John Innes Centre

Science Strategy

Plant and microbial science for healthier plants, people and planet

May 2026

Contents

Foreword

PROFESSOR CRISTÓBAL UAUY
DIRECTOR

I am proud to present our Science Strategy for the next decade. At a time of profound global challenge, from climate change and food insecurity to the growing burden of diet-related disease, our mission has never been more important. Grounded in discovery research, we will harness the power of plant and microbial science to deliver solutions for healthier plants, people and planet.

This strategy builds on our core strengths: deep fundamental insight, interdisciplinary collaboration, and a commitment to translating knowledge into real-world impact. From sustainable agriculture and resilient crops to next-generation nutrition and medicines, our work will address some of the most pressing challenges facing society today.

Our success depends on our people, partnerships and shared purpose. Working across the Norwich Research Park and with partners worldwide, we will strengthen our leadership and maximise impact. By investing in discovery, embracing innovation, and fostering a vibrant and inclusive research culture, we will deliver lasting benefits for society and the environment.

Our Institute

The John Innes Centre is a globally renowned plant and microbial science institute. We conduct interdisciplinary research that answers fundamental questions about plants and their associated microbes, and develop innovations that support agricultural, food and health system transformation.

We have an ambitious vision for achieving a healthier and more sustainable future through the power of plant and microbial science: *Healthy Plants*, *Healthy People*, *Healthy Planet* (HP3).

Over the next ten years, our research strategy will accelerate progress towards the HP3 goals by tackling some of the biggest challenges across human health and nutrition, food security and sustainable agriculture, all in the face of climate change.

Our mission is to discover how plants and their associated microbes function for the benefit of people and planet.

Our Research

From molecules to organisms to populations, our research and interdisciplinarity integrates molecular, biochemical, computational and genetic approaches. The combination of excellent discovery research and ambitious ways of applying our understanding, allows us to respond to emerging challenges and underpins our global impact.

Our strengths lie in discovering and understanding fundamental processes in plants and microbes and how they are modified by the environment. Building on this foundation we are able to move towards more quantitative predictions about how plants and their associated microbes are likely to respond to the challenges posed by a changing climate, and using technologies such as engineering biology, to deliver targeted solutions for healthier plants, people and planet.

Our Science Strategy is structured around three strategic research themes, each bringing plant and microbial science together to realise our vision:

- Sustainable agriculture for a healthier planet
- Resilient plants in our changing world
- Next generation medicines and diets

ARABIDOPSIS IN THE LAB

TURNING BACTERIAL TRICKS INTO BIOTECHNOLOGY TOOLS

Research on how insects, microbes and plants interact has revealed a new way that cells remove unwanted proteins.

Professor Saskia Hogenhout FRS and her team discovered that tiny proteins made by parasitic bacteria, called phytoplasmas, can take control of a host cell's protein 'recycling' system through a ubiquitin-independent route, instead of relying on the usual molecular 'tag' that cells use to mark proteins for destruction.

The team are using this discovery to develop a new way to remove selected proteins from living cells with high precision. This provides scientists with a powerful tool for understanding how cells work and is being developed into a technology with potential uses in plant, animal and human health, creating new opportunities in biotechnology and medicine.

PROFESSOR SASKIA HOGENHOUT FRS

Healthy Plants, Healthy People, Healthy Planet

Healthy Plants, Healthy People, Healthy Planet (HP3) is a collaborative vision to deliver solutions to global challenges, securing a safer, healthier and more sustainable future. A call for interdisciplinary research that underpins the innovation needed in a world with a rapidly changing climate, facing massive losses in biodiversity, a growing global population.

HP3 addresses the critical challenges facing the planet, where plant and microbial science can play a leading role in delivering solutions.

Together the John Innes Centre and The Sainsbury Laboratory, backed by over £400 million in investment, are building world-leading plant and microbial science laboratory infrastructure that places the UK at the forefront of research and innovation.

The Next Generation Infrastructure (NGI) programme supports researchers and innovators to do ground-breaking work and deliver the ambitious long-term aims of our vision, which will bring together the interdisciplinary teams required to deliver the solutions to the global challenges of feeding the world, climate change and improving global health.

CGI OF THE NGI MAIN LABORATORY BUILDING
CREDIT: SECCHI SMITH

Sustainable agriculture for a healthier planet

THE CHALLENGE

Feeding the world sustainably is one of humanity's biggest challenges. Significant environmental damage is caused by agricultural systems, and we must find ways to minimise the environmental impact of producing food.

We must dramatically decrease the carbon footprint of food production, which is responsible for around a **third** of global greenhouse gas emissions.

OUR AMBITION

We aim to reduce the carbon footprint of agrifood systems and enhance natural biodiversity, by applying our understanding of how plants respond to and interact with beneficial and harmful microbes and pests, both above ground and in the soil.

Ongoing research will support us and others to find ways to harness these interactions to develop agricultural approaches that require fewer inputs and reduce environmental impact.

