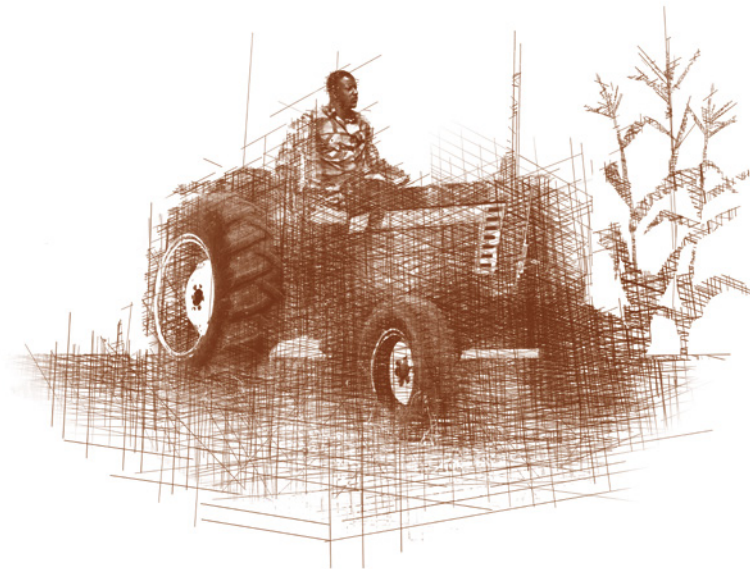


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ANNUAL REVIEW  
2019 | 2020



GATSBY



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# INTRODUCTION

## BY LORD SAINSBURY OF TURVILLE

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Settlor of the Gatsby Charitable Foundation



I have always wanted Gatsby to be proactive and have never been content for us to sit back and wait for people to bring us interesting proposals. Gatsby has also always been focussed on areas that I think are vitally important and where I believe that Gatsby can make a real difference. As a result we have always been motivated to think innovatively and take bold action.

This means that throughout Gatsby's life we have mainly initiated projects rather than funding projects brought to us. This model is reliant on finding passionate and dedicated experts to lead our work – imaginative people capable of looking at an issue and bringing others together to create entirely new solutions.



In the mid-1980s we were becoming increasingly excited by the potential impact that new developments in plant science could have on agriculture in Africa. But we lacked connections to the kind of expert we would need to lead on exploring and developing potential projects. A family friend with knowledge of Indian agriculture, Robert Cassen, suggested we talk to a development economist who had worked on agricultural and rural issues across more than ten African countries – Laurence Cockcroft.

Laurence became our advisor and set about shaping our Africa programmes, always guided by his firm principle that it was only by working through local people that we could develop sustainable projects and ensure any effort was genuinely responsive to local needs. He found imaginative ways to do this, including by forging links between UK and African agricultural research organisations, and by setting up numerous local institutions. Laurence played a crucial role in relationship-building and in identifying local board members, executives and advisors – including dynamic and impressive people such as Olive Luena, Ibrahim Sueshi, Joe Githongo and Susan Elango, who became the charismatic leaders of the institutions.

Above: Gatsby advisors Olive Luena and Laurence Cockcroft meeting Jakaya Kikwete, then Tanzanian president, in 2009.

Whenever I travelled with Laurence, there was immense enthusiasm for his work – his long commitment to collaboration and locally-led development, his wisdom and intelligence, and his personal warmth meant that he had a particularly special place in the affections of all those connected with our work in Africa.

The projects Laurence helped initiate have benefitted many people across many different African countries. Perhaps as importantly, as our work in Africa has evolved, we continue to benefit from his values and philosophy, which remain imprinted on our work. With Laurence retiring in 2019, I wish to take this opportunity to once again thank him for his enormous contribution to Gatsby.



THE PROGRAMMES  
HAVE MADE  
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Despite Laurence's retirement, work that he helped initiate will continue for many years – most notably through our forestry programmes in Kenya and Tanzania. I remember Laurence relaying his experience of first meeting Kenyan plant pathologist Florence Wambugu – a “force of nature”. We were quickly

convinced that we should develop a project to transfer clonal technology for growing improved Eucalyptus from South Africa to Kenya – the start of our involvement with East African forestry.

Many years later, that involvement has evolved into two sector programmes seeking to transform commercial forestry in Tanzania and Kenya. The programmes have made substantial progress and there is real excitement about what could be achieved – particularly through innovation and the adoption of new processing technologies throughout different wood value chains.

The forestry programmes were led and driven forward in recent years by another exceptional individual, Luke Potter. Devastatingly, we lost Luke in 2019 in a terrorist attack on the place where he was working. I was fortunate to work closely with him on several occasions, and he never failed to impress me. He had an irrepressible energy and allied his excitement for new ideas with a deep practicality. It is clear that Luke's teams were devoted to him, that he inspired others to push themselves and fulfil their potential, and that he was utterly selfless in giving his time and energy to others.

In 2019 we also suffered the sudden loss of Richard Kisang', who had played an important role for Gatsby in setting up Msingi – an industry development organisation for East Africa. Richard had subsequently moved to become Msingi's Head of Corporate Performance. He was at Msingi's heart – a great character able to keep his audience spellbound, and a proud Kenyan passionate about his country and the region's development.

Luke and Richard are both deeply missed. Their hard work has helped position numerous initiatives to make the lives of thousands of people better. We will now work to realise that promise in memory of them.

## PLANT SCIENCE

My great friend Roger Freedman first triggered my excitement about the possibilities of science when we were together at university. Roger has acted as an invaluable advisor throughout Gatsby's life, and was responsible for shaping our programmes in plant science and neuroscience.

Gatsby also supports the Two Blades Foundation – a charitable organisation chaired by Roger that seeks to develop crops with durable disease resistance and promote their deployment worldwide. Roger is leading a Two Blades project to tackle Wheat Stem Rust, a fungus which at its worst can devastate crops and cause 50–100% yield loss.

A new strain of rust arose in Uganda in 1999 and has been moving across East Africa and towards the Middle East. Roger and his team have been working to “stack” resistant genes from wheat and its wild relatives into preferred varieties in East Africa, and last year successfully completed two field tests. Work now proceeds to a full demonstration trial in Kenya, which is exciting news.



Above: Professor Nick Talbot (pictured) and Professor Sophien Kamoun of the Sainsbury Laboratory in Norwich are working with collaborators in Bangladesh to fight wheat blast, a pathogen that has significantly impacted wheat production.



## NEUROSCIENCE

My fascination with the brain also stems back to my time at university – and particularly my studies under the enormously charismatic Richard Gregory, who used visual illusions to explore the relationship between our brains and our senses.

In the late 1990s, Roger and I began exploring how Gatsby could support neuroscience research in the UK. This eventually led to the creation of the Gatsby Computational Neuroscience Unit, designed to combine machine intelligence with theoretical neuroscience to build neurobiologically realistic models of the way the brain computes.

The Unit marked its 21st birthday in 2019 with a special celebratory event, which included a talk from alumnus Dr Demis Hassabis, the CEO of DeepMind – the artificial intelligence company that has developed algorithms capable of all sorts of activities, including beating grandmasters at the complex board game Go. The algorithms use deep learning – a field that was dramatically pushed forward by the Unit's first head, Geoff Hinton, during his time there. The possibilities are huge and I look forward to seeing what advances will be made over the coming years.

Above: Glass panelling throughout the Sainsbury Wellcome Centre for Neural Circuits and Behaviour allows its researchers to brainstorm ideas, make notes and give impromptu presentations.

## PUBLIC POLICY

We live in a period of dramatic economic change that is undoubtedly leading to social and political upheaval in many countries, including the UK. Economic thinking has been dominated by theories that privilege market efficiency, while underplaying the role of innovation and creativity in driving growth in a dynamic world.

More than ever, we need a dynamic national innovation system – one that can identify opportunities and develop strategies and policies that will deliver a high rate of innovation and high value-added jobs.

This is why Gatsby supports the Centre for Science, Technology & Innovation Policy, based at Cambridge University's Institute for Manufacturing. The Centre carries out practical policy research, exploring how national innovation systems can effectively translate new science and engineering ideas into technologies, industries and wealth.

The windows of opportunity for innovation and the capabilities of firms to take advantage of them are at any one time unevenly distributed among sectors and regions. So I am particularly pleased that much of the Centre's recent research has examined the relationships between technology, manufacturing and sector policies – this will be critical to putting high-growth industries and high value-added jobs back into communities that have been devastated by globalisation over recent decades.



## EDUCATION

A high-performing national innovation system needs to be backed with a fit-for-purpose education system that can equip young people with the technical knowledge and skills needed to thrive in the future.

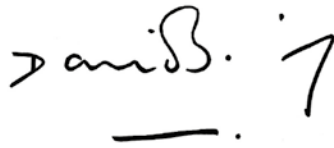
I continue to be delighted with the progress being made by Gatsby's education team in helping to shape technical education and career guidance in England. The past five years have seen some extremely positive national policy reform, often influenced by Gatsby's work. The challenge now is to ensure that this reform is implemented successfully, and this will be the focus of Gatsby's education work for several years to come.

One notable example of Gatsby's influence is the creation of Institutes of Technology (IoTs), collaborations between Further Education colleges and universities, which specialise in providing higher technical education in science, engineering and technology. Gatsby first presented the idea of IoTs to government in early 2015. It is therefore a source of great pride that, in 2019, the government announced the first twelve IoTs and plans for a further eight, which will mean there will be one in every major city in England.

