



RHS Science Strategy Update 2020



The RHS Vision

To enrich everyone's life through plants, and make the UK a greener and more beautiful place.



Theme
1
Garden Plant
Diversity



Theme
2
Plant Health



Theme
3
Environmental
Gardening for
Wellbeing



Introduction

When we set out the *RHS Science Strategy 2020–2025* we could not have foreseen the effects we would face because of a global pandemic. Yet in spite of the many challenges brought by Covid-19, the work of RHS Science & Collections continued apace during lockdown. The benefits of gardens and green spaces on our wellbeing and health, as well as the RHS Vision of enriching everyone's life through plants, became even more important to national life.

In spite of the pandemic, 2020 still proved to be a year of achievements for RHS Science. Research into the genetic study of plants was presented at conferences that moved online, a new monograph and research papers were published that provided greater knowledge to help gardeners to enjoy the pleasure of gardening. Surveys into pests and diseases have continued and enquiries analysed that will help us inform the advice we offer to gardeners and the horticulture industry. Policies guiding water use and biosecurity to be used within the RHS, and beyond, have been compiled and are being evaluated. RHS Gardening Advice faced a huge increase in enquiries as people spent more time in their gardens during lockdown.

The positive effects of plants, gardens and green spaces on health and wellbeing took on even greater emphasis in 2020. Our collaborative scientific research linking these was used as evidence to inform the Government in their decision to re-open gardens and garden centres during the first lockdown, and keep them open during later ones. Not only did this benefit people's physical and mental wellbeing, it helped the horticulture industry at a time when it was facing threats.

RHS Hilltop – The Home of Gardening Science

By the end of 2020, teams had started moving into the new centre for RHS Science: RHS Hilltop – The Home of Gardening Science (formerly known as the National Centre for Horticultural Science and Learning). Although delayed, it is heartening that we were able to reach this milestone in spite of the challenges of the pandemic. RHS Hilltop brings together, for the first time, our laboratories, research facilities, herbarium, entomology and

library, education spaces and gardens and puts science and learning at the heart of the RHS.

Work also continued on planting the three new gardens at RHS Hilltop that will become beautiful living laboratories for experiments, where we can

further explore the relationships between plants and wellbeing, and where visitors will be able to participate in our scientific research by sharing their responses to plants and how they affect us physically and emotionally.

RHS Hilltop will be a fitting place to engage with visitors, train PhD students and inspire scientists of the future, and help enrich everyone's lives through plants. I look forward to the time we can welcome people to our new home of gardening science to see our charitable scientific work, and the environmental and health benefits of gardens and gardening, for themselves.



Professor Alistair Griffiths

RHS Director of Science & Collections



The RHS would like to thank everyone who has given so generously to create RHS Hilltop, including our members and visitors. The Society would particularly like to thank The National Lottery Heritage Fund, The Mohn Westlake Foundation, Enterprise M3 Local Enterprise Partnership, Oak Foundation, and The Royal Commission for the Exhibition of 1851.



Horticulture Matters

RHS Hilltop

The Home of Gardening Science has been designed to provide state-of-the-art facilities that will enable the RHS to inspire and train the next generation of horticultural scientists. The brand new centre and its associated gardens will allow the RHS to support a greater number of collaborative PhDs and Fellowships now and in the future, and carry out research that will help all gardeners and growers. RHS staff, students and apprentices will also benefit, as will gardeners, teachers, schoolchildren and communities that are inspired to grow and consider careers in horticulture – helping close the skills shortage in the industry.



PhDs supported by the RHS in 2020

Impact of Plants on Indoor Air Quality (University of Reading/ University of Birmingham)

Developing non-peat growing media with microbial amendments (Royal Holloway College)

RHS rosemary collection – quality traits beneficial for UK horticulture (Royal Holloway College)

Maximising the environmental benefits of gardens through optimal planting choices and understanding of occupants' engagement (University of Reading/University of Sheffield)

Impact of plants on the design of healthy office environments (University of Reading)

Improving soil biology derived ecosystem services through organic material applications (Cranfield University)

Leaf surface micro-organisms & bacterial – potential for pollution degradation (University of Warwick)

Gardening and Health Systematic Review (University of Exeter)

Water balance processes in indigenous and introduced plantation tree production systems in the southern Cape region of South Africa (Nelson Mandela University, South Africa)

Climate resilient tree traits for Ecosystem Services & Labelling – Fellowship (RHS-led research)

Wellbeing in the Garden – Fellowship (University of Sheffield)

Narcissus phyloclimatic modelling (University of Reading)

Evolution of the Mediterranean flora – squills, bluebells and grape hyacinths (University of Reading)

