees including *Prunus mume* I feel that it is an effective tool for preventing infections after removing large branches.

Pine pruning

Pruning of the pines starts as soon as the Japanese plum pruning finishes in early January. It was fascinating to see a variety of pines being grown in a nursery area within the garden being trained for specific locations in the park. Many of the pines in the gardens around Kairaku-en are at least 100 years old. The majority are *Pinus thunbergii* (Japanese black pine) which is the most commonly used variety for trained garden trees, however, *P. densiflora* (Japanese red pine) and *P. parviflora* (Japanese white pine) are also used, but are treated slightly differently.

The yearly maintenance of Japanese black pines essentially consists of removing old needles to tidy the appearance of the trees as well as controlling vigour by removing large strong-growing buds in early spring. It is also important to remove any developing cones which appear as small brown buds at the branch tips. The gardeners constantly work to improve the shape of the trees thinning congested areas and cutting back any branches that are out of proportion with the rest to create a balanced shape unless deliberately aiming to grow a new branch.

Conclusion

There are many aspects of Japanese horticulture that I feel western gardeners can learn a lot from,

the most prominent of which for me is the mindset that Japanese gardeners have towards the care and maintenance of gardens and plants. Being able to spend time with the gardening team at Kairaku-en was a privilege and a wonderful experience that I learned so much from.

I was able to achieve all of my aims – learning about the fascinating history of this garden and the ways in which it is maintained and managed. These have provided me with a much greater understanding of garden maintenance and management that I can draw upon in the future and I've managed to develop a wide range of practical skills such as pruning techniques and the theory and principles behind the way Japanese gardeners consider and care for plants and gardens.

I would encourage everyone if they get the chance to visit Kairaku-en, it really is one of the most beautiful gardens in the world.

I am grateful to the Percy Thrower Bursary Trust and the CIH for this wonderful opportunity. I will endeavour to forever pass on my knowledge and passion for horticulture to others.

Richard Moore

'My career began at Pershore College, graduating with a BSc and 1st class honours in Horticulture. I've been lucky enough to work in a variety of historic gardens, as well as training in a range of Japanese gardens and am very proud to have become the Young Horticulturist of the Year 2019. After working as a Landscape Gardener, I was fortunate enough to get a job as a Botanical Horticulturist at Royal Botanic Gardens, Kew. I spent my first two and half years at Kew maintaining the medicinal herb garden as well as the Director's private garden and I'm now working with the Alpine and Rock garden team. Being surrounded by the world's most wonderful collection of plants is a true privilege!'



Festival of Horticulture

CANCELLED

UPDATED 2020 EVENTS

24 SEPTEMBER 2020
YHOY FINALS

CANCELLED

24 SEPTEMBER 2020

AGM
RBG Edinburgh

The 2020 AGM will be transmitted via video conferencing. Full details to follow in due course.

25-26 SEPTEMBER 2020
ANNUAL CONFERENCE

CANCELLED

UPDATED 2021 EVENTS

24 APRIL 2021
AGM
Harrogate Flower Show

15 MAY 2021
YHOY FINALS
RBG Logan, Stranraer

24-25 SEPTEMBER 2021
ANNUAL CONFERENCE
RBG Edinburgh

Full details of the 2020 AGM at Royal Botanic Garden, Edinburgh will be on our website in due course.

Please check the CIH website for further details of everything listed above: horticulture.org.uk

Lockdown lives

We asked you to tell us how you had adapted your business practice or domestic gardening during the lockdown due to the Covid-19 pandemic. Here are a selection of items that highlight the positive outcomes and creative ways that CIH members approached this unprecedented challenge.

G's Feed Our Nation

On the 22 March, G's started their 'Feed Our Nation' campaign to attract UK-based seasonal agricultural workers. In the first two months almost 4,000 UK residents contacted G's seeking employment opportunities as the lockdown got underway. Now, around 30% of G's seasonal workers are from the UK out of a total requirement of 2,500. This is the first time in decades that there has been this many UK nationals in G's harvest operations.

G's has extended the recruitment activity so that their in-house recruiters have sufficient time to describe the role well. It's been extremely important to be transparent and talk through the nature of the work. This has helped G's attract and offer jobs to those applicants who are available for a significant part of the season with the motivation for manual work and a desire to reach the quality and efficiency required, rather than those who are looking to do their bit for a few days.

With so many Brits seizing the opportunity to 'Pick for Britain' through summer 2020, industry is hopeful that a new appreciation of where our food comes from and an awareness of the exciting opportunities that exist in horticulture has surfaced.

Beverly Dixon, G's Group HR Director

River Garden Auchincruive

Based on the former SRUC site at Auchincruive near Ayr, we are a residential community for people in



Above: A student weeding organic celery at G's Hainey Farm, May 2020 (see 'G's Feed Our Nation').

Below: Planting tomatoes in the glasshouse (see 'River Garden Auchincruive').



recovery from addiction. During Covid-19 we have not been able to make an income through the café or events, and we have not had the benefit of our wonderful volunteers.

On the announcement of lockdown, we took the decision to focus our energies on food production only. We hope this will help with food security. There are legumes, brassicas, apiaceae, alliums, miscellaneous rotations, and glasshouse crops.

But something unforeseen happened. We have seen our residents grow through horticulture. They have had to rely on themselves to do all the work. They have knuckled down and jelled as a team to get the hard work done, taking ownership and interest in the growing. There was great pride in planting 120 fruit trees, and wildflower meadow, to replace the old orchard.