## THE ARTS

Gatsby continues to support the Sainsbury Centre for Visual Arts. The tour of the Centre's exceptional *Alberto Giacometti: A Line Through Time* exhibition reminded me of the extraordinary talent both my parents had for spotting great unknown painters and sculptors. They first met and began supporting Giacometti when he was practically unknown – his drawings and sculptures appealed to them greatly well before he became acknowledged as one of the twentieth century's greatest artists. My father's bond with him was even more extraordinary given that my father couldn't speak French and had to rely on my mother to translate.

My parents' friendships make me reflect on my own friendships, and the great fortune I have had to meet the extraordinary people who have done so much to shape Gatsby's work and my own life. I remain enormously grateful to all of them.



David Sainsbury  
Settlor

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Below: Lord Sainsbury of Turville presents the University of Warwick with an award to mark their positive progress as a signatory of the Technician Commitment at a celebratory event at the Tower of London.



# IN MEMORY

In 2019, Gatsby tragically lost two valued staff members – Richard Kisang’ and Luke Potter. We share the messages below from family, colleagues and friends in tribute to them.



THROUGH MSINGI, I HAVE A UNIQUE OPPORTUNITY TO CONTRIBUTE TO EAST AFRICA'S ECONOMIC TRANSFORMATION TO ACHIEVE WIDESPREAD AND LASTING PROSPERITY. I'M CONFIDENT THAT MSINGI WILL CONTRIBUTE SIGNIFICANTLY TOWARDS THE EFFORTS TO BREAK THE CYCLE OF POVERTY FOR MILLIONS IN EAST AFRICA



RICHARD R. KISANG’

“He was always committed to his work, always willing to go the extra mile – and always willing to help a friend or colleague with the minimum amount of fuss.”

“Richard was never one to turn down a request for help at any time or whatever kind. He always made an effort to assist. Be it with his time, skills, advice. He was both brilliant and hardworking. He overcame many obstacles to achieve success at a very young age.”

“As a testament of his brilliance and capability, he quickly established himself as a go-to person within the department, very ably coming up with innovative ways to deliver exceptional service. It was known if there was a difficult project, Kisang’ would be the guy to be consulted.”



“Richard was a warm friend and more than a colleague – a dreamer and a man of vision. He was full of love, good humour and a maturity well beyond his years. We were always stunned to discover how young he actually was. He was a wise man who demonstrated the values of love, prayer and forgiveness.”

“Richard was simply a lovely guy. He was always engaging, and had an ability to hold a crowd by speaking softly and seriously – and was always well-informed about Kenya, speaking with the knowledge and wisdom of someone so much older. A smile was never far away – he had a great sense of humour and was always great fun to be around.”

“Richard was at the very inception of the Msingi concept at Gatsby years ago, putting in countless hours to ensure the setup and success of the organisation. In his work, he embraced duty and friends as one, constantly reaching out to colleagues at Msingi and the wider Gatsby family, and putting in time and effort to never leave anyone behind. His colleagues and vast network of professional contacts remember him as a natural leader who was knowledgeable, insightful and a tireless champion for the country, region and continent.”

“As a person, Kisang’ was very jovial, a great guy to be around. He always lifted the spirits of every team member he worked with. His brilliance shone through and in some instances, some of us would be shy to engage in a debate with him because he had all his facts set out.”

“His star could not stop shining from its first day. Kisang’ did not only have intellectual brilliance but also sharp entrepreneurial skills. We have indeed lost such a talented Kenyan, a friend and a comrade.”

“Richard was a thought leader, independent-minded and a great and generous soul.”

“You inspired me as a person and many more. You were always the best brain and soul.”

“We must never forget the joy with which Richard faced life. As he liked to say ‘eat life with a big spoon’. Richard brought great warmth into our office, he was larger than life, who can forget his roaring laugh and his wonderful sense of humour.”

“He loved his family who were never far from his thoughts even on the busiest of days at work – our entire office knew about Tina and the children.”

“May we as friends of Richard keep his spirit alive.”



“We have the choice and ability to improve society and fix the broken world, and Luke was a prime example of someone who dedicated his working life to that cause.”

“He was an incredibly hard worker, sometimes to his detriment. He simply never put himself first. No matter how challenging – he was unwavering in choosing what he saw as the right path.”

“Luke possessed the dual qualities of being both a big thinker and understanding the detail needed to get there. It has to be said that sometimes the detail became overwhelming though, and many a time we would be bewildered by his complex diagrams, concepts and pages crammed full of notes!”

“One of his most inspiring traits was his deep interest in the world and how it worked. He was always open to all the endless possibilities for progress and was always full of discussions as to how new ways of thinking could make a difference.”

“Luke would enter the office and make it a point to connect with everyone. And he remembered, no matter how long it was since you last spoke, where conversations – both work and personal – left off. It was always these small things – the few minutes he took with people, the thoughtful feedback he gave, how he'd push you to think strategically and how he made it a point to appreciate the work that you were doing – that made him such a great colleague.”

“It didn't take long for me to realise how lucky I was to have a boss and mentor like Luke. He eagerly shared his wealth of experience and ideas with me; he always had time, despite how busy he was; he pushed me to think big and be ambitious.

And when we worked together on something, he always made sure I was given the credit. Putting others first was second nature to Luke. He was someone to look up to, to aspire to be more like.”

“This outpouring of love and praise would have really embarrassed Luke, because he was a very humble guy. He would probably have grinned for a moment, but then just got on with his work in his diligent, thoughtful and humble way. He selflessly gave his time and energy to others.”

“He had a wicked and unique sense of humour, and those striking blue eyes always had a mischievous glint in them. We will miss his smile, his crazy ideas, his funny stories, and his quiet but determined energy for life and for helping others.”

“Part of his legacy will be those many smiling faces of farmers and their families whose livelihoods he so passionately helped to improve.”

“He lit up the room with his smile and his gentleness. You felt like you were the only one in the room when he talked to you. Gracious, warm, good, kind, beautiful and smiley. You could see the love he had for his daughter when he talked about her and her dance competitions.”



“Family was hugely important to Luke. Eleni and Holly always featured in his plans, and he couldn't hide his excitement of sharing his passions with his two favourite girls.”

“He was always surrounded by friends. Because he was the very fire around which others would warm themselves.”

“He was extremely motivated to make the world a better place and worked so hard to bring success not for himself but for others. People love him and admire his dedication. He will always be my friend and source of inspiration.”

“Thank you for all you have given to everyone you touched, Luke, and we will strive to honour your legacy by living your values and continuing your work.”



I STRONGLY BELIEVE IN THE NEED FOR SOCIETIES TO OFFER AS EQUAL AN OPPORTUNITY AS POSSIBLE TO ALL, AND THAT, WHILE ECONOMIC COMPETITIVENESS IS ESSENTIAL TO BUILD A COUNTRY, LONG-TERM STABILITY IS NOT ACHIEVABLE UNLESS THE GAINS ARE WIDELY SPREAD



LUKE POTTER

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# PLANT SCIENCE

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## ADVANCING KNOWLEDGE IN FUNDAMENTAL PLANT BIOLOGY, AND NURTURING TALENT AMONG YOUNG SCIENTISTS

We aim to support research which builds a fundamental understanding of plant biology. To this end we provide core funding for two major laboratories. The Sainsbury Laboratory at Norwich is a research centre for the study of plant-pathogen relationships. The more-recently established Sainsbury Laboratory Cambridge University is devoted to the study of plant development.

These centres of excellence attract world-class researchers, and offer inspiration and opportunities to the young scientists we encourage and support through our studentships, summer schools and educational projects.

We also sustain an extended group of plant scientists through our Plant Science Network, and award *ad hoc* grants to researchers whose work needs additional support from a funder prepared to take risks in support of ground-breaking research.

Some of the greatest challenges posed by population growth and climate change will only be met by translating a fundamental understanding of plant biology into improvements in agriculture. Where opportunities to advance new knowledge into practical use are identified, we provide support for their development.

### THE SAINSBURY LABORATORY, NORWICH (TSL)

Since 1987 Gatsby has supported TSL to focus on understanding how microbes manipulate plants and cause disease, and how plants defend themselves against this process. Over three decades, TSL has built an outstanding international reputation for scientific excellence.

Key discoveries over the past year include: identification of a domain, called MADA, present in a group of plant immune receptors, which may be involved in triggering plant cell death during immunity; identification of a novel calcium channel protein which is key to early plant defence; and the discovery of new disease resistance genes from wild potato varieties, wheat, barley and legumes for a range of significant crop diseases.

We recently carried out a comprehensive review of all the Centre's activities. Five TSL scientists – Jonathan Jones, Sophien Kamoun, Cyril Zipfel, Nicholas Talbot and Joe Win – appeared in the Clarivate Analytics Highly-Cited Researcher List 2018, and group leaders have also raised significant external funding from the UK's Biotechnology and Biological Sciences Research Council (BBSRC) and Global Challenges Research Fund, the European Research Council, international foundations and industrial partners. Based on its excellent scientific developments, outputs and future plans, we have confirmed renewed support for TSL for a further five-year research cycle.

The Executive Director, Professor Nicholas Talbot, is steering a new strategic direction linking fundamental and translational research to address emerging diseases, sustainable agriculture and plant health. As part of this, TSL will recruit a new faculty member with complementary expertise, and collaborative efforts will be fostered between group leaders within TSL and at other Gatsby-supported institutions. A further new effort is an innovative Masters degree programme on global plant protection launching in 2020. It will equip the next generation of leaders with not only key knowledge of molecular plant pathology, but also with the expertise to address contemporary challenges in the control of emerging diseases in global agriculture, as well as in knowledge transfer and business practices.