Pathogen-induced changes in plant-insect interactions for crop and ornamental species in the genus *Solanum* (University of Cambridge)

Benign enhancement of natural defences: BEYOND (University of Sheffield/James Hutton Institute)

Urban Buzz: quantifying and enhancing the resources available to pollinators in urban landscapes (University of Bristol)

Use of endophytes to induce resistance to honey fungus (*Armillaria*) (University of Bristol)

Rose viruses: understanding the current status and protecting the future of the UK rose sector (Newcastle University)

Garden Gastropods: slug and snail diversity in UK gardens (Newcastle University)

Nematodes other than *Phasmarhabditis hermaphrodita* as slug biocontrol agents (Liverpool John Moores University)

Do beneficial insects such as pollinators spread aphid-lethal dicistroviruses? (University of Cambridge)

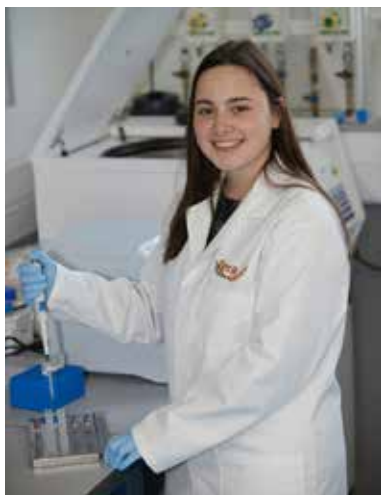
Native and invasive ladybirds in a changing U.K. climate (UEA)

The establishment of novel insect biodiversity in Britain (University of York)

The impact of climate change on UK garden plants – can we avoid a new Japanese knotweed? (University of Reading)

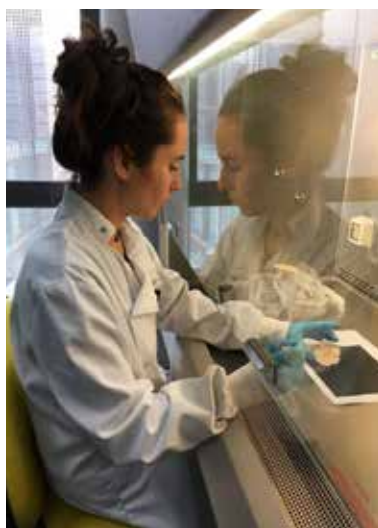
The dynamics of insect biodiversity in novel British landscapes (University of York)

Career success following RHS-supported studies



▼ **Helen Rees** studied for her RHS-funded PhD at the University of Bristol, researching the effects of endophytes to produce resistance to honey fungus (*Armillaria*) in plants. Her supervisors were RHS plant pathologists Jassy Drakulic and Matthew Cromey. Helen was able to use the research facilities at Wisley during her studies, and took part in plant health exhibits at RHS shows. This background in horticulture helped lead to her new role as researcher and lecturer with SRUC (Scotland's Rural College) within the crop protection team.

▲ **Ines Vazquez** studied rose viruses, using molecular diagnostic tools, in her PhD funded by the RHS and Defra and working with industry – David Austin Roses. Her supervisors were Gerard Clover and Rebekah Robinson. She also received an RHS travel grant that allowed her to visit laboratories and attend conferences in the USA; visits to Wisley brought a horticultural perspective to her lab-based work. Her use of molecular techniques helped Ines gain her role as a Molecular Scientist in the Next-Generation Sequencing team at Fera Science Ltd, and she is still connected to plant virology.



► **Curtis Gubb** studied for his PhD at the University of Reading and University of Birmingham, researching the role of indoor plants on air quality. As well as receiving part funding from the RHS and sourcing plants from RHS Garden Wisley, he benefited from the support of the science and horticultural advice teams, including Rob Sterling, Tijana Blanuša and Alistair Griffiths. Curtis now works at engineering consultants Cundall within their sustainability team, working on how to improve air quality within the built environment.



► **Tatenda Mapeto** received support from the RHS while studying for her PhD in Forest Hydrology at Nelson Mandela University in South Africa. Her co-supervisor was Mark Gush, Head of Environmental Horticulture (continuing from before he took that role with the RHS). Following the conferral of her PhD in 2020, Tatenda has become a lecturer in Forest Management at Nelson Mandela University and continues to follow her passion for all aspects of forest management, and uses the forest hydrology skills developed during her research.



Members of the Science team promoted careers in horticulture through video clips explaining their own careers, which are available at rhs.org.uk/education-learning/careers-horticulture

Bluebell genome described

Work funded by the RHS and University of Reading resulted in the publication of the chloroplast genome for the English or common bluebell, *Hyacinthoides non-scripta*. This molecular study, the first for this iconic native species, will assist with identification and naming of bluebell cultivars.