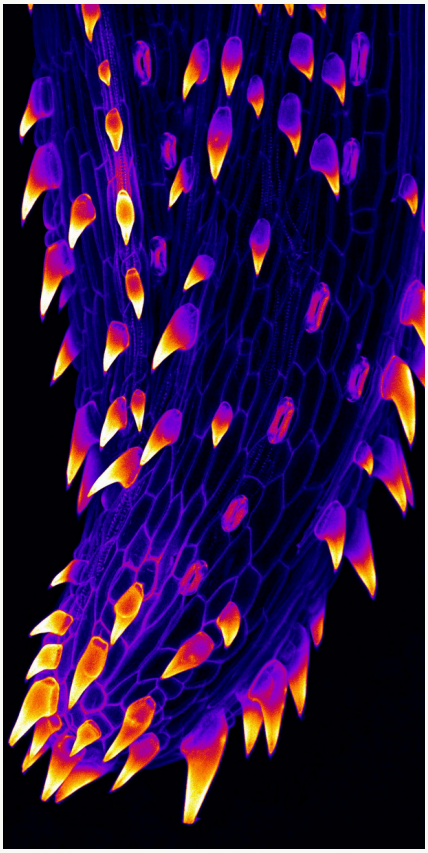
EXPERIMENTAL TRIAL PLOTS AT THE DOROTHEA DEWINTON FIELD STATION

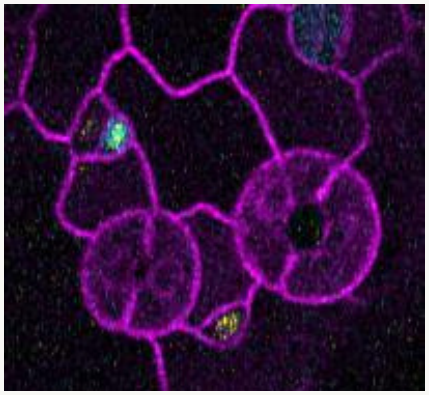
OUR PROGRESS SO FAR

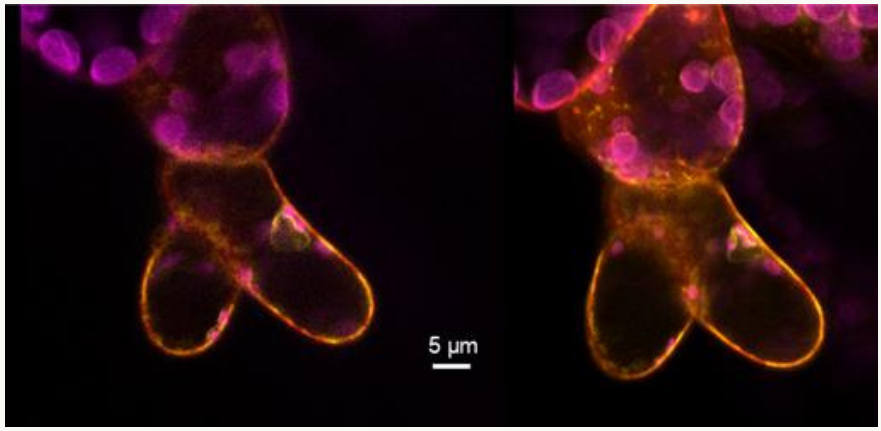
The last two or three decades have transformed our understanding of the interactions between plants, microbes, pests and the environment. We have made major advances in our understanding of how pests and microbes can invade and colonise plants while evading detection, and the role of immune receptors in plant immunity. Genomics has made it possible to study the genetic diversity of the pathogens and pests at species and population level.

We now know key genes that provide resistance to certain pathogens, and our research has delivered a greater understanding of their functions. We are on the cusp of being able to engineer key resistance genes into crops to develop new forms of disease resistance and resilience to pests. For example, based on our understanding of yellow rust in wheat we have created resources that allow plant breeders to develop new varieties with genetic resistance.

The John Innes Centre is known globally for its exciting portfolio of work on plant-microbe interactions that benefit agriculture. We are exploring the interactions between beneficial microbes and plants, investigating molecular mechanisms and developing microbial communities that can protect against pests or enhance plant growth. We have been exploring how to use microbes such as *Pseudomonas* and *Streptomyces* as biocontrol agents to combat disease in a range of crops.







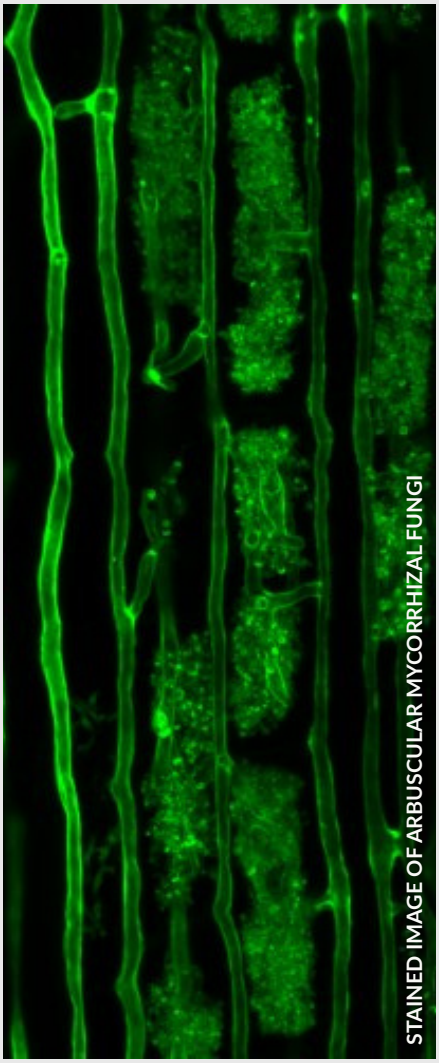
IMAGES: LEFT - TIP OF WHEAT LEAF (CREDIT: DR SUSAN DUNCAN)
TOP MIDDLE: TIME COURSE EXPERIMENT FOLLOWING STOMATAL DEVELOPMENT IN A YOUNG LEAF (CREDIT: DR XINYU ZHANG)
TOP RIGHT: MEDICAGO ROOTS COLONISED BY BLUE-LABELLED SINORHIZOBIUM MELILOTI (CREDIT: DR SEBASTIAN PFEILMEIE)
BOTTOM : AIRYSCAN SUPER-RESOLUTION IMAGE OF CHLOROPHYL AUTOFLUORESCENCE IN MARCHANTIA

REDUCING FERTILISER USE THROUGH PARTNERSHIPS WITH SOIL MICROBES

Professor Myriam Charpentier discovered an endosymbiosis mechanism that makes plant roots more welcoming to beneficial soil microbes, enhancing nutrient uptake. This opens up the potential to reduce the amount of inorganic fertilisers needed in farming to maintain yield.