This also raised money for the 2.6 Challenge (twopointsixchallenge.co.uk), which was initiated by the organisers of the London Marathon. It would have

been the 40th marathon on 26 April and the biggest single sporting fundraiser in the world. To help charities, the 2.6 Challenge was organised. Charities or individuals held events on 26 April to raise money. The London Marathon organisers also put in funding and this will be allocated to the charities proportionately, depending on how much each raised. We had two teams planting 26 fruit trees in 2.6 days. We more than met our challenge and planted all 120 fruit trees and bushes in three days.

The (listed) site we are on has great horticultural significance as an ex-SRUC site, and as the oldest glasshouse in Scotland. Also what was the longest herbaceous border in Scotland is here. The site has been neglected for nearly 20 years and we are trying to bring it back to life as a recovery village and local destination.

River Garden Auchincruive is run by a charity, Independence from Drugs and Alcohol Scotland. Colin Crosbie (former Curator RHS Wisley and Head Gardener to HM Queen Mother at Windsor) is an active Vice-Chair, while CIH Scotland Chair Peter MacDonald advises on orchards.

Christine Jones MCIHort, Head Gardener, Independence from Drugs and Alcohol Scotland

Paused projects

I'm a garden designer creating domestic gardens in London and I have had several projects 'paused' by Covid-19.

Landscaping work has continued but at a much slower pace than scheduled: physical distancing has meant fewer workers on site at any one time and, although it is easing now, sourcing building materials and securing timely delivery has been difficult.

Finding plants for my planting schemes has been harder and I have had to ask several clients to wait until September for their gardens to be finished in the hope that by then the plants I want will be available and that we will be able to work more normally.

These constraints have meant a lot of



effort has had to go into keeping clients on board, maintaining both their interest and their trust that they will eventually get the garden of their dreams and be happy to pay me for it!

John Gilbert MCIHort

Keeping it real

My Myerscough colleagues and I followed the guidelines/protocols diligently. However, for one day Dr Irene Weir and myself decided to get at least one photo of us at work during lockdown. It gave us the opportunity to meet (at a minimum 2m distance) in real time. Meeting in Microsoft Teams can just convey only so much when you are talking about plants and horticulture!

Myerscough College near Preston, Lancashire, closed to students and non-essential staff in line with government guidelines. It was a blow to all the students and staff, but especially the horticulture team that had just begun an industry link-up and was growing several thousand plants and new varieties in partnership with young plant producer Volmary. With no students to assist the production and maintenance of the plants, it fell to three members of staff Emma Collins, Dr Irene Weir and me, Dr Lionel Smith, to take turns to come in on alternate days to maintain and complete the project. A grower inspection day with all relevant precautions is due to go ahead as planned.

Lionel S Smith PhD MCIHort

Gardening on and more...

'Keep Calm and Carry On' is what many of us gardener folk did. Our work is hugely important; our raw materials are living and need to be nurtured, fed

and watered; our clients, many of them elderly, crave for our presence not simply to maintain their beloved gardens but because we are a lifeline for them. We are their 'normal' providing a window of colour into their restricted, sometimes physically and mentally impaired worlds.

A whole new side to my job description emerged. I am now bin lady, milk lady, post lady, tutti-fruity veg delivery lady, 'gone potty' bedding plant supplier, meals-on-wheels delivery lady, lend-an-ear to whoever needs lady, offer-a-solution lady... an endless list but the bottom line is I that I have learned to adapt. I may be a garden designer, project manager and knowledgeable gardener, but none of that matters now for my 'talents' are needed elsewhere. Covid-19 turned my world upside down, along with everyone else's.

The past month my phone has not stopped ringing. Eventually it dawned on me... Joe Public have been forced to stay at home and they have decided to splash out on 'the green stuff', so much so that I have actually employed someone to assist me!

It has got me thinking, 'what will you take with you from all of this and what will you simply leave behind...?'

Jane Farley MCIHort

A balancing act

Despite gardening work reduced by 50% during lockdown, and a lack of financial support from HMRC in line with self-employment regulations, I have been lucky enough to retain one couple as gardening clients. They are in their 70s but we have been responsible regarding equipment cleaning and

Above: Dr L Smith and Dr I Weir of Myerscough College (see 'Keeping it real').
Below: Redesign and maintenance, as well as study kept Jo Wilson occupied (see 'A balancing act').

social distancing. Since February, I have been working on a re-design of their fruit cage and mini-orchard areas, which were recently completed. Since the end of April I've been maintaining the wider garden area. This means that I've had eight hours of work per week, which may not seem much, but it has allowed me to balance home-schooling and study time.

Going forward, with children possibly returning to school, completion of my postgraduate garden design course in August, and my final RHS Level 3 exams in September, I hope to set up a website to advertise maintenance, consultancy and design. Getting business marketing set up is one thing, but finding clients willing to welcome gardeners and designers back into their space is another. I have been working so hard to change my career from teaching to horticulture, and I'd never choose anything else, but I feel anxious and uncertain about the long-term viability of being self-employed.

Jo Wilson, Student Member



Indoor pursuits

I am a Garden Apprentice usually based at Sandwell Valley Park Farm. In the future I hope either to continue working within a heritage garden site or go into garden design focusing on sustainability. During lockdown I continued to remain curious and was surprised to learn that an Echeveria I had looked after for a year had flowered. I continued to go to work on a limited basis to carry out essential work around Sandwell Valley and Gardens.