Research presented at virtual conferences

RHS-supported research continued to be presented at virtual conferences during lockdown. This included a poster (communicating early results of the study) presented on the molecular study of *Muscari* for Botany 2020, held online by the Botanical Society of America.

Colchicum monograph published

An in-depth, illustrated examination of *Colchicum*, informed by the RHS Plant Trial of these autumn flowers. As well as describing all 104 species, it looks at the most popular cultivars and encourages gardeners to grow a greater diversity of the genus.

RHS Colour Chart reprinted

The RHS Colour Chart is the standard work used worldwide to record plant, flower and fruit colours accurately, and is the authority relied upon by the horticulture and other industries. The Horticultural Taxonomy team compiled and checked all 920 colours before its reprinting.

First woman RHS scientist

A podcast by Mandeep Matharu, RHS Herbarium curator, celebrated the work of Dr Janaki Ammal (1897–1984), the first woman in the RHS Science department. She joined in the 1940s and worked as a cytologist, studying the chromosomes of plants.



Our new 1851 Royal Commission Herbarium

The move of our collections to new, purpose-built accommodation at Hilltop has meant rehousing more than 90,000 herbarium specimens in special boxes. At the same time we have been able to reorganise the families to those recognised in the Angiosperm Phylogeny Group classification. Along with the specimens, we are moving our unique collection of plant portraits, photographic slides and collectors' notes.

2 Plant Health: healthy plants, gardens and wildlife



- Monitor plant pests and diseases in gardens
- Improve detection and identification of plant pests and diseases
- Advance control and management strategies for plant pests, diseases and weeds in gardens, while working towards minimising pesticide use in gardens
- Encourage good stewardship of nature in gardens for environmental benefit



Citizen science count of slugs

Slugs and the damage they cause to plants is one of the greatest concerns raised by RHS members. This year, RHS Slugs Count – a citizen science project – was launched and volunteers asked to monitor and identify slugs in their gardens. It will show which slugs are most common, where they are found and what time of year, and help identify which slugs are causing problems and which are neutral or beneficial. All this will help inform advice given to gardeners.

Nationwide pest and disease survey conducted

Gardeners across the UK have been surveyed to rank pests and diseases problems. Previously this has been inferred from sources such as advice enquiries. The survey carried out in collaboration with Royal Holloway, University of London, indicates that slugs, snails and aphids were the most important pests while highest ranked diseases were late blight and rose black spot, although rankings varied across regions. An important conclusion was that inferences on garden pest and disease ranking based solely on enquiry data should not be taken as a proxy for importance. The research is informing future directions in garden pest and disease research.

Susceptibility to *Phytophthora* root rot uncovered

Decades worth of enquiries were analysed to explore the susceptibility of different plants to *Phytophthora* root rot, a fungus that causes plant roots to decay. The results, showing for example that *Taxus* (yew) is highly susceptible whereas *Forsythia* and *Paeonia* are rarely affected, have been used to compile a guide of suitable plants for gardens where there has been an outbreak of this disease.

Molecular study of rose virus

Rose rosette virus is a relatively recent and devastating disease that has not yet reached the UK; the molecular study of this and other viruses affecting roses has been completed. The study enables a better understanding of rose viruses that affect gardens and the rose-growing industry in the UK, and informs on measures that are required to keep the country free from rose rosette virus and other emerging rose viruses.

Research continues on diseases affecting roses (far left) and on box tree moth (*Cydalima perspectalis*; left, centre) that damages box plants.



Biosecurity applied

As well as working to safeguard plant health within UK gardens, the Plant Health Team has been focusing on biosecurity at RHS Gardens, Shows and Garden Centres. Biosecurity at the RHS uses a combination of risk analysis, plant reception, and inspections to ensure material entering the garden is healthy. This is crucial as thousands of plants have been imported for RHS Gardens Bridgewater and Wisley.

3 Environmental Gardening for Wellbeing

- Advance the understanding of cultivated plants, gardens and gardening to adapt and mitigate against climate change and improve our environment
- Encourage sustainable resource use in gardens for environmental benefit
- Advance knowledge for growing food in domestic, community and school gardens to improve nutrition and wellbeing
- Better understand the role of plants, gardens and gardening in improving social, physical and mental wellbeing, for individuals and communities





Water: managing a precious resource

The dry and sunny summer of 2020 meant an increased interest in water use from gardeners, with the watering advice page on the RHS website receiving more than 18,000 hits during May 2020 (compared with 18,254 views during the whole of 2019). The subject received wide media coverage, including on television and social media.