### THE GATSBY PLANT SCIENCE EDUCATION PROGRAMME (GPSEP)

GPSEP aims to improve the teaching and learning of plant science at all ages, engaging and inspiring the next generation of plant scientists through projects in both schools and higher education. The programme is overseen by SLCU and the Cambridge University Botanic Garden.

The Science and Plants for Schools (SAPS) project provides engaging plant science teaching resources for UK school teachers and technicians. In 2019 a new online course was developed, focussing on building subject knowledge and confidence in teaching plant science. Jointly developed with the National STEM Learning Centre, over 650 UK educators have already participated in the course. SAPS also continued to run its Train the Trainer courses for those who train student science teachers. In 2019 these popular courses enabled the cascade of SAPS activities to around 1,650 trainee science teachers.

Above: Undergraduates identifying and classifying plants during a practical session at the Gatsby Plant Science Summer School 2019.

Opposite page: SLCU Research Associate Stephanie Smith is investigating the control of shoot branching by nitrate availability in the model monocot plant *Brachypodium distachyon*.

Seeking to nurture post-16 students to become the next generation of plant science researchers, in 2019 GPSEP further developed its plant science 'masterclasses', working with nine universities and reaching 300 16–18 year olds. With funding from EIT Food, an online course for pre-university bioscience students was also developed. The course, 'Improving Food Production with Agricultural Technology and Plant Biotechnology', launched in autumn 2019 and recruited nearly 1,000 participants. 2019 also saw the 15th annual Gatsby Plant Science Summer School, at which 80 of the UK's brightest bioscience undergraduates participated in a series of lectures, practical sessions and discussions with leading scientists and researchers.

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#### SAINSBURY LABORATORY CAMBRIDGE UNIVERSITY (SLCU)

The aim of SLCU is to develop an integrated understanding of the regulatory mechanisms underlying plant growth and development. Now in its second five-year research cycle, the Laboratory has a highly collaborative and interdisciplinary research environment that draws on molecular, cellular, whole plant, computational, and population biology approaches to investigate how plants are constructed.

There are currently twelve research groups, two of which joined recently. Dr François Nédélec, a group leader, studies cell morphogenesis and development using synthetic and systems biology approaches, along with computer modelling. His expertise at the physics/biology interface combines molecular and cellular scales, using information to simulate the collective behaviours that make cells 'alive'. Dr Sarah Robinson, a career development fellow, investigates how cell and organ size and shape are determined by using biomechanics, modelling and genomic approaches; she has developed a unique mechanical microscope that can track extensions in live cells.

Research activities across SLCU continue to integrate computational and theoretical approaches with diverse experimental methods. This year the Laboratory hosted the second Cambridge Developmental Biology meeting which focused on quantitative approaches. SLCU also continues its ongoing computational biology workshops in collaboration with ENS-Lyon.

The Laboratory continues to invest in cutting-edge technology to facilitate its experimental research. A new Zeiss upright confocal microscope for spectral detection has been acquired, and in-house construction of a light sheet microscope as part of a cross-university collaborative project is nearing completion. SLCU contributes to the EPSRC-funded FINESSE NanoBio initiative run by the university's Department of Engineering, and this will acquire a customised helium/neon/gallium ion microscope for ultrahigh-resolution imaging.

In October 2019, David Sainsbury welcomed Bill Gates (co-chair of the Bill & Melinda Gates Foundation), Alok Sharma (UK Secretary of State at the Department for International Development (DFID)) and Professor Charlotte Watts (DFID Chief Scientific Advisor) to SLCU to meet plant scientists working on projects supported by the three organisations.

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THE LABORATORY  
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INVEST IN CUTTING-  
EDGE TECHNOLOGY  
TO FACILITATE ITS  
EXPERIMENTAL  
RESEARCH

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These researchers, from SLCU, TSL, Cambridge University, Lancaster University and the John Innes Centre, are developing innovations to increase productivity, increase crop yields sustainably, and empower farmers across sub-Saharan Africa and South Asia. During the visit, Alok Sharma announced that DFID will provide a further £38 million of UK aid to contribute to a portfolio of projects, and this will strengthen DFID's ongoing partnership with the Gates Foundation.

Every year, the Laboratory runs a range of outreach and engagement activities. For Big Biology Day in October 2019, SLCU and the Cambridge University Botanic Garden jointly ran a hands-on exhibition with a theme of 'Seeds, Bees and Pollen'. Through fun, engaging activities, people of all ages explored the special mechanisms that plants have evolved to attract different pollinators and disperse their seeds. Activities included a new card game called *Pollinator Blitz*, designed and created by SLCU researchers Pamela Ribone and Stefano Gatti. Visitors could also take home their own mini-hydroponics science experiment to compare the differences between monocot and dicot seeds – the two major divisions of flowering plants – when they germinate.

## THE GATSBY PLANT SCIENCE NETWORK

The Gatsby Plant Science Network consists of Gatsby-funded undergraduates, postgraduates, postdocs and alumni, with mentors chosen from UK universities with teaching and research interests in plant science.

A challenging and stimulating training weekend for Sainsbury PhD students took place in spring 2019 in Cambridge. After the PhD students' own presentations, Professor Dame Jean Thomas gave a very entertaining and inspiring account of her personal journey in science. The following day, two Sainsbury alumni, Dr Fabian Kellermeier and Dr Fiona Robertson, each shared their experiences of very different career paths – Fabian having started in industry and moved to a career in teaching, with Fiona staying in academia and now lecturing at the University of Zimbabwe.

In summer 2019 we supported seven research placements for second-year undergraduates, hosted at the universities of Bristol, Cambridge and Leeds, and the Royal Botanic Gardens in Edinburgh and Kew. These undergraduates will now have the opportunity to apply for Sainsbury PhD studentships and will also attend a training weekend in Cambridge in 2020. We are delighted that all eight undergraduates who participated in the undergraduate placement scheme in 2018 have now chosen to study for PhDs in plant science, including three who secured Sainsbury PhD studentships.

Ahead of the new academic year, members of the Network met in Oxford. This annual meeting provides an important forum for undergraduate and PhD students to meet influential members of the UK plant science community. The evening lecture was given by the zoologist and former Chief Scientific Adviser at DEFRA, Professor Sir Ian Boyd, who spoke on 'The entropy problem and critical trade-offs'.

## THE TWO BLADES FOUNDATION (2BLADES)

Gatsby provides core support to 2Blades, a charitable organisation that supports the development of crops with durable disease resistance and promotes their deployment in agriculture worldwide, with a particular aim of benefitting developing countries. Over the past year, 2Blades reviewed its portfolio and is focussing on six programmes, with its major efforts remaining in wheat, soybean and maize.

The importance of understanding plant pathogens at the molecular level led 2Blades to help to complete the full genome sequences of two of agriculture's most dangerous and complex fungi – Wheat Stem Rust and Asian Soybean Rust. The long-running wheat programme has completed two field tests to evaluate the performance of multiple-stacked resistance genes. These were exceptionally successful in protecting plants from disease symptoms, and this promising finding will now progress towards a demonstration trial in Kenya.

The programme on Asian Soybean Rust (ASR) includes two academic partners, TSL and the Federal University of Vicosa, and has recently secured a new industrial partnership with Bayer. A further exciting pipeline of ASR resistance gene candidates from multiple species related to soybean is coming out of the 2Blades group at TSL directed by Dr Peter van Esse. Finally, on maize, 2Blades is again working with Bayer to identify resistance against damaging ear and stalk rots through the 2Blades and Zipfel research groups at TSL.



Opposite page: SLCU's Pamela Ribone and Stefano Gatti have designed an interactive plant science card game called *Pollinator Blitz* for public outreach activities. Players have to correctly match flowers with their pollinator in a race against their opponents.

Left: The plant science advisors, Professors Jane Langdale, Ottoline Leyser (front centre), Liam Dolan and Nick Talbot (back centre), with PhD students in their final year at the most recent Gatsby Plant Science Network meeting in Oxford.



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# NEUROSCIENCE

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## ADVANCING KNOWLEDGE IN EXPERIMENTAL AND THEORETICAL NEUROSCIENCE

One of the most exciting challenges of the 21st century is to understand how the brain performs the computations which directly underpin our behaviour. Our approach is to work towards this by harnessing the efforts of a dynamic and multi-disciplinary group of scientists with a common interest in the workings of the brain. We are partnering with Wellcome and University College London to do just that in the form of the Sainsbury Wellcome Centre – a scientific research centre using state-of-the-art techniques to investigate how brain circuits process information to create representations and guide behaviour.

Gatsby has also developed several innovative collaborative programmes around the world. In addition, we support cutting-edge research meetings, and invest in education, outreach and sector development programmes.

Above: SWC Histology Research Scientist Jessica Bron-Tabi adjusts a stereo dissecting microscope in preparing histological reactions to visualise brain samples.

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Opposite page: Gemma Estrada Girona and Yiota Demosthenous, two scientists in the recently established SWC Virology Core, collaborate on the design of new gene delivery tools to precisely trace and manipulate brain circuits.

### SAINSBURY WELLCOME CENTRE FOR NEURAL CIRCUITS AND BEHAVIOUR (SWC)

SWC is a research centre at University College London (UCL) which will house about 200 scientists and support staff investigating how brain circuit function underlies behaviours.

Research highlights include work from Dr Tiago Branco's group; this has identified circuits and cellular mechanisms involved in how an animal escapes from threats, and opens up a promising way to understand cognitive control of instinctive behaviours. Dr Sonja Hofer's group elucidated the circuit mechanisms in the brain's visual area which facilitate integration of contours in the environment, and so may be important in object grouping and in understanding the visual scene. And a new virology core has been established to expand on the sharing of viral reagents for circuit tracing already done by the Margrie and Murray labs.