Tapping into my creativity, I also took part in an online challenge to create a 'plot on a plate' miniature garden for the Chelsea Physic Garden using whatever I had in my home, utilising limited resources. Watching television programmes such as *Carry On Crafting* I made my own terrarium and started growing plants indoors. Not having a garden myself has made me appreciate the space I do have more, and value the importance of nature indoors.

Mahnaz Begum, Student Member

Dual purpose project

During lockdown we had to home-school our son. Sitting is not something that comes naturally to our seven-year-old little boy. How do you tire out a little boy so that he has a good night's sleep?

There is a part of our garden that was full of stones and I despaired of having a lawn. So my son and I had set this as our task. We hand-dug the whole area, sieved the stones out, put the soil back and the stones in a container.

The result: not only did it serve the purpose of tiring out our son it also engaged him in planning out the garden and growing. It has been wonderful working along with my boy and we have enjoyed seeing our hard work transform the stony site into a gorgeous green lawn.

Matthew George, Student Member

Growing a greenprint

Belfast's new community-led horticultural co-operative, Good to Grow, plans to actively increase pollinators while sustaining employment. As a fledgling horticultural co-operative the main goal is to change the relationship that local people have with their food chain – to promote pollinator-friendly, sustainable and ethical gardening and provide local employment opportunities. During lockdown, Good to Grow populated its Facebook page with environmentally friendly ideas to make use of growing space from windowsill to garden.

Each co-op member has equal parity building ownership and a democratic approach and will include growers, allotment owners, horticultural students,



Above: Taking a break from that digging and sieving! (see 'Dual purpose project').

Below: In room horticulture kits provided activity at HMP Send. (see 'Horticulture at HMP Send').

locally grown produce outlets, garden designers, botanists, food security specialists, seed collectors and many more sectors.

Recently selected as one of Belfast City Council's ten social enterprises in the Projects that Matter Campaign the co-op recently met its crowdfunder target and is now in receipt of match funding from the Council up to the value of £5,000.

More information at:
goodtogrow.coop or
crowdfunder.co.uk/good-to-grow-1
Gill McNeill, Student Member

Horticulture at HMP Send

At HMP Send, a women's prison in Surrey, with the onset of lockdown the residents faced long periods of confinement in their rooms. In response, staff from the Horticulture Department decided to take horticulture to the wings

and have been running a number of horticultural-based activities. The first was the provision of 'in-room horticulture kits' comprising a tray of seedlings, a dibber, and a tray of 15 plant pots each filled with compost, enabling the participants to 'prick-out' seedlings and plant them up in the pots. The therapeutic benefits have been immense and very obvious. An 'in-room' plant growing competition is ongoing with the participants growing comfrey cuttings and sunflowers (seeds supplied by RHS).

Finally, the horticulture staff have been writing and distributing a newsletter entitled, *The Weekly Muck Spreader*, that includes tips on growing vegetables, as well as running gardening-themed competitions; Issue No. 9 went out in early June.

Dr Andrew Adam-Bradford
(Contact with CIH through Helen Clegg MCIHort)

New tools

Lockdown! What's a Garden Designer to do! This quieter period has been the perfect time for me to write my monthly garden blog for a national UK organisation. It's been an honour to write about different gardening styles.

I also had the opportunity to give garden consultations using WhatsApp. It has been a great tool with which to 'look' around client's gardens, and for them to see mine. It's been a fabulous success, and has meant that I've been able to help clients with gardens further afield than I would normally travel to from my base in South Devon.

Jacquie Felix-Mitchell MCIHort

RBGE during lockdown

In early March, like so many other horticulturists in gardens across the world, the Royal Botanic Garden Edinburgh's (RBGE) horticultural teams at Inverleith, Benmore, Logan and Dawyck watched nervously as the impact of Covid-19 spread across the

GET INVOLVED

The Horticulturist relies on voluntary contributions from members and other specialists. Ideas, articles and photographs are always welcome. Contact the editor at barbara@bsega11.plus.com if you are interested in writing an article or have a newsworthy item for inclusion.



world. Small teams working on rota observing strict human biosecurity undertook essential maintenance in the glasshouses and protected environments ensuring that some of the most important plant material within the RBGE's Living Collection, including plants used in RBGE's scientific research programmes and new young wild collected plant material being grown on to be planted out in each of the four gardens, have been looked after. Even smaller teams of horticulturists carried out a limited amount of time-critical maintenance in each of the garden landscapes ensuring where possible that the worst of the weeds were kept under control, the grass was cut and tree inspections and work completed. The horticultural teams also shared images and videos of each garden on social media and on RBGE's website as part of RBGE's online 'Virtual Spring'.

David Knott CHort FCIHort

Carrying on...

The Serpentine Community Garden Society (SCGS), Buxton arranged a booking system so its volunteers could continue to grow the plants. The chief growers, who had planned the year's planting were shielding, so these volunteers put the plans into action in the face of flood, frost and drought. SCGS is now bursting with an alphabet of veg from achocha to zucchini. Heritage varieties include beans and tomatoes. Each week the salad leaves



Above: Time-critical maintenance at Inverleith RBGE during lockdown (see 'RBGE during lockdown').

Below left: Alyson at the Serpentine Community Garden Society (see 'Carrying on...').

are cropped for inclusion with food bank parcel deliveries.

Volunteers book in online with a maximum of six. Lone and couples' sessions can be chosen for a more relaxing space and pace. Social media supports a new sort of interaction that keep our wider SGCS links thriving.