Also helping gardeners answer their watering questions is RHS Water Management Specialist Janet Manning, now working on the second year of the Knowledge Transfer Partnership (KTP) Water Management Project with Cranfield University. This KTP is jointly funded by the RHS and Innovate UK, through the Biotechnology and Biological Sciences Research Council (BBSRC), the Technology Strategy Board (TSB) and the Natural Environment Research Council (NERC). Through her Wise Watering Workshop, Janet passed on her expertise to RHS teams. A draft RHS Water Policy, to improve water use across RHS Gardens, as well as a proposed water management roadmap for Wisley have been compiled and are being assessed.

More evidence linking gardens and wellbeing...

Research between the RHS and the University of Exeter looked at the role of domestic gardens in health and wellbeing, and found that people having

access to a private garden benefited from greater wellbeing than those without, and were also more likely to visit natural areas. It also showed that people with any outdoor private space – whether balcony, yard or patio – were more likely to be physically active. Revealing the importance of domestic gardens for good health, it also shows the need to consider them in urban planning.

...becomes key advice to the government during pandemic

Research in conjunction with the University of Exeter and University of Sheffield allowed the RHS to provide evidence that helped convince the UK Government to open garden centres in England during lockdown. *Spending time in the garden is positively associated with health and wellbeing; results from a national survey in England* (see also p18) demonstrated the essential role of gardens and gardening on the nation's physical and mental wellbeing.

Peat: an environmental issue

The RHS is leading by example to eradicate the use of peat in horticulture; only peat-free growing mediums are now sold in RHS Garden Centres. The Science team has been researching alternative growing mediums and using this evidence to inform the move away from peat use. RHS Science representatives participated in government consultations and work in collaboration with NGOs and industry to help accelerate the transition from peat use in horticulture to a more responsibly sourced growing medium. Responses were also submitted to Defra's consultation on the England Peat Strategy.



◀ **Lauriane Chalmin-Pui** was appointed the first RHS gardening and wellbeing Post-Doctoral Fellowship. She published a paper, in conjunction with the University of Sheffield, on the wellbeing impacts of front gardens, which showed that adding plants to front gardens reduced the stress levels of residents.

▶ **Elisabeth Larsen** has embarked on a Post-Doctoral Fellowship, jointly funded by Frank P Matthews nursery, to study the character traits of a range of garden tree species and cultivars. She will research their ability to provide environmental benefits, such as flood mitigation, carbon capture, and temperature regulation.



54 million
online
advisory
sessions



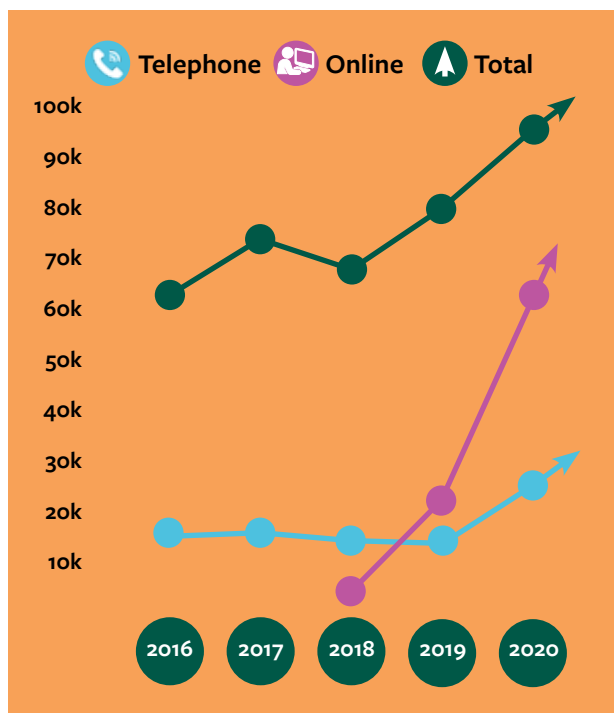
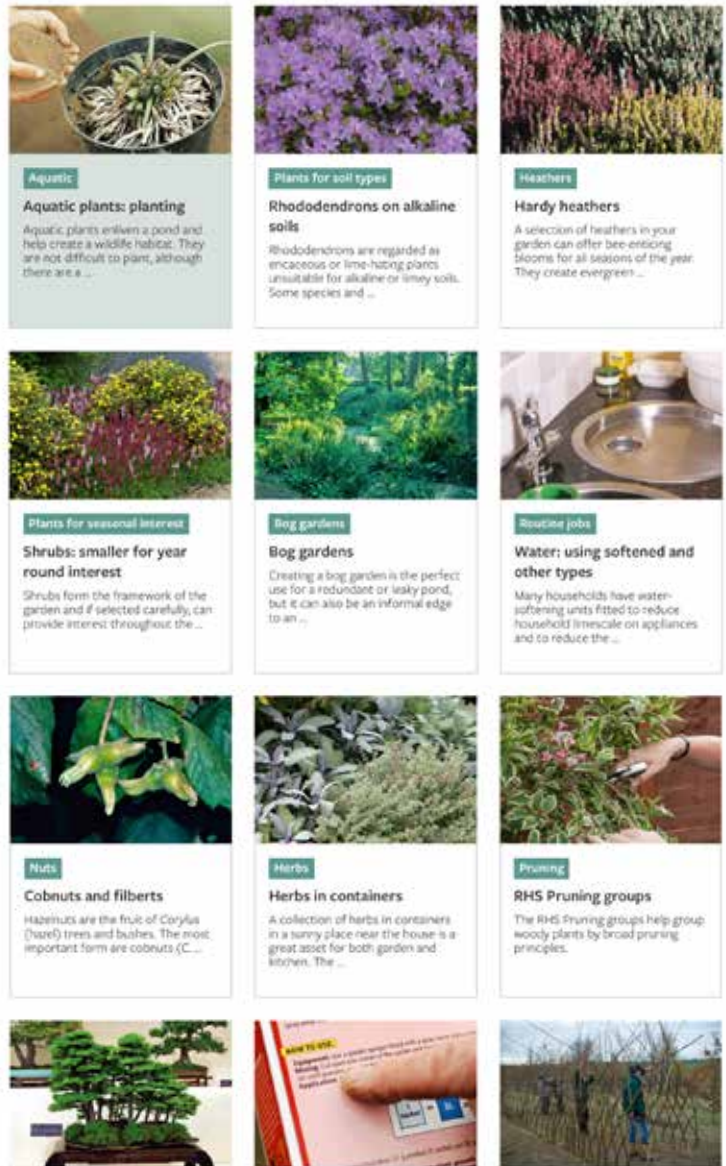
The Global Knowledge Bank