New faculty member Dr Athena Akrami joined SWC in autumn 2018. Her research combines theory and experiment to study the fundamental principles by which the nervous system's computations underlie learning and memory; high-throughput training is used to combine sophisticated and quantifiable behavioural paradigms with powerful tools to monitor and manipulate neural circuits.

SWC continues to develop deeper links with the Gatsby Computational Neuroscience Unit (GCNU; also located within the SWC building). In addition to overlaps in PhD programmes, a senior post-doctoral fellowship programme designed explicitly to link theory and experiment has been launched. Each fellow will be jointly mentored by SWC and GCNU faculty, and will operate with greater independence to pursue projects actively engaging both domains.

UCL researcher Professor Neil Burgess has been appointed as an affiliate group leader to help further catalyse breakthroughs at the theory-experiment interface. SWC will host a Wellcome collaborative award led by Professor Burgess and involving scientists from UCL and Oxford focussed on representations of spatial transformations in the hippocampus and parietal areas.



In September 2019, an international panel of experts carried out an extensive review looking at how SWC has developed over its initial research cycle. The reviewers were very complimentary of achievements to date including the calibre of the recruited researchers, the core facilities and the research culture. They agreed SWC has great potential to make important discoveries over the next five years. We look forward to working with SWC to finalise arrangements and support for the second research cycle.

### GATSBY COMPUTATIONAL NEUROSCIENCE UNIT (GCNU)

Gatsby founded GCNU at UCL over two decades ago to bring together a critical mass of theoreticians focussing on the computational theories of perception and action in neural and machine systems.

In July 2019, a three-day 'birthday' symposium was organised to celebrate the 21st anniversary of the Unit. The first day was a public programme featuring current and previous faculty members, as well as alumnus Dr Demis Hassabis (CEO, Deepmind); they discussed their work and the key role the creation of GCNU had played in the then burgeoning fields of theoretical neuroscience and machine learning. The remaining days consisted of talks from student and post-doc alumni. The meeting was a success, with approximately 70 of the world's leading experts in theoretical neuroscience and machine learning attending. Some former Unit members have gone on to large tech firms such as DeepMind, Uber, Amazon and Alibaba – whilst the majority have retained academic positions in top universities throughout the UK, Europe

and USA. This highlights the Unit's exceptional training environment.

In 2019, the Unit celebrated the success of its PhD training programme when one of its recent students, Wittawat Jitkritum, supervised by Professor Arthur Gretton, won the Inaugural ELLIS (European Laboratory for Learning and Intelligent Systems) PhD Award, which recognises outstanding research achievements in artificial intelligence and machine learning.

Peter Orbanz joined GCNU in summer 2019 as an Associate Professor of Machine Learning. His research group will study network and relational data, Bayesian nonparametrics, and exchangeability and symmetry properties. More generally, he is interested in all mathematical aspects of machine learning and pattern recognition.

The quality of GCNU research was further highlighted by securing two oral presentations at Neural Information Processing Systems (NeurIPS) 2019, with papers on causal inference and on neural models for planning under uncertainty. NeurIPS is the foremost international conference linking artificial and natural intelligence, with only 0.5% of paper submissions selected for oral presentation.

In addition, GCNU have appointed two key individuals: a skilled neuro-informatician who will support the curation and professionalisation of GCNU's outputs to increase their impact and collaborations with experimentalists; and a scientific programme manager to oversee partnerships and actively develop broader engagement.

### THEORETICAL NEUROSCIENCE AT COLUMBIA AND HEBREW UNIVERSITIES

We renewed support for two world-class theoretical neuroscience centres as part of an on-going partnership with GCNU. These are the Centre for Theoretical Neuroscience at Columbia University in the USA and the Gatsby Programme in Theoretical Neuroscience at the Safra Centre for Brain Sciences (ELSC) at the Hebrew University in Israel. Gatsby funding is used by these centres to support graduate students and post-doctoral scientists, bridging academic personnel, administrative support, and a new IT infrastructure.

This support has been instrumental in enabling the centres to develop further. For example, the Columbia Centre secured significant US BRAIN Initiative cooperative grants to link experiment and theory on visual stimuli and on motor control, while group leaders at ELSC have formed international collaborations with the US and EU brain initiatives.

Below: Professor Maneesh Sahani, Director of GCNU, giving a lecture on Machine Learning to PhD and Master's students at UCL.

### PSYCHIATRY CURRICULUM REVIEW AT RCPsYCH

In partnership with Wellcome, we have renewed support to the UK's Royal College of Psychiatry to update the content of the postgraduate curriculum for psychiatry to include neuroscience and technologies relevant to brain and mental health disorders.

During 2019, the College updated the neuroscience components of the syllabus and all candidates taking the written examination are now required to learn the new content. The bootcamp model for teaching neuroscience principles which was successful in early phases of the project is being continued, with more self-organised events around the UK.

We also provided twelve bursaries for psychiatrist trainers to attend the British Neuroscience Association (BNA) 2019 Festival of Neuroscience in Dublin; this enabled them to expand their knowledge and contacts so as to lead new training events and strengthen greatly the College's regional 'Neuroscience in Psychiatry Networks' for the future. Appetite for the latest neuroscientific information continues, and an advanced bootcamp is being considered that could be used across the country.

### BRITISH NEUROSCIENCE ASSOCIATION (BNA)

In late 2018, we provided a three-year grant to BNA to implement a new strategy aiming to reposition the Association as a powerful force supporting neuroscience and neuroscientists in the UK. This will be achieved by a drive to increase and broaden membership, the introduction of bold annual themes, and a major sector development project: *Credibility in Neuroscience*.

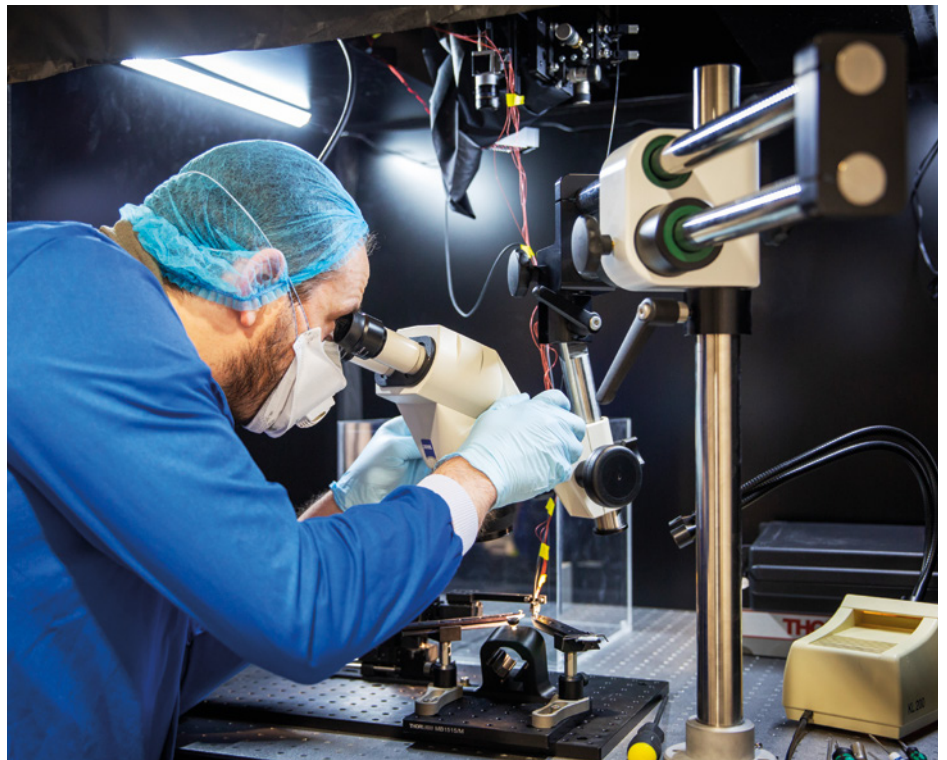
The project on credibility started in early 2019 and will explore issues of reproducibility, replicability and reliability in neuroscience research over the next ten years. The official launch took place at the Houses of Parliament in November 2019. SWC hosted a BNA workshop in late 2019 on reproducibility, demands for research that embodies excellence and impact, and the next Research Excellence Framework exercise (REF2021). BNA will host the biennial Federation of European Neuroscience Societies (FENS) Forum in Glasgow in summer 2020.

Expansion in the staff team has allowed BNA to continue existing activities such as the Festival of Neuroscience as well as explore new ones, ensuring that the BNA is truly representative and relevant to everyone in neuroscience including those in the commercial sector, the clinic and in wider society.





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3,000 OF THE  
RECENTLY  
DEVELOPED  
NEUROPIXELS  
PROBES ARE IN USE  
IN LABORATORIES  
AROUND THE  
WORLD  
”



#### STANFORD OPTOGENETICS MOONSHOT FOR AUTISM

We are supporting Professor Karl Deisseroth at Stanford University to discover the mechanisms of autism brain dynamics with a view to proposing therapies. Over the past year, his group has developed an approach for cellular-resolution, real-time identification and control of social neurons in part of the brain called the orbitofrontal cortex. Stimulation of these social neurons was found to modulate reward-related feeding behaviour, suggesting that there are subnetworks which can control behaviours in relation to social influences. The causal dynamics of social behaviour will be investigated over the coming year. These findings will help the Deisseroth group to create novel and effective therapies which will have an impact on the treatment landscape for Autism Spectrum Disorder.

#### CAJAL ADVANCED NEUROSCIENCE TRAINING PROGRAMME

We are partnering with FENS, International Brain Research Organisation (IBRO), Bordeaux Neurocampus and Champalimaud Foundation to support the continued development of the CAJAL programme, a dedicated neuroscience training facility. This represents a much-needed European equivalent to the highly-respected cutting-edge hands-on intensive training courses in the USA.