Her team isolated a gene that enhances a plant's partnership with a naturally occurring soil microbe and increases nutrient uptake in the roots of legume plants, allowing them to scavenge nutrients from the soil.

They then applied this knowledge to wheat and found the same beneficial effect. This discovery could mean significantly less reliance on fertiliser and paves the way for more sustainable, low input farming practices. We are working with industrial and international partners to move this into farmers' fields.



STAINED IMAGE OF ARBUSCULAR MYCORRHIZAL FUNGI

PROFESSOR MYRIAM CHARPENTIER

> Our findings hold great potential for advancing sustainable agriculture. It is unexpected that the mutation we have identified enhances endosymbiosis in farming conditions, and it is exciting because it offers the potential to reduce inorganic fertiliser use.

NEXT, WE WILL:

- Characterise the basic physiology and development of soil microbes and microbial communities so that we can understand how they communicate with each other and with plants. We will investigate how these interactions are affected by the environment, and how these signals can impact pathways and processes in plants and microbes
- Increase our understanding of how microbes can help improve plant performance, for example, through beneficial interactions to enhance nutrient uptake in plants
- Learn more about plant immunity and the mechanisms of evasion/resistance in pathogens, and use this to develop strategies to engineer multi-layered and durable resistance in crops
- Explore how plant developmental and physiological processes can impact nutrient uptake and use efficiency, and find ways to use this knowledge to decrease the chemical inputs in agriculture
- Build new insectary facilities to increase our capacity and capabilities for research on pest-pathogen-plant interactions, doubling the size of our existing facilities.
- Create advanced surveillance tools for emerging new plant pandemics to ensure agile responses to future outbreaks
- Recruit global leaders in the field of soil microbe-plant interactions to increase our capabilities in this area.

HARVEST AT THE DOROTHEA DE WINTON FIELD STATION

Resilient plants in our changing world

THE CHALLENGE

The changing climate is driving widespread disruption to global food systems. Flooding, drought, pests and diseases are already damaging sustainable food supplies, with new, more virulent diseases and pests putting global crop yields at risk.

Despite extensive interventions, around

20-30%

of yield in major global crops is lost to diseases and pests each year.

This is worth

$540bn

to the global economy.

OUR AMBITION

We aim to bolster food security by informing and supporting the delivery of a more resilient food system. By understanding how plants respond to, interact with, and adapt to changing conditions, we can further the development of crops that are adapted to future climates. These are resilient crops varieties that can withstand heat and drought, and with improved innate defences against pests and pathogens.

BRASSICAS AND WHEAT IN THE GLASSHOUSE

OUR PROGRESS SO FAR

Over the last decade we have gained new understanding of how plants and their associated microbes adapt to their environments. We have learnt how plant growth and development is impacted by temperature, opening doors to design new strategies for more resilient plants.

Using controlled environment facilities, we can precisely simulate growth conditions in different climates using real weather data, to investigate changes in gene expression in plants as they respond to the changing environment. We are increasingly able to predict how genetic variation tailors plant response to challenges such as a changing climate, pest and disease burden.

We are working to widen the range of crops farmers will grow in future, identifying those best adapted to our coming climate. We are increasing our research in legume crops such as pea, identifying the key genes that control function and cataloguing genetic variation. While technologies such as gene editing have transformed our research in some areas, we are not yet able to edit all species, so we are working to be able to edit legume species, providing a tool for both research and crop improvement.

IMAGES: TOP LEFT : T-LEVEL STUDENT WORKING IN THE GLASSHOUSES
BOTTOM LEFT: DR DIANE SAUNDERS OBE WORKING IN PARTNERSHIP DEPLOYING MARPLE IN KENYA
RIGHT: DR ELENI VIKELI RECORDING VISIBLE TRAITS OF PEA PLANTS

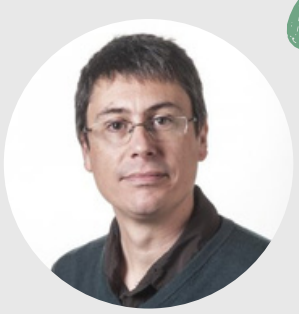
FROM FLOWERING GENES TO CLIMATE RESILIENT OILSEED RAPE

Oilseed rape is highly vulnerable to variations in the weather, and warming winters are resulting in low yields on UK farms. Previously, Professor Caroline Dean FRS discovered how key genes enable plants to sense and respond to the winter cold that is necessary to promote flowering and high yields.

Professor Steve Penfield is now building on this knowledge to develop strategies to allow oilseed rape crops to withstand fluctuations in winter temperatures.

His team found that warming in early winter impacts the initial development of flowers, resulting in loss of yield when the crop is harvested. The team are now identifying varieties which are less affected by temperature changes and can be crossed with high yielding but temperature sensitive varieties, to create commercially viable varieties of oilseed rape which can maintain a high yield, whatever the weather.

OILSEED RAPE IN FLOWER



PROFESSOR STEVE PENFIELD

> We're living in an era where climate change is beginning to affect the yield and performance of our crops. We need to know exactly what crops are doing at different times of year and exactly how this is affected by different aspects of the weather.