The RHS is a knowledge-based charity, which creates and shares its information and data through a range of channels to reach a wide audience that includes gardeners, academia, the government and the horticulture industry. It aims to help everyone to garden successfully and enjoy the process of growing.



Number of enquiries soared

As face-to-face advice on plants and gardening was not available during lockdown, RHS members used other ways to contact RHS Gardening Advice. The total number of enquiries rose dramatically as more people turned to gardening for enjoyment and help their mental and physical wellbeing. Online and telephone queries reached new highs. Popular topics included the selection and cultivation of shrubs and of herbaceous perennials. Advice on soil was sought significantly more often than in previous years, as was choosing and growing fruit. Between April and October 2020, there were more than 7,000 plant identification enquiries – double the usual number.





Sharing of scientific knowledge expanded

As many people, restricted to their homes during the pandemic,

took up gardening for the first time or looked to expand their experience of growing at home, inspirational content was provided by the Science & Collections teams.

New and updated web pages, magazine content, members' newsletters and social media brought original and informative content to members and non-members alike. Home-filmed videos – such as those produced by Leigh Hunt, Principal Horticultural Advisor, on seeds and houseplant watering – offered encouraging and accessible ways into gardening for everyone.



Publication of supplements to the International Registers for orchid hybrids and dahlias provided support for specialist growers. The 2020 edition of *RHS Plant Finder* helped gardeners connect with nurseries at a vital time for the horticulture industry, as the pandemic affected the RHS Flower Shows relied upon by many growers.



Virtual Chelsea created

As RHS Chelsea Flower Show was cancelled, RHS members and the

public were offered a digital alternative. RHS Libraries researched and created five online exhibitions on the history of the show for Virtual Chelsea. These attracted more than 16,000 unique views during Chelsea week 2020. RHS Gardening Advisors, scientists and celebrities also took part in video Q&A sessions, addressing gardening questions from virtual show visitors, and raising the profile of Advice and Plants content available at rhs.org.uk.

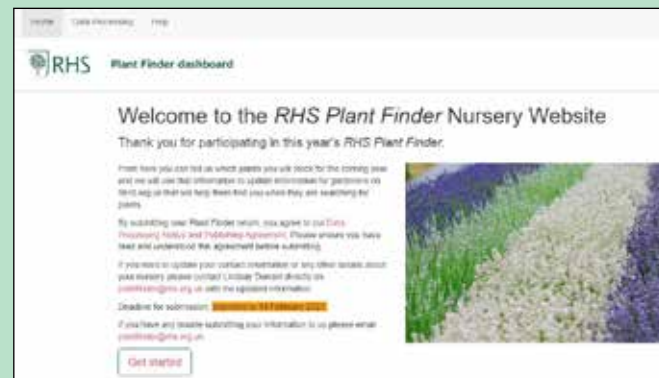


Better database created for botanists and gardeners

The innovative new Horticultural

Database went live in 2020, providing plant knowledge and images to rhs.org.uk and implementing a new way of managing and maintaining our plant information.