'Just wanted to say how much I enjoyed being in the Garden today. It's tricky when you would love to sit together on a hot day and have a good natter but we manage pottering at a distance with smiles and waves. Thanks for making it so easy to share this communal space in an atmosphere that reminds me of busy socially distancing bees.' Volunteer on WhatsApp.

Our site was once part of Lismore Fields, where archaeologists discovered a unique 'seed exchange' from Neolithic times. We feel privileged to continue growing here in unprecedented times.

Find us at:
serpentinecommunitygarden.org
Steve Phillips Volunteer SCGS
(Contact with CIH through Madeline Hall FCIHort)

Calling back

The biggest difference for me as an unemployed horticulturist is that Covid-19 seems to have made agencies and other recruiters engage with enquiries much more!

I've been struggling to find reliable, worthwhile employment since mid-2016, and in that time I've contacted countless employment agencies and other recruiters. I'd say for every 10 times I've contacted recruiters (either by phone or more usually by email) I've received one solitary response. Since mid-March this year I've received responses to every single email I've sent, and I've even been proactively approached by some of the recruiters who didn't seem to want to touch me

with a bargepole before the pandemic. I even received an email from someone I contacted in 2018 asking if I'd still be interested in that position!

Which sadly isn't to say that I'm any closer to find reliable, worthwhile employment! Two of my enquiries have received positive responses to indicate that I'm in with a chance of being invited to interview once recruitment reopens, but for the most part decent-looking vacancies continue to open up in places too far from me (the current hotspot being East Sussex, for some reason).

James Collett ACIHort

Zoom

I've been using Zoom to deliver online, interactive sessions for therapeutic gardening for adults with mental health support needs, a virtual wildflower walk for the general public and Level 1 Practical Horticulture Skills theory sessions for a volunteer gardeners' group at Peel Park in Salford, among other subjects.

Sue Jeffries MCIHort

Testing volunteers

With the arrival of Covid-19 into Ireland and our early lockdown horticulture students in University College Dublin (UCD), who were due to go out into the industry for their professional work experience, volunteered to work in a Covid-19 testing laboratory and in a contact and trace centre. Now as the incidence of Covid-19 disease in the country continues to diminish the number of track and trace centres and laboratories required have been reduced. As a consequence horticulture students from UCD have now taken up professional work experience placements in the horticulture food sector and in the amenity sector, in garden centres and in the landscape construction/maintenance industry



under strict social distancing and hygiene guidelines.

Horticulture academic staff discovered a world of new technologies for online video meetings, webinars, lectures and tutorials, all from their homes while practicing their skills in their gardens! We have also completed assessment and grading to ensure that this academic year has been completed. Now plans are underway for a late opening of UCD in September, to ensure that students have as close to a traditional university education experience as possible.

Our students will have a blended educational experience with some lectures online with face-to-face tutorials and practicals and semi-virtual industry visits. We can say that horticulturists are adaptable professionals and have embraced the new normal!

Owen Doyle CHort FCIHort



Triple purpose

When the government announced that garden nurseries were to close there was a lot of concern that millions of pounds worth of plants grown for the retail trade would be thrown away. At the same time, I had clients asking me if I could get hold of plants that they would usually go and buy at garden centres for pots and bedding.

Wishing to support my main trade plant supplier, How Green Nursery, and knowing that I could easily put in an order a week to supply plants to various clients, I roped in my 19-year-old son who had just been sent back from France where he had been running a chalet. He was at a loose end so I figured I could kill three birds with one stone – help out the nursery by buying more plants than usual, help clients get the plants they so desperately wanted, and give my son something to get him

Above: A garden benefits of lockdown for Owen Doyle was the chance to see some this hydrangea in bloom as he is often away teaching in China at this time (see 'Testing volunteers').

Above right: The newly replanted Edwardian rock garden at Leith Hall Gardens and Estate (see 'Leith Hall Gardens and Estate').

Below: Tara Dalton's son was on hand to assist in her playing her part as a 'go between' nursery and clients (see 'Triple purpose').



out of bed in the mornings!

P.S. I also made various videos about veg growing that I posted on Instagram and continued to work in garden design too.

Tara Dalton MCIHort

Video sessions

Of all of Plews' services, teaching clients how to garden in their own garden is the most rewarding, but hardest to carry out. I gather information on them and their garden beforehand and write lesson plans, but the ability to think on one's feet is essential.

With a mix of theory and practical, I enable them to understand importance of soil, reasons for tasks, how to carry out pruning, propagation – whatever they want to learn.

Turning this close relationship into video sessions was easier with existing clients, trickier with new. Have you ever tried to demonstrate by mime how to prune an overgrown cornus when winter colour is desired but they would like summer flowers? Holding phone and secateurs to ensure placing was correct before pruning is no mean feat. A pity no-one could have been filming us...

Looking ahead, I'll use both in-their-

garden and video sessions for distance teaching, gaining flexibility whilst retaining relationship.

Marie Shallcross MCIHort

Leith Hall Gardens and Estate

The National Trust for Scotland's garden at Leith Hall in Aberdeenshire has been maintained by two staff members during lockdown, carrying out essential gardening tasks. Missing our seasonal gardener and our many volunteers, we have been trying to keep on top of grass cutting, weeding the borders, watering of the greenhouses and some propagation. It has been a strangely quiet time in the garden with no visitors to admire the beauty of it and not a soul to notice the riot of colour in our newly replanted Edwardian rock garden.

