



Breaking new ground for science

RHS Hilltop – The Home of Gardening Science is a groundbreaking new facility at RHS Garden Wisley, Surrey. It will transform the study and sharing of horticultural and gardening science for the environment and human health. Here is a preview ahead of its opening on 24 June

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RHS Hilltop – The Home of Gardening Science as viewed from across the Wildlife Garden (left) designed by Ann-Marie Powell. Landscaping has continued through winter and into spring while work on the building is completed. Scientific study undertaken in state-of-the-art RHS laboratory facilities (right) will benefit all gardeners.



Since the establishment on 7 March 1804 of the Horticultural Society of London, a golden thread of excellence in horticultural science has been woven inextricably into its DNA. The second president Thomas Andrew Knight (1759–1838) is regarded as a pioneer in horticultural science for applying scientific principles to practical problems. RHS Secretary John Lindley (1799–1865) continued the commitment to research and evidence-based advice, and standardised names of ornamental plants. When RHS Garden Wisley was given to the Society by Sir Thomas Hanbury in 1903, it was stipulated the estate should continue as an experimental garden for the ‘encouragement and improvement of scientific and practical horticulture in all its branches’. From 1916, the scientific work of the RHS was hidden behind the great oak door of the venerable Arts and Crafts Laboratory by the old main entrance, but at the new RHS Hilltop – The Home of Gardening Science, all will be revealed.

RHS Hilltop is part of a £160 million investment into the future of horticulture planned across all RHS Gardens. It is evidence of a shift in the RHS from a traditional learned society to a dynamic, forward-thinking, inclusive charity, relevant to the needs of the 21st century and which puts science at the heart of everything.



Focus on environmental science

Research will be boosted by three state-of-the-art laboratories, which will significantly improve the UK's horticultural science research capabilities. A new environmental horticulture team will undertake scientific research into nature-based solutions to help towards tackling the biodiversity-climate crisis, putting the green of plants and gardens back into ‘green’ infrastructure. The team will look into areas such as carbon storage, soil health, flooding, energy, noise and pollution, resource use and waste. This work will encourage sustainability in gardens, advance knowledge for growing food in homes, »

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RHS Hilltop includes learning space for secondary school visits and workshops. The Learning Studios (above) will bring parts of the curriculum to life, with hands-on experience that will inspire pupils to study, learn more about and potentially take up a career in science and horticulture.

The architects, their brief and how the building works

Award-winning architects WilkinsonAyre, who won the competition to design the building in 2015, are famous for eye-catching, innovative designs at The Gardens by the Bay in Singapore, the Alpine House at Kew and the new stands at Lords Cricket Ground. Osbourne, the civil engineering contractors, delivered the building on time, on budget and were extremely respectful of the site.

RHS Hilltop is orientated north to south and designed on an acoustic model which stops the noise coming from the A3 and reflects it away from the garden. The interior is quiet – fewer than 50 decibels in the public spaces and 40 within the offices.

Understanding an important brief

The brief was to deliver a major upgrade to scientific facilities at RHS Garden Wisley to bring them to 21st-century standards so that the Society's Science Strategy could be implemented and – through public engagement – enable the Society to better share best practices in horticulture.

RHS Hilltop is a replacement for the existing Grade II-listed Laboratory, which was state of the art when it was built but is now antiquated, so storage facilities for the Society's scientific research and internationally important scientific collections, such as the herbarium, entomology and pathology collections, needed to be brought in line with 21st-century practices. Hilltop was also expected to provide the correct environment in which to keep the reference collections secure and ensure their longevity while making them available to researchers.

The building also had to be a new visitor destination for Wisley and include the provision of facilities in several important areas, including offices, research, classrooms and learning. The project was expected to focus on science, learning, outreach and engagement, as well as improving welfare of staff and visitors.

Artist's impression of RHS Hilltop (below), showing the ground floor layout, together with landscaping and gardens that surround the new building.



communities and schools, and provide a fuller understanding of the role of plants, gardens and gardening in improving social, physical and mental wellbeing.

