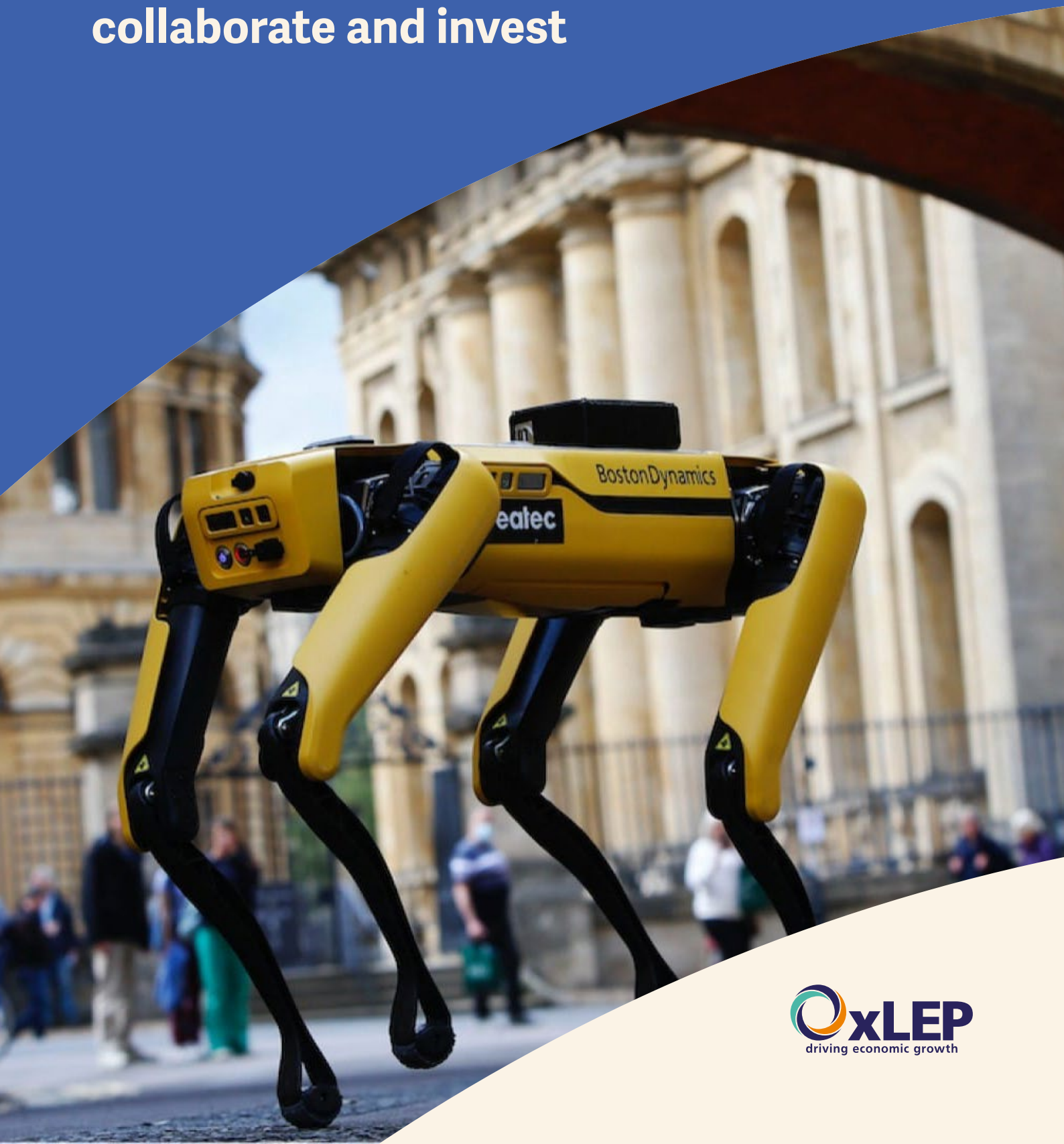
Oxfordshire's pioneering robotics

Opportunities to collaborate and invest



OxLEP
driving economic growth

Front cover image: 'Spot', a robot developed by Boston Dynamics, pictured at the Bridge of Sighs in Oxford. Oxford Robotics Institute's autonomous navigation system VILENS allows robots such as Spot to navigate hazardous sites and collate data remotely.

Robotics

Robotics continues to help us push the boundaries of human knowledge to new frontiers.

Harnessing this extraordinary power helps us to understand and operate in extreme environments, for example exploring space and deep sea, or decommissioning nuclear facilities. Meanwhile, recent advances in AI are increasing the potential for robots to interact in the real world, with the development of sophisticated sensing technologies such as robot skin. Advances in the integration of robotic technology and AI are set to change and improve all of our lives, whether assisting with routine and repetitive tasks, operating our transport, or providing disaster relief in the face of climate change.