In the historic kitchen garden we have this year grown all our vegetables through sheets of Mypex. Although the planting has been more time-consuming, we hope that time will be saved not having to continually weed the beds. We have also been experimenting with differential mowing regimes in our orchard to save mowing time and fuel costs.

Sarah Ramsay ACIHort



OBITUARIES

WALTER DINNING | KENWYN PEARSON

Walter Dinning

1937-2020

Walter Dinning, former Assistant Director (Parks) at Gateshead Council and longstanding Institute Member died in March aged 83 years.

A professional horticultural career spanning over 40 years with Gateshead Council saw Walter start as an apprentice gardener and work his way up to the post of Assistant Director with responsibility for the borough's parks, open spaces and horticultural services. During that time he was instrumental in the borough, winning both regional and national Britain in Bloom awards on many occasions.

He oversaw the development of a central plant nursery complex which when it was opened in 1984 was one of the most modern local authority plant production units in the country. He was very involved in the Gateshead Garden Festival in 1990 and, following this, established the Gateshead Spring and Summer Flowers Shows, which became a feature of the annual horticultural events calendar (sadly no longer held). Walter would also be regularly seen at Chelsea Flower Show with the various Gateshead exhibits.

In 1984 he was awarded the 'Bob Hare Award' by Britain in Bloom for an outstanding contribution over several years. In 2002 the then Institute of Horticulture (Northern Branch) recognised his outstanding contribution to horticulture by presenting him with its prestigious Branch Commendation award. In 2005 the RHS awarded him the Harlow Carr Medal for his contribution to horticulture in the North of England. At the Britain in Bloom 50th Anniversary Awards in 2014 the RHS presented him with an Outstanding Contribution Award.

Following his retirement in 1994 Walter became very actively involved in Northumbria in Bloom; first as a judge and then as a Trustee. He was constant in offering help, support and encouragement to communities right across the Northumbria region to get the most out of participating in the campaign.

Walter was also Chairman and later President of the North of England Rose, Carnation and Sweet Pea Society (Rosecarpe). He regularly gave horticultural talks and judged at several local shows.



He was one of horticulture's true characters who had time for all who had the pleasure to meet him.

Sue Wood MCIHort

Kenwyn Francis Rowarth Pearson FCIHort Dip Hort Kew

1952-2020

After completing his formal education at Cawston College in Norfolk and his initial horticultural training at the Norfolk School of Horticulture, Kenwyn started his career as an apprentice with Laxton and Bunyard nurseries. Work there included staging and staffing the company's stand at Chelsea Flower Show. In 1971 he moved to Lancashire College of Agriculture at Myerscough to undertake the National Certificate in Horticulture, participating in a range of student organisations.

The big move came in 1972 when he started on the Kew Diploma course at the Royal Botanic Gardens, Kew. Again, participation with the student's union, fete, committee, student newsletter and Kew Club were some of the many ways he helped with student life. At the gardens he achieved qualifications and a high standard of horticultural education. He is also fondly remembered for organising and cooking a Christmas day meal for the staff. The successful event saw meal portions being transported round the gardens from various mess rooms, co-ordinated by him. All the staff working that Christmas had an excellent lunch.

Having successfully completed the diploma course, he continued to work at Kew, until gaining employment with Milton Keynes New Town Development Corporation. He worked in the landscape section assisting in the planting and green structure that eventually became Milton Keynes, with some wooded areas now of course being mature woodland.

In 1978 he was appointed to the position of Head Gardener to the Cadogan Estate in central London. This involved the modernisation, mechanisation, maintenance and development of many gardens of varying sizes, with varying issues. For example, the garden in Sloane Street was above an underground car park, rather limiting plant choice. Dutch Elm disease and the Great Storm of 1987 resulted in the estate losing many mature trees and needing his judgement

as to what was safe or what needed urgent attention.

After leaving Cadogan he became a professional consultant and worked with local authorities and a number of clients with private gardens up and down the country, advising on redevelopment and maintenance. He also became an inspector for City and Guilds and Edexcel looking after standards in horticultural education. During this period he became a Liveryman with the Worshipful Company of Gardeners and a Freeman of the City of London. Regrettably, health issues forced him to give up work in 2005, and there followed nearly 15 years of ill health concluding with him living in a nursing home near Horsham and eventually losing the ability to communicate. He died of a stroke aged 68 years.

Kenwyn dedicated his spare time to a wide range of horticultural organisations. He was a constant supporter of Perennial, becoming a Trustee and Vice-Chairman, as well as Director of GRBS Enterprises. He was a founding member of the Professional Gardeners' Guild with whom he also helped found the PG Trust. He was Vice-Chairman/Director of Plant Heritage (then known as NCCPG) from 1988-1995, Secretary to the Kew Guild (1994-1999) and Vice-President in 1998. As a Fellow of the Chartered Institute of Horticulture he served as a Council member from 1991 to 1997. He was a Bloom judge for London in Bloom (Trustee 2002), The London Gardens Society, South and South East in Bloom and a committee member of London Metropolitan Gardens Society. He also served as a moderator for the RHS exams in 2003 and was part of the review panel of the RHS MHort in 1993.

Kenwyn took his mischievous sense of humour to all situations and loved to socialise. His parties during Chelsea week were legendary and all who came to know him would attest that they have all lost a great friend and colleague.