All are welcome to the library at the front of RHS Hilltop. This key resource for staff, researchers, students, members and garden visitors will help gardeners gain the knowledge they need to grow, and scientists the information they need for research.

A diagnostics laboratory will help to monitor plant pests and diseases in gardens, and improve detection and identification. Study here will advance integrated control and management strategies with decreasing chemical use and encourage good stewardship of nature in gardens for environmental benefit.

Research in the molecular laboratory will progress understanding of the true identity of garden plants such as daffodils, through their chloroplast genomes

and the correct identification of diseases – perhaps one of the five main species of honey fungus – from samples sent in to RHS Gardening Advice.

The dramatic Y-shaped building, designed by WilkinsonAyre (see p81) – combining contemporary architecture, cutting-edge scientific technology and an inspiring visitor experience – sits centrally at Wisley, its arms open to the world. Gardens designed by Ann-Marie Powell and Matt Keightley are in the foreground; the World Food Garden, on which Ann-Marie Powell also worked, lies to the west.

The two wings of the building, both two storeys high, are anchored by a majestic atrium that runs almost the whole length of the building. Glass doors at the north entrance allow visitors to flow easily between the atrium and the garden on warm days. In the west wing, flexible classrooms are a base for »

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Sustainable structures

During the demolition of existing structures on the RHS Hilltop site, 99 percent of the materials were recycled into individual waste streams for plastic, metal, glass, wood and rubble that could be tracked directly from the demolition site to later use elsewhere.

The new building's specifications include heating designed so the thermal mass of the building retains heat, while creating a stable environment for collections in the new herbarium and library. All roofs, windows and doors have high levels of insulation. The building is partly clad in slats of English sweet chestnut harvested from forests in the Midlands; every piece of timber in the building, including plywood, meets Forestry Stewardship Council standards.

Energy-saving measures built in

Good practice in environmental design is shown throughout the building. Rooflights provide natural light and ventilation. Rooftop photovoltaic cells offset the building's carbon emissions, and a sensor-controlled building management system optimises energy use.

The building takes advantage of exposed thermal mass for passive cooling and is also cooled using water from the site-wide water capture and irrigation system. High-specification glazing reduces overheating in summer.

Passive ventilation maintains a constant flow of fresh air. If CO₂ levels increase, a sensor activates mechanical ventilation that also captures the heat of the outgoing air.



All timber used in the new building (above) meets environmental standards.

The ventilation system (left) draws in cool air as temperatures indoors rise.

Purpose-built herbarium

A herbarium is a collection of dried, pressed plants mounted on paper so their characteristics can be seen. Taxonomists depend on these and detailed notes accompanying them for identification and classification of plants.

The herbarium at Wisley changed focus in 1953, when botanist Chris Brickell (later the first Director General of the RHS), decided it should specialise in cultivated plants. It is now the largest in Britain and one of the leading herbaria of its kind in the world. Among its priceless collections are 90,000 pressed dried plant specimens, 35,000 photographic slides and 3,500 botanical paintings. The oldest is a pressed specimen of *Lavandula x intermedia* from 1731.

The herbarium also houses cultivated plant specimens donated by the British Pteridological Society, the Alpine Garden Society and Plant Heritage Collection holders, among others.

Looking after a valuable collection

The herbarium in the old Laboratory had room for 70,000 pressed specimens, but with the collection now numbering 90,000 and an ambition to reach 400,000, the facilities there have long been inadequate.

Specimens in the new RHS Herbarium will be housed in a biosecure, controlled environment where temperature, light and humidity are regulated, and pests kept out. Its walls are constructed so the herbarium is permeable and can 'breathe', helping to maintain humidity levels.

There is a new digitisation suite so specimens can be shared online around the world. The 1,000 names of those who donated herbarium boxes will be inscribed in timbers, in the atrium, on a nearby wall.



Precious plant specimens are housed in blue herbarium boxes. These have been moved from the old laboratory by specialist company Bishop's Move (above left) and rehomed in the purpose-built facility (left) at RHS Hilltop. It will be called the 1851 Royal Commission Herbarium, named to thank The Royal Commission for the Exhibition of 1851 for its generous support.