The new database, developed using BRAHMS in conjunction with the University of Oxford and Oxford Innovation, supports the updating of RHS Plant Finder, and the delivery of our plant records, RHS Plant Trials, and the planned new online herbarium.



RHS Libraries



The RHS Library Service encompasses a range of collections of books and magazines covering all aspects of gardening, plus important historic garden reference materials and online resources. These are held at RHS Lindley Library in London and garden libraries at Wisley and Harlow Carr. RHS members can borrow books and magazines; students and researchers can access other collections and databases.

Services adapted to lockdown

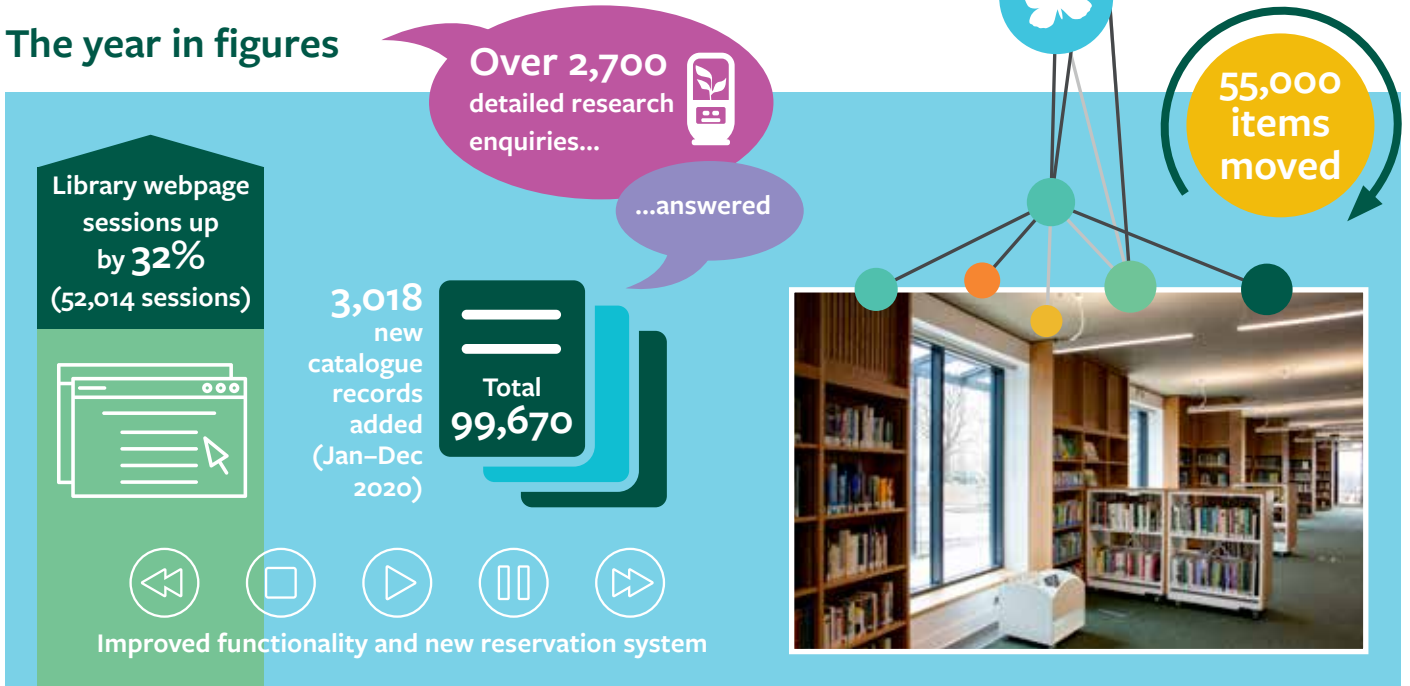
Although RHS Libraries had to close to visitors during lockdown, a covid-safe postal loans service was offered to library members, and a click and collect system put in place for the garden libraries at RHS Garden Wisley, Surrey, and RHS Garden Harlow Carr in North Yorkshire.

Exhibitions moved online

With visitors unable to attend in person, exhibitions planned for RHS Lindley Library were taken online, becoming colourful and informative digital exhibitions. These covered orchid portraits, botanical illustrations, the story of city gardening and the history of the dahlia. RHS members were offered special previews of the online exhibitions.



The year in figures



Dedicated home at RHS Hilltop

During 2020, RHS Wisley Library and its collections were moved from its temporary home at Gardiners' House at Wisley to a purpose-built library at RHS Hilltop – The Home of Gardening Science. This has provided bespoke, state-of-the-art facilities for these collections, enabling and improving their preservation, storage and use.

