Durham University
Space Research Centre

World-leading research
Independent insight
Global collaboration

FOR A SUSTAINABLE FUTURE IN SPACE.

WELCOME TO SPARC

We're forging a new era in space. Durham University Space Research Centre (SPARC) delivers world-leading research that is trusted, rigorous and relevant. Our mission is to help shape a responsible, resilient and globally competitive space sector.

World-leading research

Founded on the principles of open and independent research, SPARC exists to address the most pressing challenges in space: advancing critical technologies, protecting the orbital environment, and ensuring the long-term sustainability of space activities

Multi-disciplinary insights

Our work brings together expertise in novel sensors, Earth and space environment modelling, AI and machine learning, governance, law, policy, security and satellite operations.

This multi-disciplinary approach helps us understand the technologies that drive space operations and applications, and crucially the wider societal, political and environmental implications.

Global collaboration

We work closely with national and international partners, including the European Space Agency (ESA) and the Satellite Applications Catapult, to shape research agendas, deliver practical innovation, and take part in real-world missions. Our collaborations extend across academia, government and industry to drive the responsible use of space for the benefit of all.

Education and skills

Through our education and skills programmes, we're helping to equip the next generation of creative, industry-ready space professionals. Aligned with sector needs, SPARC is a gateway for talent, capability and critical thinking in a fast-moving field.

"We're here to ask the questions you didn't know needed asking to shape a more sustainable future in space.

Space research attracts bold claims and big headlines, but real progress depends on trusted evidence, long-term thinking and collaboration across disciplines.

Together with our partners, we focus on understanding the complexity of space systems, anticipating future risks, and ensuring that innovation is grounded in responsibility."

Professor James Osborn, Director, Durham University Space Research Centre (SPARC).

In partnership with:

esa · CATAPULT Satellite Applications · SPACE NORTH EAST ENGLAND

RESEARCH THEMES

Realising Space Sustainability

Ensuring responsible activity in orbit, we develop technologies and policies to protect Earth and space environments.

This includes climate monitoring, debris reduction, responsible operations, law, security and governance.

Harnessing Innovation for Space

Our research drives new approaches to in-orbit servicing, manufacturing, and AI-powered systems.

We explore how emerging tech, decision-making tools, and new business models shape the future of space.

Space for Everyone

We're championing fair access to space and its benefits for everyone, from all backgrounds and skills, now and in the future.

Our work supports ethical governance, international cooperation, and protecting space as a shared resource – building confidence and promoting shared understanding of space activities.

MEET THE TEAM

Scan the QR code to find out more about our team

Professor James Osborn

Director, Space Research Centre, Department of Physics

Research: Free-space optics, applying astronomical techniques to satellite communications and space surveillance. James's work explores the sustainability risks of large satellite constellations and their impact on the orbital environment.

Professor Hubert P. H. Shum

Director of Research, Department of Computer Science

Research: Human-centred AI, temporal modelling and responsible AI. Hubert's work focuses on modelling human-related data using deep learning, supporting applications across space, health and visual computing.

Dr PJ Blount

Assistant Professor of Space Law, Durham Law School

Research: International space law, cybersecurity, and space governance. PJ's work explores the legal dimensions of space security, including cyber threats and regulatory frameworks. He serves on editorial boards and advises internationally on space law and policy.

Dr Carly Beckerman

Associate Professor, School of Government and International Affairs

Research: Political risk, foreign policy decision-making, and the political psychology of science communication. Carly's work focuses on how leaders interpret uncertainty, particularly around emerging technologies such as space and data systems.

Professor Atanu Chaudhuri

Professor of Technology and Operations Management, Durham University Business School

Research: Circular economy, in-orbit servicing, sustainable space logistics. Atanu's work focuses on advanced manufacturing, blockchain adoption, and economic modelling to support reuse, recycling and resilient operations in space.

Dr Andrew Reeves

Associate Professor, Department of Physics

Research: Adaptive optics for stable, high-speed optical links through Earth's atmosphere. Andrew's work supports secure global networks, including space-based communications. He joined Durham from the German Aerospace Centre (DLR), where he led a group on similar technologies.

MEET THE TEAM

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Dr Joanne Rout

Senior Business Development Manager, Research and Innovation Services

Joanne's background is in industrial research, technical development, and commercial management.