Rolling shelving stacks (left) provide safe storage for the library. They will house many of the Society's treasures, including Europe's finest collection of nursery catalogues, many unique rare books and archives on the history of the garden.

Exhibition and display area

The exhibition at RHS Hilltop will explore the wellbeing and environmental benefits of gardens. Visitors will discover how they can design their green spaces to improve their own wellbeing, boost the nutrient value and flavour of home-grown fruit and vegetables, get advice on gardening sustainably and so become part of the solution towards tackling the biodiversity-climate crisis.

Interactive exhibits, showcases and displays are based on RHS science to provide gardening advice coming from the latest research. One display reveals how gardening enhances mental health and social wellbeing, with testimonies from psychologists, NHS patients and gardeners, explaining benefits of growing your own. Visitors will be invited to participate in an RHS experiment that explores the effect of garden design and different plants on emotions. Using interactive screens, you will be asked to think about your emotional responses to plant

shape, scent and colour. The results will help RHS scientists create the first evidence-based wellbeing garden blueprint.

Exhibits on plant health explain current problems and how to avoid them, and microscopes reveal the invisible garden and wonders of hidden wildlife on your doorstep.

In the library entrance, expect to see changing displays of rare books and artefacts, an artist in residency, short courses and garden-themed storytime sessions. Screens will explore the library's digitised collections, featuring thousands of items from more than 500 years of garden history, art and science.

Visitors can also watch herbarium specialists at work, drying and preparing new plant material for the collections. The Global Knowledge Bank Wall (above right) will highlight the diversity of the Society's herbarium (plant) and entomology (insect) collections and provide an in-depth look



into some of the science research projects that inform RHS Gardening Advice.

A daily programme, Hilltop Live, invites visitors to join RHS science researchers and garden curators in conversations, demonstrations and talks. You will also be able to book behind-the-scenes tours of the library and its treasures, the herbarium collections and the laboratories.



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forays into the gardens – the living laboratories. Lessons can also take place in the learning garden – who wants to sit in a classroom on a day out from school? Adjacent to this, the World Food Café has a menu based on seasonal crops, connecting visitors with the World Food Garden outside and the cuisine and cultures beyond.

One of the most versatile spaces at RHS Hilltop is the auditorium. It can be laid out as a lecture theatre, tables with seating or a meeting room for members of affiliated societies or charities such as Plant Heritage to exchange plants, knowledge and enthusiasms. On the first floor are laboratories, meeting rooms and a rooftop viewing terrace, affording glorious views over the orchard and garden to the distant skyline beyond.

In the east wing four expansive viewing windows are at an ideal height for adults, children and wheelchair users to observe staff at work. Visitors can also see into the library and storage archives. A display case will have examples from the RHS collection of 100,000 books, about 250,000 photographs of plants and gardens, and some 30,000 botanical artworks. Windows overlook the herbarium demonstration room and, from outside, the seed-cleaning room (until recently housed in an ancient shed).

Home of gardening science

The fact that RHS Hilltop is the only building of its kind in the world solely dedicated to gardening science is reflected in the vast range of research projects undertaken by RHS scientists and PhD

How the new scientific facilities (above) will look. RHS Hilltop will spur discoveries and research into issues such as biodiversity in gardens and the biology of pests and diseases.

New plantings in February (right) in Matt Keightley's Wellbeing Garden.



students, from UK-garden slug and snail diversity to rose rosette virus, hedges that capture pollution, the role of front gardens and human health, and using chloroplast genomes to identify cultivated plants. For the first time, ‘behind the scenes’ tours will allow visitors to see these scientists at work in their new laboratories.

With unparalleled facilities and perspectives on education and citizen science, RHS Hilltop – The Home of Gardening Science is set to enrich everyone's lives through plants. Advances in horticultural science that take place here will help gardeners to change the world for the better. **O**

In June, *The Garden* will be exploring RHS Hilltop's gardens, outside spaces and science in action.

Resources

The RHS is grateful to everyone who has supported Hilltop, including members, donors, trusts and companies. If you would still like to support the final works to the building and gardens, please donate at: rhs.org.uk/wisley/sciencecentre