Making collections more accessible

Work continued on digitising RHS Libraries collections, including the launch of a more accessible library catalogue using a new front-end system, Enterprise. To better promote and support RHS qualifications, electronic resources and services to horticultural students have also been improved. A new, online RHS Libraries Research Guide went live, explaining how to use the Libraries' services to find out about gardening ancestors.

Online exhibitions



Gardening by the book

The history of gardening told through 12 remarkable gardening manuals from the RHS Lindley Collections



Codlings, Costards and Biffins

What's in an apple? Discover the history of this fascinating fruit and the work that the RHS and others are doing to preserve its future



Apple Art

Apple highlights from the RHS Lindley Library collection



The City Gardener

What can a gardener who lived over 300 years ago teach us today?



Flower of a thousand faces

A history of the Dahlia, through the collections of the RHS Lindley Library



Dahlia Art

Dahlia highlights from the RHS Lindley collections



Worth a thousand words

Explore the beauty of nature with some of the finest contemporary botanical artworks in the RHS Lindley collections



Enduring beauty

The beautiful orchid portraits painted for the RHS



Healing garden

The hidden medicinal stories of popular garden plants, with illustrations from our rare book collection

Timeline

RHS Science Strategy Timeline from 2020

Increase PhD Projects

16
PhDs

18
PhDs

21
PhDs

Complete move to RHS Hilltop – The Home of Gardening Science

Collections Strategy

Create 5 RHS Fellowships (2 started in 2020, 1 in April and 1 in August)

Complete Water Knowledge Transfer Partnership KTP

Provide 3 annual Secondary Sc

Provide 3 annual Degree Stude

Increase STEM Ambassadors from 3 to 9

2020



2021



2022



Complete public-facing content and interpretation at
RHS Hilltop – The Home of Gardening Science

Implement Meet the Scientist Programme

Advice and content from our scientific discoveries in RHS Shows
Virtual Chelsea

Advice and content from our scientific discoveries in RHS Gardens

Scientific content for publishing in *The Garden* magazine and RHS books

Large-scale Citizen S

24
PhDs

27
PhDs

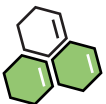
30
PhDs

School Work Experience Placements

Student Placements

Deliver masterclasses on horticultural science

2023



2024



2025



Science project with communities and education

Selected recent RHS Science publications

Garden Plant Diversity

- ✿ Clubbe, C., David, J.C. & 37 others (2020). Current knowledge, status and future for plant and fungal diversity in Great Britain and the UK Overseas Territories. *Plants, People, Planet* **2020(2)**: 557–579.
- ✿ Konyves, K., Garnett, G., Billsborrow, J., David, J.C., & Culham, A. (2020). The complete plastome of *Hyacinthoides non-scripta* (L.) Chouard ex Rothm. (*Asparagaceae*). *Mitochondrial DNA Part B: Resources* **5(1)**: 1003–1004.
- ✿ McDonald, S. (2020) *The International Dahlia Register* (1969), *Twenty-eighth supplement* RHS: London. 28pp.
- ✿ Shaw, J.M.H. (2020). (2748) Proposal to conserve the name *Eriobotrya* against *Raphiolepis* (*Rosaceae*). *Taxon* **69**: 620.
- ✿ Shaw, J.M.H. & Dee, R. (2020). Another new name in the *Aloe* group of genera. *Cactus World* **38(3)**: 234.
- ✿ Underwood, M. (2020). Registration of the daffodil epithet *Narcissus romieuxii* 'Julia Jane'. *Daffodil, Snowdrop and Tulip Yearbook* **2019**: 38.

Plant Health

- ✿ Anderson H.B., Robinson A., Siddharthan A., Sharma N., Bostock H., Salisbury A., Roberts S., van der Wal R. (2020). Citizen science data reveals the need for dynamic garden plant recommendations to help pollinators. *Scientific Reports* **10(1)**: 20483.
- ✿ Beal, E.J., Waghorn, I.A.G., Perry, J.N., Clover, G.R.G., Cromey, M.G. (2020). Susceptibility of garden plants to *Phytophthora* root rot. *Plant Disease* DOI: 10.1094/PDIS-04-20-0765-RE
- ✿ Bird S., Raper C., Dale-Skey N., Salisbury, A. (2020). First records of two natural enemies of box tree moth, *Cydalima perspectalis* (*Lepidoptera: Crambidae*), in Britain. *British Journal of Entomology & Natural History* **33**: 67–70.