NEXT, WE WILL:

- Use knowledge of how plants sense and respond to fluctuating environmental cues such as temperature, light, and water to support the development of crops that are more resilient to future climate challenges
- Investigate how plants and microbes adapt to different environmental niches and look at the impact of selection pressures on genome architecture and population genetics, so that we can predict future microbe-plant interactions
- Increase our understanding of the genetic and cellular basis of plant growth and development, and use this to deliver crop traits relating to flowering, seed development, and plant architecture which will support agriculture
- Apply the evolutionary arms race between crops, pests and pathogens to develop strategies to contain and mitigate disease outbreaks from existing and emerging plant pests and pathogens
- Uncover how beneficial microbes and pathogens can affect plant development traits to promote beneficial colonisation or infection
- Expand our work on underutilised crops such as pea and lentil, selecting climate resilient varieties for pre-breeding programs and to provide plant-based sources of protein, for example, through our involvement with Defra's Genetic Improvement Networks and collaboration with the Met Office.
- Explore expanding our Germplasm Resource Unit collections in current and new potential UK crops, and make them available to researchers, breeders and growers
- Connect with researchers, breeders and farmers to boost UK research capacity in cereal break crops to provide profitable alternative crops for our farmers
- Develop plant varieties suitable for growth in vertical farms, free from variations in weather and isolated from pests, allowing more diversified farming.

WATKINS COLLECTION DIVERSITY

Next-generation medicines and diets

THE CHALLENGE

Diet related illness puts tremendous strain on health services globally. Malnutrition, obesity and highly processed foods cause an unsustainable burden on health services and impact quality of life. Currently, less than 1% of the UK population follows dietary guidelines.

Poor diets account for **13%** of all deaths.

Inadequate nutrition contributes to a **19 year** gap in healthy life expectancy across UK communities.

OUR AMBITION

We will design plants and microbes which significantly improve human health and well-being. By better understanding the genetics and biochemistry of microbes and plants, we can find ways to engineer beneficial properties for health and nutrition.

We will enhance nutrition and improve health outcomes by making selective changes to crops, reducing the burden on global economies and public health systems.

By harnessing the way that plants and microbes create specialised metabolites, we can deliver medicines and other high value compounds which benefit human health.

PEAS GROWING IN THE GLASSHOUSES

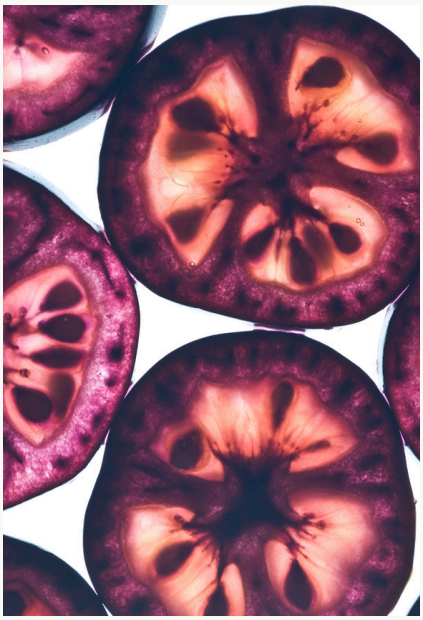
OUR PROGRESS SO FAR

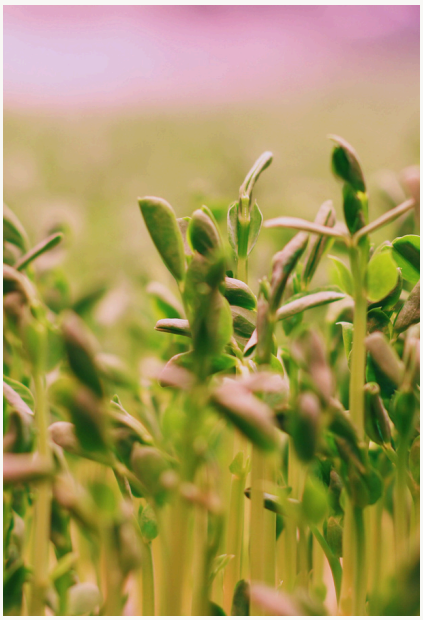
Building on our discovery research we have taken steps to improve the nutritional quality of crops. We have gained new understanding of how essential nutrients, vitamins, starch and fibre form and accumulate in crops, and are working with partners to demonstrate the benefits of these improved properties.

We are already using this knowledge to create crops with enhanced nutritional content, such as wheat and pea with increased iron and zinc, wheat and potato with altered starch properties and tomatoes enriched with vitamins and antioxidants.

Our research has uncovered complex metabolic pathways plants use to make molecules with potential value in medicine and agriculture. By identifying these genes, we can harness a plant's own genetic machinery to create useful molecules and produce variants with improved properties. We can also introduce the genes into alternative, quicker growing plants to produce molecules in a more sustainable manner.

By developing new methods to map out useful metabolic pathways in plants and new technologies to produce molecules at scale we can now apply this to develop more efficient supply chains. For example, using plants to express 'Virus-Like Particles', as a new way of producing, transporting and delivering new mRNA vaccines without the need for a refrigerated supply chain, allowing use across the world.





IMAGES: LEFT: GRASS PEA TRIAL
MIDDLE: PURPLE TOMATOES
BOTTOM: VITAMIN B12 FORTIFIED PEA SHOOTS (CREDIT: LETTUS GROW)

MAKING FOODS HEALTHIER BY IMPROVING THE PROPERTIES OF STARCH

Dr David Seung and his team are investigating how modifying the properties of starch can create different benefits for food and industry.

Starch is the main dietary carbohydrate across the globe, found in foods such as potatoes, rice and wheat. It consists of tiny granules formed of simple sugar chains, with the granules of different crops varying greatly in size and shape.