Oxfordshire's pioneering role

Robotics is fast developing into a multi-billion dollar global market. Much of the earliest pioneering work in the field was carried out in and around Oxford and the region continues to lead the way today. Research into robotics at the UK's Atomic Energy Authority (UKAEA) has enabled the safe decommissioning of nuclear plants. Today the organisation is exploring how robots and automation can be used to perform maintenance tasks in nuclear fusion plants.

Two Oxfordshire centres offer unique world-class expertise – and many opportunities to collaborate:

The Remote Applications in Challenging Environments (RACE), based at the Culham Science Centre, offers outstanding test facilities to companies from around the world to develop robotics and AI solutions.

The Oxford Robotics Institute has a world-leading reputation in large-scale mobile autonomy and offers industrial collaboration across several sectors. It has specialist groups including mobile robotics, soft robotics, dynamic robotic systems, cognitive robotics, and an applied AI lab.

Harwell Campus hosts over £2 billion worth of facilities such as Diamond Light Source, the UK's National synchrotron, and the Faraday Institution. It is a world-renowned research centre for the physical and life sciences, laser technology and high performance computing, and plays a leading role in the UK space sector.

Oxfordshire's centres of expertise

Academic and research centres

University of Oxford

Investors in the region can benefit from collaboration with the University of Oxford and its exciting spinouts.

The University of Oxford is known around the globe as a leading research institute. In 2024 it was ranked #1 for the eighth year. It was also ranked #4 for engineering and technology (2024 Times Higher Education).

The University's robotics and AI teaching and research is led by the Oxford Robotics Institute. Its work includes machine learning and AI, computer vision, fabrication, multispectral sensing, perception, and systems engineering.

Oxford University Innovation, the University's commercialisation arm, has successfully spun out over 200 companies, including the fast-growing universal autonomy developer Oxa.

Oxfordshire has a successful record in securing investment to promote growth. Oxford Science Enterprises is an £850 million fund designed to help Oxford's outstanding scientists build and grow great businesses that can improve the world. Investors have provided seed and follow-on funding ranging from £100,000 to £10 million.

The EPSRC Centre for Doctoral Training in Autonomous Intelligent Machines and Systems at the University's Engineering Department collaborates with a number of industry partners, including Amazon Web Services (AWS), Google Deep Mind, Samsung, Schlumberger, Toshiba and Toyota.

The Oxford Machine Learning Research Group is interested in applying machine learning methodology to problems in science, engineering, industry and commerce, and works closely with the Oxford Man Institute, which focuses on quantitative finance.

Oxford Brookes University

Oxford Brookes University offers advanced education through its Advanced AI and Robotics Group, which encompasses health, theoretical applications of dynamic systems, reinforcement learning and developmental robotics.

The Visual Artificial Intelligence Laboratory specialises in the application of machine learning and AI to fields including robot-assisted surgery, activity recognition and scene interpretation. It has worked with industry partners including Createc Robotics.

Culham Science Centre

Culham Science Centre is home to UKAEA (the United Kingdom Atomic Energy Authority) and the Culham Centre for Fusion Energy, the UK's national fusion energy laboratory. UKAEA operated the Joint European Torus (JET) – the world's largest and most powerful tokamak – on behalf of its European partners, and the Mega Amp Spherical Tokamak (MAST) Upgrade device. The UK government is investing £184 million in new fusion facilities, infrastructure and apprenticeships at the Culham Science Centre.

RACE - Remote Applications in Challenging Environments

RACE's 100+ engineers have conducted more than 35,000 hours of remote operations, working principally on nuclear reactor shutdown. RACE is now applying this unparalleled knowledge to a growing range of commercial situations. The world leader in fully remotely operated systems, it has formed international private sector collaborations in sectors including petrochemical, space exploration, construction and mining. Its robots are overcoming physical environments such as radiation, extreme temperature, limited access, vacuum and magnetic fields.

Harwell Campus

Harwell's Space, HealthTec, EnergyTec and Quantum clusters attract innovative companies and numerous multidisciplinary collaborations. Its space cluster encompasses the European Space Agency (ESA), Satellite Applications Catapult, UK Space Agency and STFC RAL Space, and includes the ESA's Human and Robotic Exploration Directorate.

RAIN

The University of Oxford and RACE are participants in RAIN, a multi-university collaboration on human-robot interaction, remote inspection, remote handling, sensors and software.

Opportunities for collaboration

RACE services

RACE TEST hosts Europe's only standardised test facility for ground and air-based robots. Developed alongside the US National Institute of Standards and Technology, RACE's test lanes give developers a chance to measure their performance against international standards while giving end users a space to impartially compare robotics in a controlled environment, and an opportunity for consistent and standardised operator training.

ORI membership

Industrial collaboration lies at the heart of the Oxford Robotics Institute (ORI)'s research. ORI membership buys partners deep immersion and access to its full portfolio of research and activity, accelerating and catalysing knowledge transfer.