- ✿ Brace, L.C., Gange, A.C., Clover, G.R.G. (2020). What are the predominant pests and diseases afflicting gardens in the UK? *Urban Forestry & Urban Greening* **52**: 126706.
- ✿ Jactel, H., Desprez-Loustau M.-L., Battisti A., Brockerhoff, E., Santini, A., Stenlid, J., Björkman, C., Branco, M., Dehnen-Schmutz, K., Douma, J.C., Drakulic, J., Drizou, F., Eschen, R., Carlos Franco, J., Gossner, M.M., Green S., Kenis M., Klapwijk M.J., Liebhold, A.M., Orazio, C., Prospero, S., Robinet, C., Schroeder, M., Slippers, B., Stoev, P., Sun, J., van den Dool, R., Wingfield, M.J., Zalucki, M.P. (2020). Pathologists and entomologists must join forces against forest pest and pathogen invasions. *NeoBiota* **58**: 107–127.

- ✿ Newbery, F., Robinson, R.J., Beal, E., Scrace, J. (2020). First record of *Septoria rudbeckiae* on *Rudbeckia* in the United Kingdom. *New Disease Reports* **42**: 2.
- ✿ Vazquez-Iglesias, I., Ochoa-Corona, F.M., Tang, J., Robinson, R., Clover, G.R.G., Fox, A., Boonham, N. (2020). Facing Rose rosette virus: a risk to European rose cultivation. *Plant Pathology* **69(9)**: 1603–1617.

- ✿ Vazquez-Iglesias, I., Scrace, J., McGreig, S., Pufal, H., Robinson, R., Clover, G.R.G., Adams, I.P., Boonham, N., Fox, A. (2020). First report of Rose spring dwarf-associated virus in *Rosa* spp. in United Kingdom. *New Disease Reports* **42**: 13.

Environmental Gardening

- ✿ Blanuša, T., Qadir, Z.J., Kaur, A., Hadley, J., Gush, M.B. (2020). Evaluating the effectiveness of urban hedges as air pollution barriers: importance of sampling method, species characteristics and site location. *Environments* **7(10)**: 81.
- ✿ Chandler, J.O., Haas, F.B., Khan, S., Bowden, L., Ignatz, M., Enfissi, E.M.A., Gawthrop, F., Griffiths, A., Fraser, P.D., Rensing, S.A. and Leubner-Metzger, G. (2020). Rocket Science: The Effect of Spaceflight on Germination Physiology, Ageing, and Transcriptome of *Eruca sativa* Seeds. *Life* **10(4)**: 49.

- ✿ Duddigan, S., Alexander, P.D., Shaw, L.J., Sandén, T. and Collins, C.D. (2020). The Tea Bag Index—UK: Using Citizen/Community Science to Investigate Organic Matter Decomposition Rates in Domestic Gardens. *Sustainability* **12(17)**: 6859.
- ✿ Dziki, S., Lumsden, T., Ntshidi, Z., Mobe, M. and Gush, M.B. (2020). New app can predict apple orchard water use up to a week in advance. *The Water Wheel* July/August: 42.
- ✿ Hahn, N., Essah, E.A., Blanuša, T. (2020). Biophilic design and office planting: a case study of effects on perceived health, well-being and performance metrics in the workplace. *Intelligent Buildings International*: 89347.
- ✿ de Bell, S., White, M., Griffiths, A., Darlow, A., Taylor, T., Wheeler, B., Lovell, R. (2020). Spending time in the garden is positively associated with health and wellbeing: Results from a national survey in England. *Landscape and Urban Planning* **200**: 103836.
- ✿ Howarth, M., Griffiths, A., da Silva, A. and Green, R. (2020). Social prescribing: a 'natural' community-based solution. *British Journal of Community Nursing* **25(6)**: 294–298.
- ✿ Thomsit-Ireland, F.L., Essah, E., Hadley, P., Blanuša, T. (2020). The impact of green facades and vegetative cover on the temperature and relative humidity within model buildings. *Building and Environment* **181**: 107009.
- ✿ Chalmin-Pui, L.S., Roe, J., Griffiths, A., Smyth, N., Heaton, T., Clayden, A., Cameron, R. (2020). "It made me feel brighter in myself"- The health and well-being impacts of a residential front garden horticultural intervention. *Landscape and Urban Planning* **205**: 103958.
- ✿ Griffiths, A., Keightley, M., Gatti, A., & Allaway, Z. (2020). *RHS Your Wellbeing Garden: How to Make Your Garden Good for You – urban Science, Design, Practice*. DK: London
- ✿ Padovani, R.J., Salisbury, A., Bostock, H., Roy, D.B., Thomas, C.D. (2020). Introduced plants as novel Anthropocene habitats for insects. *Global Change Biology* **26(2)**: 971–988.

rhs.org.uk

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Inspiring everyone to grow