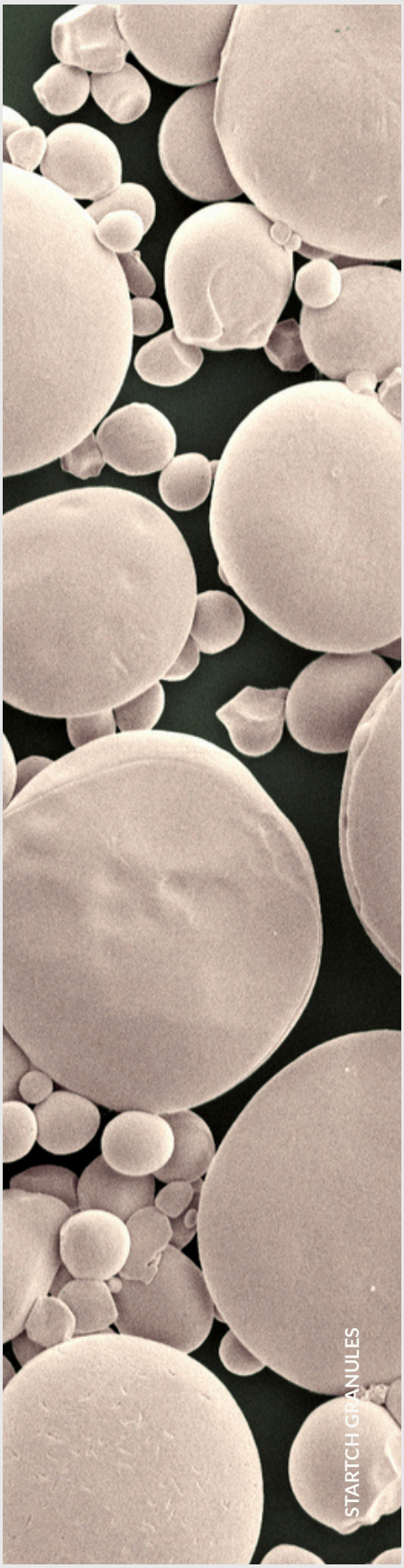
Using genomic and biochemical techniques, as well as computational modelling, his team identified the key genes that control how these different starch granules form.

This knowledge was used to create wheat lines with huge variation in starch granule shape and size. Working with the food industry and plant breeders, the team are now working to test the potential benefits of these novel wheat starches in specific applications.

For example, some mutations make starch which breaks down more slowly when eaten, and could be linked to a reduced risk of diet-related chronic diseases.

Working with partners at the Quadram Institute, they are testing whether these properties remain after processing and cooking, and how starch properties can impact a food's digestibility, cooking quality, nutritional value and human health.

DR DAVID SEUNG



STARTCH GRANULES

NEXT, WE WILL:

- Uncover the chemical diversity of primary and specialised metabolic pathways in plants and microbes and establish the role of these molecules in the host and the natural environment
- Investigate how microbes and plants evolve their genomes and generate biochemical diversity by exchanging genetic information, providing new biotechnology routes to engineer novel chemistry
- Devise new ways to exploit genomics, big data and machine learning to deliver the next-generation of medicines and other high value compounds from plants and microbes
- Engineer plants and microbes as bio-factories to produce the next-generation of medicines and other high value compounds at scale
- Enhance carbohydrate, protein and micronutrient composition and bioavailability in crops, and investigate how different nutritional compositions in crops impact their use, and their effects on human health
- Work with partners across the Norwich Research Park (NRP) to develop a new Health Strategy and create nutritious dishes which people will choose to eat. We will work with social supermarkets to ensure our nutrition work benefits those who need it most
- Increase our capabilities in engineering biology and the chemistry of plant specialised metabolism through targeted recruitments.

NICOTIANA BENTHAMIANA INFILTRATION

JULIA MUNDY, STRUCTURAL BIOLOGY PLATFORM
CREDIT: TECHNICIANS COMMITMENT

Supporting our mission

Achieving our ambitious research outcomes relies not just on the quality of our science, but also our ways of working. Six strategic pillars support our mission: leadership, partnerships, infrastructure and technologies, training and education, entrepreneurship and most of all, our people and culture. Each pillar cuts across all our work.

They are:

- Partnerships to maximise our impact
- Infrastructure and technologies to deliver excellent research
- Training and education for future science leaders
- A vibrant research culture
- An entrepreneurial culture to translate discoveries and drive growth
- A strong voice for plant and microbial science

"Successful research does not happen in isolation. It is built on strong foundations, talented people, trusted partnerships, world-class infrastructure and an inclusive culture. These pillars are essential for turning ideas into discoveries and real-world impact."

PROFESSOR CRISTÓBAL UAUY
DIRECTOR

PILLAR

Partnerships to maximise our impact

Our approach is collaborative. Over 50% of our external funding and 95% of our publications are in partnership, reflecting our ethos to work with others to help elevate our science and extend our impact.

To fully deliver our vision, we are creating a global hub, bringing the international plant and microbial science community together to catalyse new initiatives and partnerships that drive the delivery of HP3.

WORKING IN PARTNERSHIP WITH BREEDING COMPANIES TO BRING OUR DISCOVERIES TO MARKET

Our work creates global resources for plant breeders, enabling them to deliver crops that are more nutritious, sustainable, and better adapted to future climates.

In 2024, we led a landmark study of modern wheat varieties alongside a large historic collection of wheat, representing global diversity from the early 20th century. The project revealed that breeders have exploited only 40% of available wheat diversity, leaving 60% untapped, with major potential for yield, resilience and nutritional traits.

The study is shaping breeding pipelines worldwide. Working with partners we are testing novel variation for disease resistance, nutrient use efficiency and heat tolerance in pre-breeding lines, accelerating crop improvement. We have already identified novel resistance genes in the historic collection, and these are being deployed against novel strains of a yellow rust wheat pathogen, which are not present in modern varieties.