ESA BIC UK

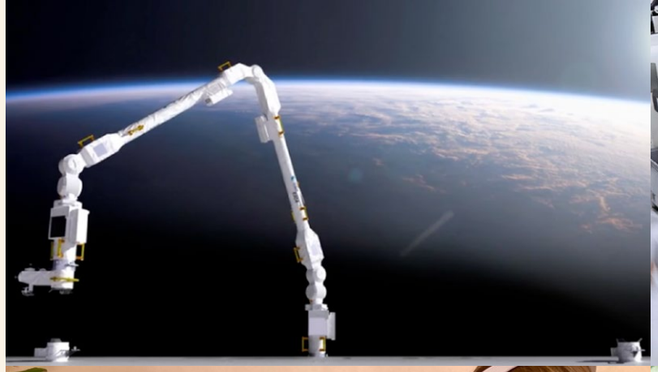
Harwell Campus has ambitious plans to grow its space cluster to 200 organisations by 2030. The European Space Agency's Business Incubation Centre (ESA BIC UK), part of a European-wide network, helps 10 young space-related companies to turn their ideas into commercial reality each year. One of those is Extend Robotics, founded in 2019 to revolutionise the control of robotic systems by building an intuitive and accurate human robot interface. It joined ESA BIC UK with the aim of developing its technology for space teleoperation tasks.

Space

Space offers huge scope to the robotics industry and Harwell brings many opportunities for collaboration.

The UK Atomic Energy Authority (UKAEA) and the UK Satellite Applications Catapult have partnered to demonstrate how advanced remote handling and robotics technology developed for fusion energy research can be used to provide maintenance for in-orbit satellites.

The UK Space Agency is funding two consortia with UK bases to help clear space junk. The Harwell teams of MDA and Astroscale are working together on a robotic arm concept that will hunt down and grab a defunct satellite – a difficult mission with an object that is constantly turning. Swiss company ClearSpace is developing a rival 'tentacle' method.



Investor support

Learn more about investment opportunities in Oxfordshire including energy and future mobility here. For further support, please contact the inward investment team.

Revolutionising nuclear decommissioning

Advanced sensing technologies for robotics provided by Oxford-based Createc are revolutionising nuclear decommissioning.

In 2023, Createc's radiation-sensing hardware helped explore a highly hazardous building that had been closed for 25 years.

Two Boston Dynamics Spot robots were guided by operators to capture critical data through real-time observation of the radiation environment in hazardous areas of the building's evaporator cell.

One Spot robot was fitted with Createc's N-Visage Explore payload and advanced radiation detectors, while the second, equipped with a manipulator, established a secure data network, and collected crucial samples from plant items.

The resulting 3D model, high-resolution videos and still images present a detailed map of radiation sources which can be used to plan a decommissioning strategy for the site.

The Createc team worked with Dounreay Site Restoration Limited (DSRL) and React in the most complex and technologically advanced project of its kind in the UK

Createc's Energy MD, Will Newsom, said:
"All three companies pushed the boundaries to deliver this complex project."

Oxford Innovation Finance

Oxford Innovation Finance is the home of OION, one of the oldest and largest Angel Investment Networks in the UK, and the Oxford Innovation EIS Growth Fund. These provide investors with the opportunity to invest in pre-screened opportunities, while offering companies the opportunity to secure investment from a large, diverse investor base. Its investments include Inovo Robotics, which has offices in the UK and Hong Kong, and agricultural robotics start-up Muddy Machines.

Createc

Robotics and computer imaging specialists Createc can efficiently build prototype systems and develop them into working products, often bridging the gap between leading research and industrial applications.

Success stories

MDA

Canadian international space mission partner MDA is a pioneer in robotics, satellite systems and geointelligence, working with partners globally. In April 2021, MDA was listed on the Toronto Stock Exchange. Its only international facility outside Canada and in Houston, USA, is at Harwell in Oxfordshire.

Intuitive Surgical

Californian firm **Intuitive Surgical** created the da Vinci surgical system, one of the first robotic-assisted, minimally invasive surgical systems to be cleared by the FDA. Today its systems and technologies are used by surgeons in 67 countries around the world. Its UK location is in the Schrödinger building at Oxford Science Park.

Precision manufacturing and protyping

Within Oxfordshire's manufacturing sector are companies providing precision manufacturing and prototyping services to help bring concepts to commercial reality. Here are some of them:

RAL Space at Harwell Campus operates a wide range of space test and calibration facilities.

Precipart: high precision custom solutions for aerospace, industrial and medical, including machined and 3D printed parts for surgical robotic tools. Location: Oxford Science Park.

AW Clarke Engineering: sheet metal and machined components. Location: Littlemore, Oxford

Blackmore Precision Engineering: machine tools and software for lean manufacturing. Location: Kidlington.

Oxford Product Design: industrial design and prototyping. Location: Harwell village.

SRD Engineering: precision engineering for aerospace, F1, and manufacturers. Location: Bicester.

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