The goal of creating a strong, sustainable programme is beginning to be realised. The programme was recently established as an independent entity in Belgium. An experienced executive manager is being sought to join in 2020. This new role will develop and implement new plans, including a strategy for partnerships, fundraising and marketing to continue to grow the organisation.

Above: Dr Tristan Chaplin, a postdoctoral fellow in the group of Professor Troy Margrie, aligns an objective in a miniaturised microscope designed to measure brain activity.

#### TECHNOLOGY DEVELOPMENT – NEUROPIXELS PROBES

Since 2013 a consortium of UCL (with funding from Gatsby and Wellcome), HHMI Janelia in Virginia, USA, and the Allen Institute in Seattle have collaborated with Imec in Belgium to develop and manufacture state-of-the-art nano-electronic devices for detecting the activity of hundreds of neurons.

At the end of 2018, the successfully-developed Neuropixels probe was commercialised. The probe is 10mm long with 960 sites and 384 recording channels. This combination of dense recording sites and a high channel count into a small and light-weight probe allows implantation of multiple probes and long-term recording of very large populations of neurons simultaneously across several brain areas in freely-behaving animals.

In early 2019, production was ramped up and Neuropixels probes started to ship to neuroscience groups all over the globe. By the end of 2019, more than 250 laboratories have received Neuropixels probes, with about 3,000 probes distributed in total. SWC and the CAJAL programme provide training workshops on Neuropixels probes to increase access to researchers across the world who have not previously used probe technology in their neuroscience experiments.

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# EDUCATION

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## STRENGTHENING TECHNICAL EDUCATION AND SKILLS IN THE UK BY DEVELOPING AND ENABLING INNOVATIVE PROGRAMMES AND INFORMING NATIONAL POLICY

For over thirty years, Gatsby has developed and facilitated innovative programmes to strengthen science, technology, engineering and mathematics (STEM) skills in the UK. In recent years, we have focussed much of our effort on seeking to influence national education policy. We do this by undertaking rigorous problem analysis, commissioning high-quality research, proposing pragmatic policy solutions and engaging closely with government officials, sector bodies and other stakeholders to support implementation of positive reform.

Adopting this approach, 2019 has seen us inform national policy in areas including technical education reform, career guidance, funding for post-16 STEM courses, and the recruitment and retention of specialist science teachers.

Above: In 2018, every secondary school in England received Gatsby's *Good Practical Science* report, which specifies what world-class practical science should look like in schools and how it can be achieved.

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Opposite page: Our local area programme works in five localities to support coherent planning for technical education reform, in order to provide clear progression pathways for young learners.



### TECHNICAL EDUCATION REFORM

In June 2016, the government accepted all 34 recommendations of the *Independent Panel on Technical Education*, chaired by David Sainsbury. Since then, Gatsby has worked alongside the Department for Education (DfE) and key partners to support a technical education system that develops the skills needed by employers, and provides students with a clear route to skilled employment or further study.

Successful technical education reform requires collaboration between national and local government, Further Education (FE) institutions and employers. As such, we continue to work with local decision-makers across Mayoral Combined Authorities and Local Enterprise Partnerships to support and encourage coherent planning.

At the national level, government must oversee a framework for qualifications that enable people to develop the knowledge and skills which will see them flourish in future employment. We are therefore delighted at the progress being made with the implementation of T-levels. Alongside apprenticeships, T-levels – to be introduced from September 2020 – will offer young people the strong technical education they need to start a rewarding career.

It is important that all parts of the FE sector understand the implications of technical education reform and are able to fully engage in its implementation. To this end, we have partnered with the Association of Colleges and DfE to deliver awareness-raising workshops to support FE training providers' planning for T-levels. We have also arranged several international study visits, taking college leaders and government officials to explore highly-regarded technical education systems in countries such as Switzerland and the Netherlands.

Industry placements will be a key component of T-levels, providing students with an opportunity to spend an extended period with an employer and learn essential on-the-job skills. To support their success, we are piloting work to coordinate industry placements across NHS Trusts. In 2019, we also published a report on international insights to industry placements that illustrated various approaches which could inform the expansion of placements in England.

Professional registration helps to give technical occupations the status they deserve. Apprentices already benefit from strong links between apprenticeships and professional body registration.

We are working with BCS, the Chartered Institute for IT, and the Science Council to ensure that this opportunity will also be available for T-level students in IT- and science-related fields.

The apprenticeships system in England continues to undergo significant reform. As such our work is focussing on how to improve the quality of apprenticeship training and on exploring the mechanisms other countries use. As part of this approach, we have recently commissioned research to examine the quality of on- and off-the-job training in apprenticeships to understand how it might be improved. We are also planning to convene an international symposium to bring together renowned experts to discuss how to ensure the quality of technical education while responding to the changing demands of the modern workplace.



SUCCESSFUL  
TECHNICAL  
EDUCATION  
REFORM REQUIRES  
COLLABORATION  
BETWEEN NATIONAL  
AND LOCAL  
GOVERNMENT,  
FURTHER EDUCATION  
(FE) INSTITUTIONS  
AND EMPLOYERS



## HIGHER TECHNICAL EDUCATION REFORM

In 2019 the DfE launched a consultation on proposals for how to establish a set of employer-approved 'Higher Technical Qualifications', ensuring that they are offered by providers with demonstrably high-quality technical provision, and bringing awareness of them to young and older learners alike. These qualifications, at education levels 4 and 5, will provide excellent progression pathways for T-level graduates wanting to study further before entering employment, as well as for existing employees looking to upskill. Gatsby research has been fundamental in building these proposals and has been widely cited by DfE and others. The outcome of the government consultation will be published later in 2020 and we will continue to engage with DfE to ensure the higher technical education reforms deliver on their promise.

In April 2019, government announced the first twelve Institutes of Technology (IoTs) – collaborations between FE colleges, universities and employers, which will specialise in providing higher technical education in STEM. Later that same year, an additional £120m was announced to create a further eight IoTs so that there will be one in every part of England. Having first presented the idea of IoTs to government in 2014, we are pleased they are being launched across the country and are committed to supporting their success in the future.

# £120m

In 2019, an additional £120 million was announced to create a further eight Institutes of Technology so that there will be one in every part of England.

Right: Helen and Gillian, apprentice Light Vehicle Service Technicians at Volkswagen Audi.  
Credit: Leonora Saunders

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Opposite page: A careers fair at Park View Academy. Gatsby remains committed to ensuring that schools and colleges are provided with the support they need to give every young learner access to good career guidance.

## STEM SKILLS IN THE WORKPLACE

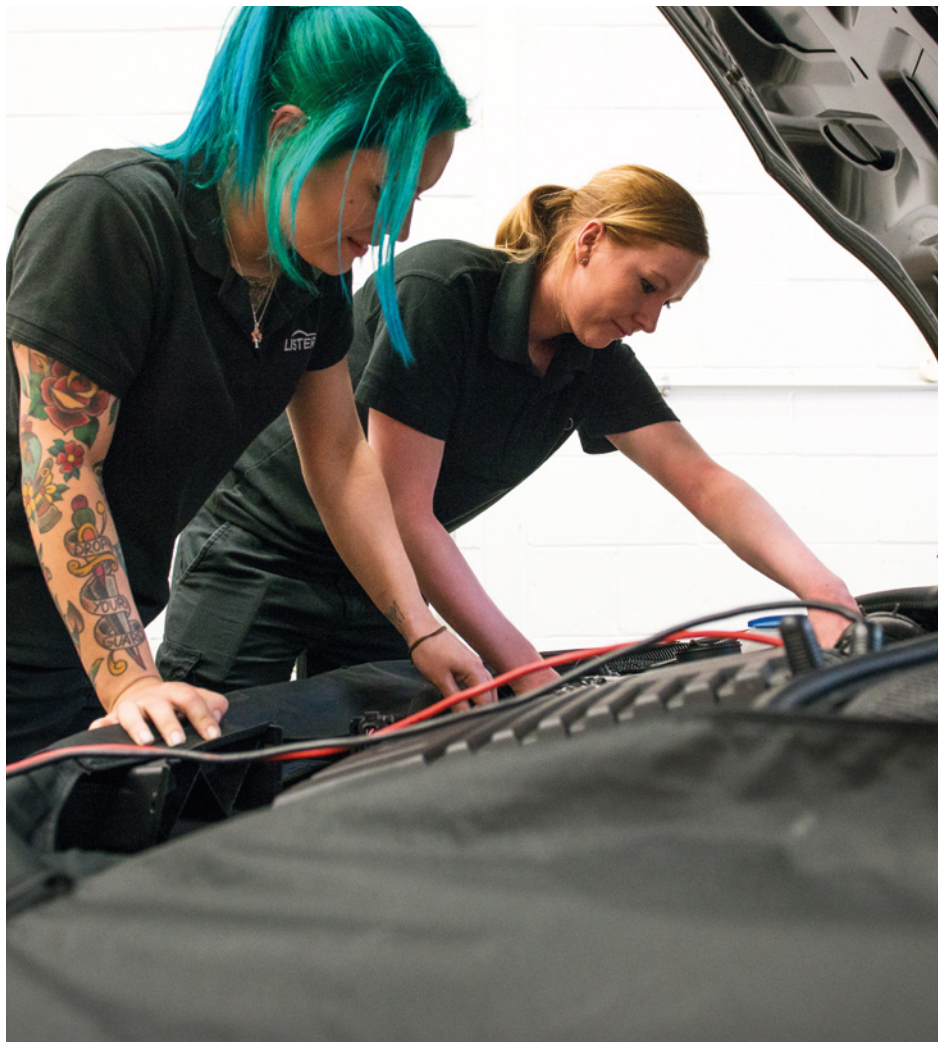
With significant reform to the technical education system underway, it is important that learners are aware of the opportunities technical education can provide.