IMAGE: BREEDERS DAY - ANNUAL EVENT SUPPORTING KNOWLEDGE EXCHANGE

Our Commitments:

- We will create a plant science hub to connect the plant and microbial science ecosystem, convening new partnerships and initiatives to deliver a step change in the way we work with the wider scientific community.
- We will focus on deep strategic partnerships, such as our commitment to the Centre of Excellence for Plant and Microbial Science (CEPAMS) and CIMMYT.
- We will identify the best routes to deliver impact from our research findings, working with industrial partners across the translational ecosystem, and social scientists to bring products to patients and consumers.
- We will lead and contribute to national crop research communities including the Delivering Sustainable Wheat strategic programme, Defra's Genetic Improvement Networks and crop specific gene bank networks.
- We will establish a wider forum of UK farmers, industry and policy makers to understand varied perspectives and provide insights to align our research with need and opportunity.
- We will identify and explore partnerships with a wider variety of funders including charities, technology companies and breeding companies, identifying common interests in our research.
- We will continue to deliver a programme of regular alumni communications and engagement activities, to benefit both alumni and current staff and students.

IMAGES: LEFT: WELCOMING T-LEVEL STUDENTS TO THE INSTITUTE
MIDDLE: WORKING IN PARTNERSHIP TO DECODE THE WATKINS COLLECTION
BOTTOM: INTERDISCIPLINARY SPITTLEBUG SURVEY

PILLAR

Infrastructure and technologies to deliver excellent research

Our research depends on access to specialist infrastructure, resources and technologies. Our facilities, and the skilled people who run them, enable us to conduct research that cannot be delivered elsewhere, from multi-year field trials and germplasm resource development to cutting-edge molecular and computational approaches.

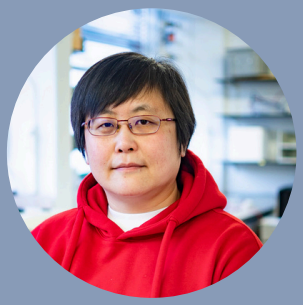
As a national capability, our facilities and expertise are accessible to a broad range of users and collaborators. The recent investment in the Next Generation Infrastructure programme, offers us a unique opportunity to work with The Sainsbury Laboratory and the BBSRC to transform the physical capabilities of our campus.

Technological advances are transforming our understanding of plants and microbes. From structural biology and imaging, which helps determine detailed molecular structures of proteins, to new genetic technologies which allow us to speed up the breeding process by decades, we are learning more about how plants and microbes function and using this to deliver innovations

CGI OF THE NGI GLASSHOUSES DUE TO OPEN IN 2028
CREDIT: SECCHI SMITH

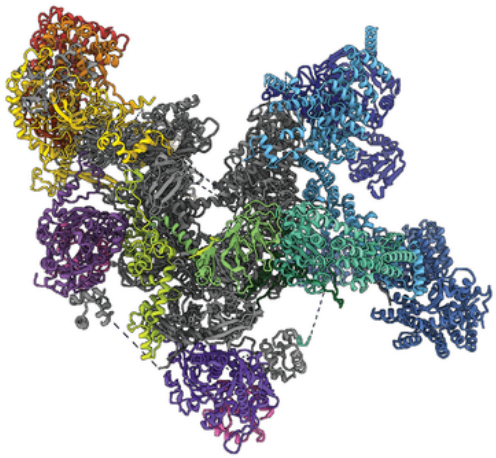
AI-DRIVEN DISCOVERY SCIENCE

AI is fast becoming a core technology for the design and analysis of our experiments. By combining our strong background in experimental biology with emerging AI technologies, we are able to analyse vast quantities of data and move towards a more quantitative, predictive approach to biology.



PROFESSOR YILIANG DING

Professor Yiliang Ding is developing large language models to support research into plant RNA. One of these models was trained on a dataset of over a thousand plant species, learning the patterns and logic of plant RNA sequences and structures to advance our plant genetic research. Her team has also developed PlantScience.ai, a virtual plant scientist capable of conversing directly with plant biology researchers. To date, more than 3,000 researchers around the world have engaged with this AI virtual plant scientist, conducting approximately 50,000 discussions to gain insights into plant science and spark new research ideas.



3D STRUCTURE - CHOLOPLAST RNA POLYMERASE

Structural biology is also being transformed by AI tools. Dr Michael Webster is using is using cryoEM to visualise molecules in 3D and using AI tools to characterise more complex and structurally dynamic samples.

In the next steps, his team are using AI to accelerate protein structure determination using samples isolated from their native source and characterise multiple protein complexes in parallel.

DR MICHAEL WEBSTER

Our Commitments:

- We will renovate our plant growth facilities as the first phase of delivering our Next Generation Infrastructure, enabling new plant growth techniques which mirror the fluctuations seen in the natural environment.
- Our wider NGI programme will create some of the best infrastructure in the world for plant and microbial science and we will double access to our platform technologies and facilities for the wider plant science community.
- By expanding our seed conservation infrastructure, we will sustain our germplasm conservation work and conserve crop diversity.
- We will find new ways to use our large experimental data sets, by preparing our existing image, transcriptomics and metabolomics data for machine readability/AI readiness so that we can apply new approaches in future.
- We will incorporate the latest phenotyping processes into our field trials including using drones and near infrared spectrometers on our combines to capture large amounts of data, and AI to classify and score crop traits.

PILLAR

Training and education for future science leaders

We play a key role in training and inspiring the next generation of research and thought leaders, innovators, policymakers and entrepreneurs.

We want to attract and develop the best researchers from around the world to thrive, be leaders in their respective fields, to take bold ideas forward and create lasting global impact. We are dedicated to nurturing talent from different career stages and roles through our exceptional training and educational programmes that offer scientific and transferable skills for the next generation. We provide an exceptional learning environment for our staff and students, based on the latest scientific understanding and technical advances.

Our training includes formal MSc and PhD programmes alongside bespoke training courses which draw on our research expertise. Our PhD students are embedded in our research teams, providing access to state-of-the art technologies and training in the latest scientific approaches. Our alumni play leading roles in government departments, make significant contributions in industry, and create new enterprises through entrepreneurship, as well as following academic and technical career paths.