Due to the current Covid-19 regulations a small funeral took place in June, with representatives present from CIH, Kew Guild and the Professional Gardeners' Guild, the three major horticultural organisations in his life. Kenwyn was laid to rest in his family plot in Ribchester, Lancashire. A celebration of his life is planned for May 2021.

Gareth Manning FCIHort MPGCA

BRANCH REPORTS

SOUTH EAST

Our first event of the year was a meeting at Chelsea Physic Garden in February at the start of the snowdrop season. The garden was fully geared up for visitors with innovative plant displays and a marquee devoted to the selling of snowdrops and other early spring plants.

Snowdrops of many different cultivars had been planted in moss balls suspended from tree branches, massed under deciduous trees, brought closer to eye level in large mossy planters, and displayed in a wooden theatre.

The weather was kind, encouraging exploration of all that was on offer. The garden looked fresh, with a surprising number of plants in flower, even given the benevolent microclimate. *Salvia columbariae* was flowering on 2.5m stems, and *Rosa x odorata* 'Bengal Crimson' was in full bloom.

New committee member **Marie Shallcross** had organised this day for us, and booked for 24 in the restaurant. It was a great opportunity to catch up and get our horticultural visiting off to a great start – we thought.

Of course the Covid-19 situation overtook us, and visits are now postponed. The immediate casualty of the changed times was the Regional Final of the YHoY competition, scheduled to take place at Hadlow College in March. Our wonderfully efficient YHoY Branch Co-ordinator,



John Brannan, has made alternative arrangements for the Regional Final, and has ensured all heat prize winners have received their cheques and certificates. We will provide an update on the progress of the competition in the next issue of the journal.

Despite not being able to meet up the branch has continued to keep in touch with members. We are now supporting Perennial as a Bronze Partner, which has allowed us to keep in closer contact with the charity, enabling us to swiftly disseminate information on support available to our members (and to all horticulturists).

Last summer we gave you an update on the branch Instagram account,

Above: Snowdrop theatre. (Photo: Angela Evans)

which had then been running for about six months. Now 18 months on and the most popular image remains the same, a wisteria pergola in Morden College Blackheath, south east London. The number of followers continues to slowly climb, but perhaps more importantly we are able to keep in touch with members through this alternative medium, and 'follow' a number of past YHoY winners and participants, including **Rocky Coles, Tim Miles and Richard Moore**. It's lovely to see what's going on in their horticultural lives.

Angela Evans FCIHort

Branch Chair

southeast@horticulture.org.uk

FUTURE EVENTS

Members will be informed when events start again through Branch emails, in the post, or by checking on horticulture.org.uk.

NEW MEMBERS

1 = Amenity
2 = Commercial
3 = Education
4 = Advisory & Research

MEMBER

Hugo Boatright Roberts 2 Landscape Gardener Bristol
Franziska Cheeseman 1 M Hort (RHS) Berkshire
Natalie Chivers 3 Curator Gwynedd
Michael Donaldson 1 Horticulturist (soft landscaping) Fife
Matthew Eden 1 Director Essex
Kirsty Fitchett 1 Garden Designer/

Horticulturist Gloucestershire
Kevin Frediani 4 Curator of Botanic Garden & Head of Grounds Angus
Daniel Furlonger 1 Owner Surrey
Jean Hogben 3 Highlands
Caroline Kernan 1 Professional Gardener/Garden Historian
Enrico Mailli 1 Head Gardener Surrey
Dean McCoy 2 Assistant Manager, Horticultural Centre County Tyrone
Barnaby Millard 3 Horticultural Educator London

Annmarie Mitchell 1 Head Gardener Dumfries & Galloway
Richard Moore 1 Botanical Horticulturist
David Plunkett 1 David Plunkett Garden Care
Adam Savill 1 Garden Manager London
David Sewell 1 Director/Owner Warwickshire
Colin Skelly 1 Specialist Horticulturist Cornwall
Alistair Stride 1 National Grounds Maintenance Manager Bedfordshire
Francis Thomas 1

Horticulturist London
Ronald van der Hut 2 MD Surrey
Ruth Vichos 3 Lecturer in Horticulture Midlothian
Caroline Westacott 2 General Manager Devon
Gareth Wilson 2 Company Owner Director Derbyshire
Toby Young 2 West Sussex
Katrina Young 3 Senior Horticulturist and Lead Tutor Hampshire

ASSOCIATE
Laura Deigan 1 Head of Horticulture Isle of

Wight
Lesley Johnstone 1 Gardener Aberdeenshire
Steve Laing 2 Company Director County Antrim
Joanne Rogers 2 Garden Designer Hampshire
Fraser Wiles 1 Owner Hampshire

STUDENT

Alan Anderson 1 Landscape Services Officer Aberdeenshire
Mahnaz Begum 2 Horticultural Assistant Apprentice West Midlands
Yuying Bi 1
Sian Buckland 2

Jennifer Chapman 1 Fife
Pauline Coppard 2 Kent
David Forte 3 Dublin
Miranda Hobson 3 Plantsmanship Midlothian
Ruari Mostyn 1 Surrey
Lucinda Nascimento 2 London
Tahreem Noor 3 Gardener
Andrea Pitrik 3 Bedfordshire
Esther Potter 2 Horticultural Apprentice North Yorkshire
Alexander Reay 3 Tyne and Wear
Oliver Ryan-Moore 1

Head Gardener Lincolnshire
Lorilyn Shaikh 4 Hampshire
Andrew Short 3 Cambridgeshire
Yuchen Song 3 Elizabeth Spear 3 Cheshire
Jamie Swanton 3 Undergraduate
Luke Titus 2 Suffolk
David Williams 2 Keying Wu 3
Ziqi Zhang 1
Zhixing Zhong 4 Undergraduate Dublin
Huilin Zhu 4

BOOK REVIEW

NORTH WEST & NORTH WALES

Annual Branch Meeting

The 2020 ABM was held at Treborth Botanic Gardens courtesy of **Natalie Chivers** and **Dr Shaun Russell** of Bangor University.