Our *Technicians Make it Happen* campaign (TMiH) continues to go from strength to strength, and is increasingly seen by government, careers professionals and education organisations as an excellent way of illustrating technical careers through case studies and other material. In 2019, a new TMiH website – [technicians.org.uk](http://technicians.org.uk) – was launched to target an audience of young people, parents and teachers. The campaign also continues to exhibit at STEM and careers events attended by young people, including the Big Bang Fair and WorldSkills UK Live.

With T-levels soon in delivery, seeking and maintaining relationships with employers who actively champion their technician workforce is of increasing importance.

The TMiH campaign has already featured over 75 technician case studies from a wide range of leading employers. CERN, Audi, Volkswagen, the UK Atomic Energy Authority and Wellcome Sanger are just a few of those featuring in the past year. TMiH is also creating social media content that will engage as well as inform young people about the role technicians play in their world.

We continue to commission research to inform debate about the critical roles technicians play in industry. In June 2019, we published a report by Professor Paul Lewis of King's College London about the role technicians play in innovation. In collaboration with the High Value Manufacturing Catapult (HVMC) and other centres of innovation, we also supported a series of international visits to explore how other countries link innovation and skills. We are now working with the HVMC and others to explore how the lessons learnt on these visits can be made to work in an English context.





## GOOD CAREER GUIDANCE

Since 2018, the Gatsby Benchmarks for Good Career Guidance have been at the heart of the government's career guidance strategy for schools and colleges. All schools in England are now required to work towards achieving the Benchmarks and they are also included in Ofsted's new inspection framework. Our work in this area has received international interest over the past year, with Gatsby hosting stakeholders from Italy, Hong Kong, India, Australia, China and Spain, some of whom have subsequently launched pilots of their own career guidance frameworks modelled on our Benchmarks.

We are committed to ensuring that schools and colleges are provided with the support they need to reach the Benchmarks. In 2018, we published a best practice guide, illustrating how schools and colleges could approach the achievement of each Benchmark in practice. In 2019 we published further guidance to support those working with students with Special Educational Needs and Disabilities (SEND), in partnership with the Careers & Enterprise Company, Disability Rights UK and expertise from across the SEND sector. One hundred schools and colleges across England have now reached the gold standard of meeting all eight Benchmarks. Elsewhere, the proportion of schools and colleges achieving at least half of the Benchmarks has almost doubled over the past year.

We are committed to supporting parents and carers to help children make informed decisions about their future. Over the next year we will be embarking on work to explore how schools and colleges can best work with parents and carers in this way.

We are also working to establish a common understanding among employers of the essential skills students need to thrive in the modern workplace. In 2019, we worked with several organisations to launch the Essential Skills Taskforce. The taskforce is striving to develop a common framework of employability/transferable skills that can be used by schools, colleges, universities and employers.



## SCIENCE AND MATHS IN SCHOOLS

We continue to advocate the need for good practical science in schools, and we work with partners to support and promote best practice as articulated in our 2017 *Good Practical Science* report. We are also supportive of STEM Clubs in schools and colleges which allow students opportunities to explore STEM in more informal settings. To this end, we are supporting STEM Learning to deliver face-to-face support to school staff, a set of dedicated online resources, and a scheme to develop and recognise the achievements of the teachers and technicians who run STEM Clubs.

We also commission research to inform policy on the recruitment and retention of science teachers. Gatsby's 2018 report, *What happens when you pay shortage-subject teachers more money?* by Dr Sam Sims, for instance, was cited in the government's new teacher recruitment and retention strategy, and informed the development of the government pilot of early-career retention payments now underway. Similarly, we were pleased that our 2018 analysis looking at the relative costs of teaching science and engineering subjects to 16–19-year-olds was influential in the government's decision to increase the funding weightings for these subjects from 2020.

## BUSINESS EDUCATION FOR ENGINEERS

Each year the Sainsbury Management Fellowships (SMF) scheme provides ten bursaries of £50,000 to encourage outstanding, early-career engineers to study for an MBA at a top international business school. More than 350 engineers have benefitted from the scheme since it started over 30 years ago. Of these, more than 160 have gone on to found or co-found businesses, collectively valued at £4.6 billion and employing over 18,000 people. The SMF bursary scheme is managed by the Engineers in Business Fellowship (EIBF) which organises networking events throughout the year for alumni of the scheme. We also support EIBF to undertake other activities to promote business education for engineers. One such activity is a new, inter-university competition in which undergraduates and recent graduates compete in teams to produce a compelling business plan – and in some cases a working prototype – of an engineering-based product. Twenty-three universities participated in the competition in 2019, and EIBF hope to increase this to 50 by 2022.

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# ECONOMIC DEVELOPMENT IN AFRICA

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## ACCELERATING INCLUSIVE AND RESILIENT ECONOMIC GROWTH IN EAST AFRICA

Gatsby has worked to create jobs, raise incomes and build opportunities for people in Africa since 1985.

We are currently focussed on helping more people benefit from economic growth in East Africa.

This will require economic transformation – growth with depth that will radically change economies, lead to leaps in productivity, and offer large numbers of people pathways out of poverty.

To help achieve this we fund and implement programmes that look to catalyse large-scale and lasting change in priority sectors, such as commercial forestry in Kenya. We aim to transform such sectors so they are competitive, inclusive and resilient – capable of evolving and adapting independently to future risks and opportunities.

Beyond directly implementing programmes, we are building and supporting local institutions dedicated to sector transformation. We also aim to share what we are learning with others who are trying to promote inclusive economic growth.

We have established Gatsby Africa – an English charitable company limited by guarantee with branches in Tanzania and Kenya – to implement our Africa programmes. You can find more information on our website, with some initiatives profiled on the following pages.

Above: Tree nursery worker in Tanzania.  
Credit: Rob Beechey

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Opposite page: Tree nursery worker in Kenya.  
Credit: Neil Thomas



## DEVELOPING A WORLD-CLASS COMMERCIAL FORESTRY SECTOR

Between 2001 and 2018, Kenya lost almost 10% of its total tree cover – 326,000 hectares. Over the last five years alone, timber and wood product imports have increased fivefold to \$1.9 billion. Kenya's domestic supply of wood cannot meet demand, leaving an annual wood deficit of 16 million m<sup>3</sup>. Moreover, Kenya's industrialisation and projected population growth will worsen that deficit, seeing it more than double by 2030 to 34 million m<sup>3</sup>.

We have therefore launched the Kenya Commercial Forestry Programme (KCFP) to help the country close its wood deficit and achieve its goal of 10% national tree cover, whilst providing jobs and incomes to growers who may otherwise be in poverty.

KCFP's vision is for Kenya to become a globally competitive producer of high-value timber products from indigenous and exotic species, while greatly developing its domestic supply of timber and new wood-fuel products. Commercial forestry resources would increase from 150,000 to 500,000 ha by 2030, including through the rapid expansion of planting in the Arid and Semi-Arid Land counties – the poorest parts of Kenya. These marginal areas would be opened up by improved productivity (driven by better-suited planting materials, improved management and superior processing technology), making commercial forestry competitive versus other uses of the land.

Transfer of processing technologies and other forms of innovation would not just upgrade existing forestry value chains in Kenya, but create entirely new propositions and markets – particularly for small- and medium-scale producers in high potential areas. Kenya's currently small number of competitive commercial forestry operations would be joined by many others, creating the necessary demand for new and improved supporting services – including services around value addition technology and forest finance. Taken together, this would open major opportunities for industrialisation and significant job creation – raising incomes and tax revenues while reducing poverty.



Importantly, this would not just spur job and wealth creation, but help safeguard the Kenyan environment; including the country's five key forests that regulate 75% of Kenya's renewable water supplies, ensure national food security, support biodiversity, and strengthen resilience to climate change.

Achieving this will require effective coordination across the public and private sectors, technological innovation, and lesson-learning from other countries which have rapidly expanded their commercial forestry sectors. Maximising the impact will also mean ensuring that the growth of commercial forestry does not come at the expense of community rights and livelihoods – the focus must rather be on inclusive growth, with benefits shared widely.

KCFP aims to help deliver this by:

- Bringing public and private players together with targeted, commercially-relevant research and development
- Supporting tree nurseries so as to improve the quality and diversity of planting material available to growers of all sizes
- Supporting large firms to increase how effectively they manage their own plantations and their relationships with small growers
- Supporting firms to test and roll out new technologies that can improve efficiency and add value
- Generating intelligence and insight to support policy development and sector planning.

To learn more, please visit:  
[gatsby.org.uk/kcfp](https://gatsby.org.uk/kcfp)





### BUILDING EAST AFRICA'S INDUSTRIES OF THE FUTURE

We have partnered with the UK's Department for International Development to create a highly ambitious industry development organisation for East Africa – Msingi.

Msingi is focussed on catalysing competitive industries of the future – inspired by other leading international organisations who have played a pivotal role in transforming local and regional economies, such as Fundación Chile.

Msingi aims to generate new jobs, boost incomes and reduce poverty while fostering inclusive opportunities for future generations to improve their livelihoods.

Msingi takes a regional approach to sectoral development, working across Kenya, Rwanda, Tanzania and Uganda. It partners with governments and the private sector, blending market facilitation approaches with the ability to directly finance pioneering, strategically-important entrepreneurs. The aim is to enable industries to remain competitive and dynamic in the long term, able to mitigate risks, be governed effectively, and capable of developing new products and services in the future.