Alongside our scientific training, we have a strong commitment to outreach and engagement with school and college students, through our Education Programme, supported by the John Innes Foundation.

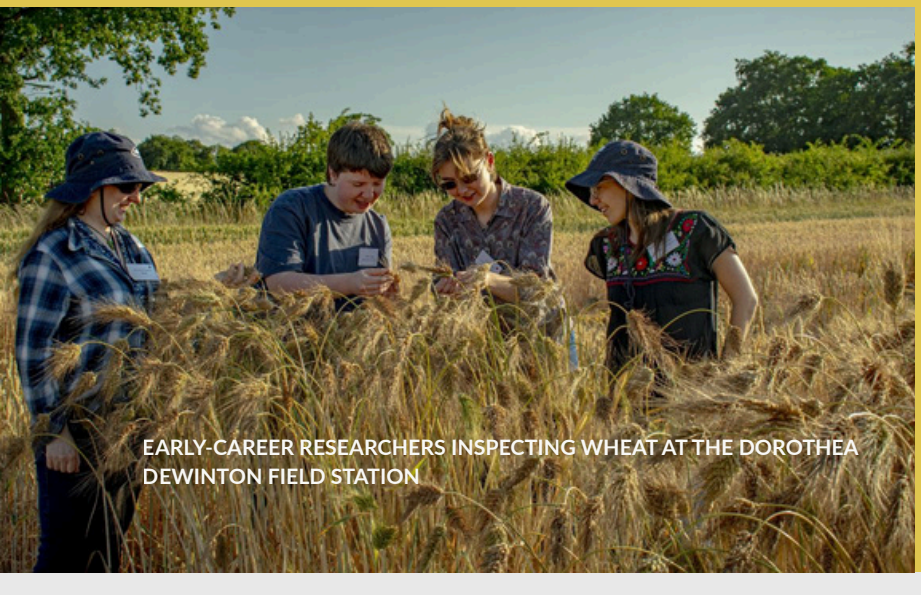
IMAGE: STUDENTS AT THE YEAR 10 SUMMER SCHOOL

Our Commitments:

- Our Education Programme will bring real-world research examples to primary and secondary schools and colleges, increasing awareness and enthusiasm for plant and microbial sciences.
- We will provide industry placements to support T-Levels as an important route to secure the future of technical skills in the UK.
- We will provide undergraduates with an unrivalled insight into plant and microbial research through our eight-week Undergraduate Summer School and with Year in Industry placements.
- We will train the next generation of plant breeders in plant molecular genetics and its potential applications to crop improvement on our Plant Genetics and Crop Improvement MSc.
- We will provide our PhD students with a coordinated programme of advanced training in plant and microbial sciences, formal courses in research and transferable skills, access to cutting-edge technologies and collaborations with industry and international partners.
- We will create a digital platform to share our scientific training across areas like bioinformatics, microbiology, genetic technologies, mathematical modelling, and AI with the community.
- We will develop a new bespoke leadership programme for our Technology Platform leads, supporting technical leadership and innovations.

SUPPORTING EMERGING FEMALE WHEAT RESEARCH LEADERS

Alongside our partners at The Sainsbury Laboratory (TSL), Professor Diane Saunders developed the Rosalind Franklin Women in Wheat Champions programme, to address the under-representation of female research leaders in wheat science. The programme combines one-to-one mentoring with dedicated career development and leadership training, and a strong focus on network building.



EARLY-CAREER RESEARCHERS INSPECTING WHEAT AT THE DOROTHEA DEWINTON FIELD STATION

Over the first five years of the programme, all six postdoctoral researchers that have left JIC or TSL have attained independent positions such as Tenure-Track Group Leader and independent fellowships. Through support from BBSRC, this programme has now been expanded across the UK wheat community, significantly widening its reach.

PILLAR

A vibrant and inclusive research culture

Passionate, driven people are at the heart of our success. Our research is only possible because of our diverse workforce, working together with a clear shared purpose. Our international workforce provides diverse viewpoints and approaches. We are recognised for our collaborative culture and long-standing commitment to equality, diversity and inclusion.

UNDERSTANDING, VALUING AND CELEBRATING NEURODIVERSITY

The Understanding, Valuing and Celebrating Neurodiversity project created the first neurodiversity training tailored for the research environment. Funded through a BBSRC Connecting Culture grant, the project created bespoke e-learning resources featuring our staff and students, alongside a comprehensive communications library with blogs, videos, and webinars.

Initially available to BBSRC strategically supported institutes, the resources were later opened up to the UK research environment, significantly enhancing neurodiversity support. In the first three months, more than 600 people engaged with the e-learning course, and 170 staff and students were trained in person. The impact on participants was striking; managers saw a nearly 40% higher knowledge and 33% more confidence in managing neurodiverse teams. Most importantly, neurodivergent individuals reported a 74% increase in workplace advocacy confidence.

Our Commitments:

- We will take a proactive lead in Open Science, working with our teams to adopt proposed standards such as FAIR data principles, and to share our resources through open databases like Ensembl Plants, Streptomyces.org and Actinobase.
- We will build on our Athena Swan Gold Award, by broadening our approach to equality, diversity and inclusion, taking a more intersectional approach and engaging with the AdvanceHE Inclusive Institutes Framework.
- We support fairness in the way evaluate researchers and research outputs, and will engage with the Coalition for Advancing Research Assessment (CoARA) national chapter to learn from and share best practice as we deliver our CoARA action plan commitments.
- We will provide ringfenced funding and flexible pump priming for grassroots initiatives led by staff groups and Voices to support our research culture.
- We will create new resources for our research culture programme including microbehaviour training, and share our flagship activities such as our neurodiversity programme with the wider science community to spread best practice.