The chairman opened the meeting with a welcome before he delivered his report. He noted the proximity to the previous ABM and explained the circumstances for this.

He thanked the committee for their continuing work and the progress made on the programme for the year. There was a brief discussion about the events for 2020, mainly to confirm that plans were moving forwards. It should be noted that at the time of going to press all these events have been cancelled or postponed.

The Branch Officers were re-elected: **Andy Lambie**, Chairman and Membership Secretary; **Gordon Limb**, Treasurer; **Rob Mackey**, Secretary; **Richard Lewis**, Publicity Officer and **Gareth Manning** and **Vic Criddle** as Committee members.

The chairman thanked members for attending. He introduced Dr Shaun Russell who provided background information about the history and future of the Botanic Gardens at Treborth, prior to the garden walk.

The Branch would like to extend thanks to Dr Shaun Russell and Natalie Chivers for hosting the ABM and to the University staff who provided welcome refreshments

Robert Mackey MCIHort
Branch Secretary
northwest@horticulture.org.uk



Right: Dr Tim Lang
(Photo: Andy Hall/
The Observer)



Feeding Britain: Our Food Problems and How to Fix Them

By **Tim Lang**

Pelican 2020, £25

ISBN 9780241442227

This is an important book, packed to the gunnels with statistics and graphs from the government's go-to expert on food systems and their politics. It champions horticulture as noted, unlike in the UK "The Netherlands did not allow its horticulture to decay. It invested, trained, researched, and made it an exciting career route".

Professor Lang's thesis is that to be resilient the UK needs to be 80% self-sufficient in food (we are now at 50%, up from the disastrous 30% of 1939 but down from the 80% of the 1980s). To do this means ending the growing of grain etc for beef, turning it to grass-fed only, with the population eating less meat, and a massive increase in the horticultural production of fruit and veg (from only 12% and 57% by value of produce consumed, respectively, in 2017). As an ex-hill farmer, Lang understands that the uplands need to be re-forested too – to mitigate climate change – so boosting forest industries.

We have never had such cheap food and in so much variety. Whereas pre-World War II people spent half their incomes on food, we now spend that on housing costs, with 10% on food. But we also waste a lot: with a carbon footprint (worldwide in 2011) equal to 87% of that of ALL global road transport.

However, inequalities in society (worsening in the UK) means access to good food is patchy, food banks proliferate and dietary choices are often

poor with the well-known issues of obesity and diabetes. In effect, the NHS pays for our cheap food policy.

Lang believes that we have always expected others to feed us (it was a justification for empire following the abolition of the Corn Laws in 1846 with food routes defended by the navy).

From 1994 to 2016 Lang directed City, University of London's Centre for Food Policy (which he founded in 1994) and sat on many government committees. He must have felt a prophet crying in the wilderness and this tone sometimes appears in the writing. He was an ardent Remainer, knowing how much food import/export goes via the EU. Horticulture only gets 1% of CAP subsidies, but could benefit from the ending of the system he calls ridiculous where so much food production is unprofitable and the primary producers get the least value.

Lang laments the wholesale destruction of the UK's horticultural research capacity in the 1980s and the subsequent erosion of the county college training system. He argues that Britain is insecure with a 'just-in-time' delivery system where 'the warehouse is the motorway' and will not be food-secure until we invest in food skills, pay decent wages and produce a new generation of food citizenship. That will need a lot more horticulturists and a social change to value us more. Meanwhile, we await the Dimbleby National Food Strategy to complement the existing Environment Bill.

Sue Minter CHort FCIHort VMM
Past President CIH, freelance horticulturist, author, lecturer and specialist tour guide

HORTICULTURAL RESEARCH

EDIBLE CROPS

Blue light alleviates 'red light syndrome' by regulating chloroplast ultrastructure, photosynthetic traits and nutrient accumulation in cucumber plants. Miao Y, Chen Q, Qu M, Gao L & Hou L, 2019. *Scientia Horticulturae*, 256: article 108680 AND **Continuous irradiation with alternating red and blue light enhances plant growth while keeping nutritional quality in lettuce.** Ohtake N, Ishikura M, Suzuki H, Yamori W & Goto E, 2018. *HortScience*, 53: 1804 (open access).

A detailed knowledge of how the light spectrum affects plant growth is needed for production in plant factories with LED lighting. In the first paper, cucumber seedlings growing in monochromatic red light showed disrupted chloroplast ultrastructure, impaired leaf photosynthesis, excess accumulation of nutrients (P, K, Mn and Zn) and reduced growth. However, these adverse effects could be ameliorated by mixing blue light with red for the same total light intensity. The second paper goes further by demonstrating for lettuce that continuous lighting provided by alternating 24-hour periods of red and blue light gave enhanced growth compared to that with mixed red and blue light (equal daily light integral). Alternating light increased photosynthesis, leaf area, sugars and anthocyanins.