Msingi's first focus industry is aquaculture. Due to overfishing, wild fish catches have plummeted by more than 50% in Lake Victoria over the past two decades. At the same time, demand for fish has risen to 500,000 metric tonnes – far beyond the local catch of 140,000 metric tonnes. This means that despite East Africa being the home of tilapia – the most commonly farmed fish in the world – it now imports more than \$7 million worth of tilapia per year from Asia.

This presents a huge opportunity for aquaculture in East Africa. Msingi is working to increase the production of farmed fish 15-fold, and targeting 115,000 jobs in the industry by 2030. Msingi has initially focussed on increasing production to a level that will attract investment in the feed industry, since improving the quality and availability of fish feed is critical to improving aquaculture's competitiveness. In 2018, Msingi completed a \$2.5 million investment in a pioneering firm, Victory Farms. In just over two years, the business has grown annual production 500% to 3,000 metric tonnes. This growth has helped stimulate an international feed firm's interest in investing in East Africa – which will address one of the key constraints holding back the sector.

Msingi has also intervened elsewhere in the industry, providing advice and technical support to six fish-feed mills across East Africa. In addition, it has deepened engagement with the governments of Uganda, Tanzania and Kenya on policy and regulations, including making a successful case for aquaculture to be included within Kenya's 'Big 4' industrialisation agenda.

Last year Msingi also launched its second programme, targeting textiles and apparel. Textiles was once a thriving industry in East Africa, and now has a window of opportunity for growth again. Thanks to increasing wages in Asia, preferential trade agreements, competitive manufacturing costs, improving infrastructure and locally available raw materials, East Africa has become an increasingly attractive sourcing destination.

Msingi is now looking to help the region fully unlock its potential, targeting 200,000 jobs, \$750 million of Foreign Direct Investment (FDI), and \$2.7 billion of exports by 2030. This will involve:

- partnering with East African governments to develop effective high-level strategies and plans
- supporting governments to improve business environments, attract FDI and coordinate support from other donor programmes and facilities
- exploring whether Swahili fashion and design can be a source of competitive advantage
- developing a regionally integrated value chain.

Among its initial activities, the programme has partnered with the Ugandan government to support their development of a national cotton, textiles and apparel strategy.

To learn more, please visit: [msingi.com](https://msingi.com)

# \$750m

Msingi is targeting \$750 million of Foreign Direct Investment into East Africa by 2030.

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 THE AIM IS TO HELP  
 GOVERNMENTS,  
 DONORS, FIRMS AND  
 CITIZENS TO BETTER  
 MITIGATE RISKS AND  
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 TO COME

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### WHICH TRENDS ARE SET TO SHAPE THE FUTURE IN EAST AFRICA?

We believe it is crucial to understand trends and what they mean over the medium- and long-term for East Africa – this will help make sure we are positioned to support the region in the most impactful way in the future.

In 2019 we therefore partnered with Msingi and Kenya Markets Trust to launch Horizon East Africa. Horizon is developing forward-looking reports to contribute to the conversation about East Africa's future. The aim is to help governments, donors, firms and citizens to better mitigate risks and more firmly grasp the opportunities to come.

Horizon brings together global, regional and country-level data and research that is complemented by our own targeted intelligence-gathering from our networks in East Africa.

Horizon's first report was published in October 2019. Its seven chapters explore regional-level trends within East Africa's fast-changing landscape:

- 1) **Trade – Securing positions in a volatile world trade system**  
*How might international trade be affected by the 're-shoring' of production to smart factories, rising wages in China, and the recently ratified African Continental Free Trade Agreement?*
- 2) **Finance – Financing the future as debt begins to bite**  
*What economic risks and benefits are associated with increasing Chinese investment, and how might East African governments use digital technologies to more effectively raise revenue?*

- 3) **Environment – Protecting citizens and growth in the face of climate change**  
*To what extent will rising temperatures affect agricultural production and migration patterns in East Africa, and are governments ready to respond?*
- 4) **Technology – Taking advantage of the tech revolution**  
*As access to mobile and digital technologies expands, might financial and agricultural needs be better served?*
- 5) **Work – Creating the jobs and workforce of the future**  
*Does automation pose a threat for East Africa, and what is the employment potential of manufacturing, 'industries without smokestacks' and online platforms?*
- 6) **Social – Realising the promise of the demographic dividend**  
*How will the region's 'youth bulge', rapid urbanisation and deepening inequality affect its development trajectory?*
- 7) **Political – Managing risks and opportunities in a fast-changing landscape**  
*How will evolving security threats and the rise of social media affect East African politics, and what are the prospects for further political integration in the region?*

The next Horizon report will focus on trends in Kenya and be published in 2020.

To learn more, please visit:  
[horizon-ea.com](http://horizon-ea.com)



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## PUBLIC POLICY

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### SUPPORTING INDEPENDENT RESEARCH ORGANISATIONS WHICH PROVIDE EVIDENCE-BASED ADVICE TO POLICY-MAKERS

Whilst holding the post of Minister of Science and Innovation in the UK government at the turn of the century, David Sainsbury noticed that both politicians' and civil servants' efforts to deliver activities were often held back by slow and outmoded processes in relation to policy-making. While this machinery could be somewhat improved from within government, he felt that impartial, independent organisations would be best placed to keep such reform on the agenda on an ongoing basis.

After leaving office, David Sainsbury started the Institute for Government as the leading think tank working to make government more effective. The Institute shares a philosophy with another independent non-partisan research organisation set up by David Sainsbury, the Centre for Cities, whose mission is to help UK cities realise their economic potential.

Above: Policy Links, led by Dr Carlos Lopez-Gomez, (far left), hosted policy dialogue between Japan's Ministry of Economy, Trade and Industry (METI), the UK Department for Business, Energy and Industrial Strategy (BEIS) and Innovate UK.



More recently Gatsby supported the establishment of the Centre for Science, Technology & Innovation Policy and its knowledge transfer unit, Policy Links. The Centre carries out applied research into programmes, processes and practices for translating publicly-funded R&D (in particular science and engineering research) into new technologies, industries and economic wealth. Policy Links works closely with UK and international policy practitioners to offer new evidence, insights and tools based on the latest academic thinking and international best practice.

#### INSTITUTE FOR GOVERNMENT

The Institute for Government works with the main political parties in Westminster, senior civil servants in Whitehall, and officials and politicians across the rest of the UK to promote more effective government. It provides impartial, evidence-based advice and training, drawing on best practice and research in government, universities and business from around the world.

During 2019 the Institute has significantly expanded the audience for its work and developed its reputation for rigorous, impartial research both domestically and internationally. It held a public event at the British Embassy in Washington DC in January 2019, launched research in Brussels in May, and ran a three-day international conference to celebrate its tenth anniversary in London in June.

Over the year, once again, UK government has been dominated by Brexit. The Institute has analysed the government's efforts to negotiate the UK's departure from the EU, and to legislate for and implement policies resulting from the decision to leave. The Institute's work has informed the public debate on Brexit and it has convened a large number of public and private events to discuss its implications.

As well as explaining and analysing Parliament's key role in the Brexit process, the Institute has looked at its wider role and performance in its annual *Parliamentary Monitor* report. Alongside *Parliamentary Monitor*, the Institute has produced the latest iterations of its two other annual data-focussed reports: *Whitehall Monitor* (which analyses the size, shape and performance of central government) and *Performance Tracker* (which looks at the performance of nine key public services, their efficiency and the impact of rising demand).

Last year, to mark the twentieth anniversary of the establishment of the UK's devolved legislatures, the Institute published a set of interviews with former ministers who had served in the devolved governments, produced a data-based analysis of the devolution experiment, and commissioned a collection of essays on the theme, *Has Devolution Worked?* In addition, a ground-breaking report looked at the implications of the absence of government in Northern Ireland following the collapse of power-sharing in 2017.

The Institute has strengthened its existing substantial body of work on the civil service and ministers. It published analysis of the implications of turnover in the civil service, and has continued to support the development of the functional agenda in government. A new programme of work on the role of the Treasury produced an analysis of the lessons from previous Spending Reviews, and examined the Treasury's role in managing the performance of spending across government. A second new stream of research has begun to look at government's relationship with the private sector and the extent of government procurement. And further research has made the case for reform of the tax system to enable government to continue to deliver public services.

The Institute has continued to deliver professional development for individuals involved in government, providing high-level advice, seminars and research to support ministers, advisers, senior officials and select committees. To inform this work, the Institute has continued to expand its archive of *Ministers Reflect* interviews recording the insights of former ministers about what it takes to be effective in government.



DURING 2019 THE INSTITUTE HAS  
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FOR ITS WORK AND DEVELOPED ITS  
REPUTATION FOR RIGOROUS, IMPARTIAL  
RESEARCH BOTH DOMESTICALLY  
AND INTERNATIONALLY



## CENTRE FOR CITIES

The Centre for Cities is an independent research and policy organisation committed to helping Britain's cities improve their economic performance. The Centre produces practical research and policy advice for city leaders, government and businesses.

During 2019, Centre for Cities led the debate about the future of the high street. A conference in Birmingham on city place-making, sponsored by Montagu Evans, drew together people working in economic development from all over the country to hear about best practice, design and the economics of a bustling high street.

To explore the success of place-based interventions in supporting innovation and productivity, the Centre analysed the performance of Enterprise Zones over the last decade. The report, *In The Zone*, was produced in partnership with BBC News, and has been used by the government to inform their Free Ports policy.