"Our culture is rooted in scientific excellence, fostered within an inclusive and vibrant environment where everyone is supported to thrive. We recognise that building a positive research culture is an ongoing journey, one that demands time and dedication to ensure our people are supported and enabled to deliver JIC's ambitions"

DR CLARE STEVENSON
HEAD OF SCIENCE COORDINATION & RESEARCH CULTURE

An entrepreneurial culture to translate discoveries and drive growth

We work with partners to effectively translate our discoveries into real-world applications. The scientific freedom we provide allows ambitious and high-risk research to progress and deliver significant impact.

Our entrepreneurial outlook helps us to tap into the commercial potential of our science. By strengthening academic-business collaboration and establishing a translational environment we will attract investment and contribute to economic growth.

Supporting new businesses is central to our vision, we will nurture promising ideas, and bridge the gap between the laboratory and application.

Our Commitments:

- We will develop new models to create and provide long term support for spin-outs from our research, including through our Entrepreneur in Residence scheme.
- We will deliver a series of entrepreneurship workshops designed to raise awareness of the commercial potential of scientific innovation, and highlighting how scientific ideas can evolve into viable business opportunities.
- We will remodel John Innes Enterprises Ltd to better support translation and commercialisation of our science by marketing our outputs as products and services.
- Working with partners across NRP we will support companies on site, promoting collaboration, sharing expertise, and enabling access to resources to translate scientific innovation into practical applications.
- We will support early-stage companies through incubation, focusing on pre-seed ventures, providing access to essential expertise, resources and facilities to refine their ideas, build sustainable business models, and position themselves to effectively attract investment and scale.
- We will identify barriers to the acceptance and adoption of technologies, products and services arising from our research. Working with partners, we will support routes to market in key areas such as microbial biocontrols, plant-based production systems and genetic technologies.

ENGINEERING BIOLOGY TO CREATE SUSTAINABLE SUPPLY CHAINS

PROFESSOR ANNE OSBOURN FRS

The Chilean soapbark tree, *Quillaja saponaria*, is a natural source of molecules called saponins, which are a key component of human vaccines. Until recently, extracting saponins meant the trees themselves and the ecosystems around them were lost, and the plants have become endangered.

Professor Anne Osbourn FRS and her group have elucidated the complete 20-step pathway for the saponin QS-21, a vaccine adjuvant currently sourced commercially from the soapbark tree. This work was part of a collaboration with GlaxoSmithKline Biologicals S.A and Plant Bioscience Limited.

By reconstituting the pathway in tobacco, Anne's group have taken the first step towards creating an environmentally sustainable alternative supply chain and new opportunities to engineer novel adjuvants. Parallel work on soapwort saponins has provided additional leads for pharmaceutical applications.

Anne and her colleagues have now spun out a company, Hothouse Therapeutics Ltd to take this work forward, combining AI with engineering biology to design and deliver novel QS-21-like chemistry with proven effectiveness in disease models, aiming to be the first company to deliver an adjuvant suited to mRNA vaccines. Since creation, the company has expanded markedly and recently completed a hugely successful pre-Seed phase.

"Our activities are designed to deliver impact through collaboration with stakeholders across health, agriculture, food industries and policy. This ensures that our discoveries deliver benefit for society, the economy and the environment. Looking ahead, supporting new businesses is central to our vision, because promising ideas too often stall before they reach investors."

DR JONATHAN CLARKE
HEAD OF BUSINESS DEVELOPMENT

PILLAR

A strong voice for plant and microbial science

Our work should go beyond delivering research, to acting as a leader in the UK and international science landscapes and driving discussions on critical topics such as sustainability, food security, and diet and health.

The John Innes Centre is a strong voice in the community, providing leadership, advocating for plant and microbial science and provide scientific evidence to inform public policy. We also have a key role to play in building public support for science through dialogue.

Our Commitments:

- We will use our voice to be strong national advocates for plant and microbial science in the UK.
- We will use our knowledge and insight to play a leading role in shaping future science policy and national priorities by participating in committees and panels led by organisations including Defra and BBSRC.
- We will engage in policy discussions on priority topics such as genetic technologies, soil health and nutrition, identifying key positions where we can inform and drive national policy.
- We will drive public dialogue, advocating for the sector and enhancing understanding of and trust in science.

IMAGES: TOP - DEFRA AND FSA TEAMS VISIT THE GLASSHOUSES
MIDDLE: VITAMIN D FORTIFIED TOMATOES
BOTTOM: EXPERIMENTAL SUGAR BEET PLANTS

SHAPING UK POLICY ON PRECISION BREEDING LEGISLATION

Working collaboratively across the Norwich Research Park, the John Innes Centre spent five years supporting the development and approval of the Genetic Technology (Precision Breeding) Act and Regulations, ensuring that UK policy is underpinned by robust science and real-world application.

Working closely with partners across the Norwich Research Park, we pursued a three-pronged stakeholder strategy: informing Defra and the Food Standards Agency (FSA) as they developed the legislation to bring precision bred foods and feeds to market; engaging and briefing parliamentarians as the legislation passed through Parliament; and engaging a broad range of stakeholders to build wider support.

This sustained engagement delivered direct policy impact. The Precision Breeding Regulations were passed unanimously by Parliament in May 2025 providing a framework for precision bred plants and the food and feed produced from them.

In the final House of Lords debate before the vote, the JIC and our work was cited six times, demonstrating our influence in shaping the evidence base and political consensus. We are now working closely with the FSA on the biofortified high-vitamin D_3 tomato, which will serve as an early case for the new authorisation process.

John Innes Centre

Registered Charity #223852

Biotechnology and Biological Sciences Research Council

norwich research park

John Innes Foundation

The John Innes Centre is a UKRI-BBSRC strategically supported institute, and registered charity based on the Norwich Research Park.