Eustressors: Chemical and physical stress factors used to enhance vegetable production. Vázquez-Hernández M C, Parola-Contreras I, Montoya-Gómez L M, Torres-Pacheco I, Schwarz D & Guevara-González R G, 2019. *Scientia Horticulturae*, 249: 223.

This paper comprehensively reviews the potential benefits of controlled applications of stress to plant growth and quality. Positive stress (eustress) can be induced by biotic factors, biostimulants and elicitors, and non-biotic factors such as temperature, UV radiation, drought and salinity. Their application can improve water and nutrient uptake, tolerance of greater stresses and defences against pathogens and pests. They can also reduce the use of conventional agrochemicals.

Influence of recombinant *Trichoderma* strains on growth of bean (*Phaseolus vulgaris* L.) by increased root colonization and induction of root growth related genes. Eslahi N, Kowsari M, Motallebi M, Zamani M R & Moghadasi Z, 2020. *Scientia Horticulturae*, 261: article 108932.

This study reports the growth promoting effects of two recombinant strains of *Trichoderma harzianum* (Th) with enhanced chitinase activity. The better of these (T13) increased bean (*Phaseolus vulgaris* L.) root and shoot dry weights over control by 281% and 139% respectively in the absence of pathogenic *Rhizoctonia solani*, and by 262% and 104% in its presence. Increases were around 80% more than were given using wild type *Th*.

Vertical farming: a summary of approaches to growing skywards. Beacham A M, Vickers L H & Monaghan J M, 2019. *The Journal of Horticultural Science and Biotechnology*, 94: 277.

The need to maximise food production per unit area of cultivation is promoting systems of protected cropping that extend production upwards rather than outwards (vertical farming, VF). This timely review summarizes the main VF approaches and considers choice of crop, economics, environmental effects and energy requirements. It is concluded that VF has great potential, but that objective optimisation studies are needed.

Inhibition of postharvest senescence of green leafy vegetables by exogenous D-cysteine and L-cysteine as precursors of hydrogen sulphide. Al Ubeed H M S, Wills R B H, Bowyer M C & Golding J B, 2019. *The Journal of Horticultural Science and Biotechnology*, 94: 620.

The post-harvest longevity of many horticultural commodities can be improved by fumigation with hydrogen sulphide (H₂S), but its use poses logistical and safety issues. However, this study with pak choy, parsley and peppermint showed that comparable beneficial effects could be achieved by spraying with cysteine, the main precursor of H₂S in plants and generally regarded as safe. Leaf colour loss was delayed and respiration rate reduced.

Local temperature control in greenhouse vegetable production. Kawasaki Y & Yoneda Y, 2019. *The Horticulture Journal*, 88: 305 (open access).

Greenhouse growers of crops such as tomato generally aim to eliminate spatial temperature gradients. However, the authors of this paper argue that it is more important to maintain local temperatures around specific plant parts such as roots, shoot-tips, flowers and fruit (rather than leaves and stems), and that this can reduce fuel consumption without incurring yield loss.

Phenolics content and antioxidant activity in the leaves of two artichoke cultivars are differentially affected by six mycorrhizal symbionts. Avio L, Maggini R, Ujvári G, Incrocci L, Giovannetti M & Turrini A, 2020. *Scientia Horticulturae*, 264: article 109153.

Globe artichoke (*Cynara cardunculus* var. *scolymus*) is grown for its edible flower heads and health-promoting pharmaceuticals. The levels of these in leaves differed between cultivar and were affected by choice of mycorrhizal symbiont. In particular, *Claroideoglossum claroideum* 22W3 significantly increased yields of chlorogenic acid (+48%) and total phenols (+39%), and increased antioxidant activity (+48%).

Red LED irradiation maintains the postharvest quality of broccoli by elevating antioxidant enzyme activity and reducing the expression of senescence-related genes. Jiang A, Zuo J, Zheng Q, Guo L, Gao L, Zhao S, Wang Q & Hu, W, 2019. *Scientia Horticulturae*, 251: 73.

This study concludes that red LED irradiation (50 µmol/m²/s) of freshly-harvested, bagged broccoli at ambient temperature can extend post-harvest longevity by inhibiting yellowing, decreasing chlorophyll and weight loss, and enhancing antioxidant activity compared to controls maintained in darkness. Sensory score after 5 days fell by around 66% in the unlit control but by only 30% in the lit sample.

Reducing the excessive evaporative demand improved the water-use efficiency of greenhouse cucumber by regulating the trade-off between irrigation demand and plant productivity. Zhang D, Liu Y, Li Y, Qin L, Li J & Xu F, 2018. *HortScience*, 53: 1784 (open access).

This study compared the productivity of cucumber plants growing under conditions of high (uncontrolled) evaporative demand (high vpd) and low demand achieved using artificial humidification to maintain a set point of 1.5 KPa vpd. The latter treatment sustained stomatal function for photosynthesis, increasing shoot biomass by 18% and fruit yield by 20%.

Some recent horticultural publications have been briefly summarised by Dr Allen Langton FCIHort, an Honorary Research Fellow at the Warwick Crop Centre, School of Life Sciences, University of Warwick.

It is planned that all of the major horticultural commodity areas will be covered in this way over the course of the coming year. Of necessity, the selection represents a personal choice.

Please note: *HortScience* and *Journal of the American Society for Horticultural Science* are now open access journals. Articles in *Scientia Horticulturae* after Vol. 255 are now identified by article number rather than page number.

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