To look at the impact that leaving the EU will have on UK cities, the Centre released two podcasts, on the rise of anti-EU sentiment with Lewis Dijkstra of the European Commission, and on the deep roots of the urban/rural divide with Professor Jonathan Rodden of Stanford University.

The Centre's work on housing remains focussed on the importance of land supply as a key factor in solving the housing shortages in cities with high demand. The *Capital Cities* report examined the relationship between urban economies and housing wealth, revealing how the wealth is being concentrated among homeowners in economically strong cities.

Right: CSTI Director, Dr Eoin O'Sullivan (left, and his colleague Dr Jostein Hauge) speaking at CSTI's seminar and launch of their report for BEIS '*Inside the Black Box of Manufacturing: Conceptualising and Counting Manufacturing in the Economy*'.

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Opposite page: Policy Links facilitated a workshop in Hangzhou, China to compare policy approaches in the UK and China in the areas of 'smart' and 'green' manufacturing.

The Centre has continued to help cities understand their human capital and how they can support people to increase their skills and education. *Self-Employment in Cities* used HMRC data for the first time to look at how the rise of self-employment has varied between cities. It was widely welcomed by policymakers and covered by BBC News and major regional press.

The Centre's second annual survey of city leaders, *Urban Voices 2*, sponsored by Arup and published at the end of the 2019, set out the shared ambitions and challenges faced by urban areas around the country and what they need to prosper.

## CENTRE FOR SCIENCE, TECHNOLOGY & INNOVATION POLICY (CSTI)

CSTI, based at Cambridge University's Institute for Manufacturing, carries out practical policy research exploring what makes national innovation systems effective at translating new science and engineering ideas into technologies, industries and economic wealth. An important focus of CSTI's recent research has been on the relationships between technology, manufacturing and sector policies.

Over the past year, CSTI continued to have a large number of UK policy engagements. These included offering evidence and insights related to innovation policy and industrial strategy, including

on topics such as: place-based research and innovation policy (for Research England/UK Research and Innovation); public investment in research and innovation tools and demonstration facilities (for the Government Office of Science); and characterising and counting manufacturing sectors (for the manufacturing policy team at the Department of Business, Energy & Industrial Strategy (BEIS)). The Centre has also continued its international engagements, including academic-policy workshops and policy practitioner roundtables.

CSTI is currently developing research activities in new areas. In examining sources of evidence for policy makers, CSTI plans to explore how international policymakers gain access to: (a) policy research and analysis based on deep domain expertise – data and insights into particular industry sectors, technology domains, and research disciplines; and (b) international comparative analysis – benchmarking of national strengths in key research fields and technology domains. The latter will include comparative reviews of international research and innovation priorities, policy instruments and investments. And in examining challenge-led research and innovation programmes, CSTI research will characterise and compare the missions, functions and programme management of international challenge-led initiatives and agencies.







## POLICY LINKS

Policy Links is the knowledge transfer unit of CSTI. The unit has been established as a not-for-profit innovation policy consultancy, with the aim of helping governments develop more effective industrial and innovation policies. Policy Links offers education and consultancy activities based on the latest academic thinking and the study of international best practice.

Over the past year, the Unit has assisted governments and other clients understand the implications of new innovations in their economies, through training workshops, international benchmarking reports and bespoke policy studies. Policy Links delivered a number of projects to support policy making efforts in the UK and abroad.

In the UK, new collaborations were established with Innovate UK to research the practical impact of digital manufacturing. The comparative study Policy Links informed a successful business case for additional funding of £147 million for the *Made Smarter* digital manufacturing initiative. Policy Links provided ongoing *ad hoc* support to the work of the advanced manufacturing team at BEIS, including convening several workshops in the UK and Japan to support the UK-Japan Industrial Policy Dialogue.

A series of roundtable discussions were convened in partnership with the BEIS

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POLICY LINKS  
CONTINUES  
TO EXPAND ITS  
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INTERNATIONAL  
BENCHMARKING  
STUDIES  
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# £147m

A report from Policy Links informed a successful business case to the Government for the *Made Smarter* initiative.

Local Industrial Strategy team to explore how collaboration on innovation and R&D could be encouraged among UK regions. A regular series of lunchtime seminars at BEIS will share emerging insights from the work of Policy Links and CSTI with relevant policy stakeholders. Recent themes included: the conceptualisation and measurement of manufacturing, and international approaches to value chain capability development.

There was further international expansion of the Unit's activities in South-East Asia. These included projects delivered in Singapore, with tailored training for government officials in the intellectual property office; in Indonesia to investigate, with the Asian Development Bank, the implications of disruptive emerging technologies; and in Cambodia, with the United Nations Development Programme, to explore potential opportunities from the adoption of Industry 4.0. Policy Links continues to expand its network of international collaborators and in-country experts that can support its international benchmarking studies.

Policy Links continues to establish collaborations with researchers from across the University of Cambridge. This has already enabled the delivery of projects integrating expertise from technology fields spanning energy technologies, cybersecurity and e-commerce.

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## THE ARTS

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### SUPPORTING THE FABRIC AND PROGRAMMING OF ARTS INSTITUTIONS WHICH HAVE LONG RELATIONSHIPS WITH GATSBY'S FOUNDING FAMILY

David Sainsbury's parents, Robert and Lisa, began building their art collection in the 1930s. They rapidly became two of the UK's leading patrons of the arts, particularly notable for their championing and support of emerging artists – including Francis Bacon, Henry Moore and Alberto Giacometti. In 1973 they gifted their collection of several hundred paintings, drawings and sculptures from around the world to the University of East Anglia (UEA). The collection was housed in a new building – the Sainsbury Centre for Visual Arts (SCVA) – designed by Norman Foster and funded by Gatsby.

We continue to support SCVA and other arts institutions founded by Robert and Lisa at UEA.

We have long relationships with a small number of other organisations and initiatives, and we continue supporting these as they seek ways to make inspiring art accessible to new generations. Supported organisations include the Chamber Orchestra of Europe, the Royal Shakespeare Company and the Royal Academy of Music.

## SAINSBURY CENTRE FOR VISUAL ARTS (SCVA)

There have been a number of notable exhibitions and displays at SCVA over the past year, amongst them a re-appraisal of 130 pieces of Elisabeth Frink's work, entitled *Humans and Other Animals*, which was the largest presentation of her work in over 30 years. SCVA also hosted the largest presentation of Ken Kiff's work, focussing on a unique series of almost 200 acrylic paintings on paper, on which he worked from 1971 through to his death in 2001.

The Collections, guided by SCVA's acquisitions strategy, have also been added to throughout the year with several donations and bequests, including the addition of the first contemporary work for many years, Rana Begum's *No. 684L Fold*, 2016, one of her trademark large fold wall relief sculptures.

The Sainsbury Centre Sculpture Park continues to expand, with two works by Elisabeth Frink (*Mirage I and Mirage II*), together with a temporary addition in the form of John Christie's *My Blue Heaven*, 2018, and the start of a conservation project on Henry Clyne's *Variations on a Square*, 1964, in order to secure its structural integrity. Lynn Chadwick's *Beasts* have also remained on long loan.

The year has seen several worldwide touring and loan exhibitions, including *Alberto Giacometti: A Line Through Time*, which toured to the Vancouver Art Gallery, and 35 works from the Anderson Collection of Art Nouveau loaned to the Latvia National Museum of Art for their exhibition *Art Nouveau: Its Beginnings, Influences, and Original Nature*.

Alongside the many and varied exhibitions, displays and tours, SCVA continues to provide its varied programmes of lectures, practical workshops and study days, offering members of the public the opportunity to gain deeper insights by hearing from, and working with, curators, artists and researchers.

Right: The Chamber Orchestra of Europe.

Opposite page: Magdalene Odundo, *The Journey of Things* at The Hepworth Wakefield.  
Credit: Charlotte Graham

## CHAMBER ORCHESTRA OF EUROPE

We continue to support the acclaimed Chamber Orchestra of Europe (COE), which brings together about 60 musicians from Europe, all with parallel careers as international soloists, national orchestra leaders and principals, and as tutors and professors.

Highlights of the COE from last year included critically acclaimed concerts with conductor Bernard Haitink at the Lucerne Festival, returning to the Fondation Louis Vuitton with Sir András Schiff, performing at Salzburg's Mozartwoche with Robin Ticciati, and celebrating Bernard Haitink's 90th birthday in Luxemburg and Amsterdam at the start of 2019.

Other projects included Bayerische Rundfunks' Musica Viva Festival in Munich, the Klarafestival in Belgium, and, for the first time, the Orchestra took part in the Lucerne Festival's *räsonanz* concert series alongside Heinz Holliger, Sir András Schiff, Zoltán Fejérvári, Miklós Perényi and the Alumni of the Lucerne Festival Academy. The COE also appeared elsewhere in Europe with distinguished conductors and soloists such as David Robertson, Pierre-Laurent Aimard, Vilde Frang, David Afkham, Lisa Batiashvili, Veronika Eberle, Leonidas Kavakos, Yannick Nézet-Séguin, Sir Antonio Pappano and Nikolaj Znaider.

The recordings of Mozart's late operas on Deutsche Grammophon continue under the direction of Yannick Nézet-Séguin, with performances of *the Magic Flute* at the Festspielhaus in Baden-Baden, released in August 2019. Other CD releases included Mozart's Piano Concerto No. 20 with Korean pianist Seong-Jin Cho and Yannick Nézet-Séguin, as well as Schumann's Cello Concerto with Gautier Capuçon, under the baton of Bernard Haitink, recorded by Warner Classics.



HIGHLIGHTS OF THE  
COE FROM THE LAST  
YEAR INCLUDED  
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