She supports strategic collaborations between SPARC and industry.

Dr Nikos Mavrakis

Assistant Professor, Department of Computer Science

Research: Space robotics, robotic grasping, and computer vision. Nikos leads SPARC's work on robotic systems for orbital and planetary environments, enabling autonomous operations in space.

Dr Nikita Chiu

Associate Professor, in Space Innovation and Technology Governance, Durham Universtiy Business School

Research: Space sustainability, governance, and inclusive innovation. She leads cross-sector projects on risk reduction, accessibility, and responsible behaviour in space, and contributes internationally to policy and UN-led initiatives.

Dr Cyril Bourgenot

Associate Professor, Department of Physics

Research: Optical instrumentation and freeform optics for astronomy and space. Cyril develops deployable technologies for Earth observation, inter-satellite communication, and next-generation space telescopes.

Dr Bleddyn Bowen

Associate Professor, School of Government and International Affairs

Research: Spacepower, military strategy, and the politics of space. An expert in astropolitics and space warfare, his work bridges space technology, modern conflict, and international security. He advises government bodies and contributes to global space policy debates.

Dr Can Eken

Assistant Professor, Durham Law School

Research: International commercial arbitration, investment law, and dispute resolution in the space sector. A triple-qualified lawyer in California, Turkey, and England and Wales, Can brings global expertise in cross-border legal frameworks and dispute settlement.

INSIGHT

Space surveillence and the role of DARC

The new Deep Space Advanced Radar Capability (DARC) is a UK–US–Australia initiative that will track satellites and debris in geostationary orbit (GEO).

Critical to defence, communications and global monitoring, DARC will strengthen the UK's ability to detect and track movement in GEO. However, it does not cover lower orbits and depends on expert interpretation of complex radar data. To be effective it must be matched by broader analytical capacity and better integration with political and security assessments.

What is SPARC doing?

SPARC is developing complementary optical Space Domain Awareness systems that continuously monitor LEO, MEO and GEO. Our adaptive optics allow high-precision tracking of satellites 24 hours a day.

This extends the surveillance picture beyond GEO and enables faster response to changes in satellite behaviour, especially in lower orbits where military and commercial assets are increasingly concentrated.

We are also building the research base to understand behaviour in orbit. Satellites such as Luch-Olymp K2 and SJ-21 have conducted unannounced proximity manoeuvres that, while not overtly aggressive, raise concerns about intent.

With no agreed common standards or 'keep out zones', we cannot assume that other parties know or understand what we consider aggressive or irresponsible behaviour.

Our work in astropolitics and space law is helping to shape how such actions are assessed and understood, offering the UK and its partners a more informed foundation for decision-making in space.

PART OF THE ESA_LAB NETWORK

Durham is part of the ESA_Lab network - a European initiative that connects universities directly with the European Space Agency

Being part of the ESA Lab network gives Durham access to ESA's technical expertise, state-of-the-art facilities, and funding opportunities.

It also means further international collaboration, joint research initiatives, and technology transfer opportunities, alongside specialised training and student exchange programmes.

CIRCULAR ECONOMY IN SPACE

We're working with space sustainability specialist 3S Northumbria to explore how circular economy principles could reshape the future of space activities.

With thousands of defunct satellites and spent rocket stages in orbit, current disposal practices are increasingly unsustainable. Many of these assets still hold material and functional value.

We're developing valuation tools and new business models to support in-orbit reuse, servicing and recycling – moving the sector away from single-use systems towards a more sustainable, circular approach.

WAYS TO WORK WITH US

We work with organisations of all sizes to solve real-world challenges.
Our research combines technical depth with a multi-disciplinary approach, enabling us to develop tailored, effective solutions for the space sector.

Contract and collaborative research

Collaboration is at the heart of our partnerships. We work with you to understand your needs and challenges, co-developing projects to help you stay ahead of the competition.

Consultancy

Our professional and confidential consultancy services give you access to our world-leading researchers to work on developing projects, providing proof of concept for new products or services, and streamlining your processes.

Knowledge Transfer Partnerships

Knowledge Transfer Partnerships (KTPs) are a leading programme from Innovate UK that brings together a company, an academic team and a high calibre graduate to work on an innovative project. We will support your business with an academic lead and recruit a graduate to work on your specific R&D need.

Recruitment, placements and internships

Durham's Careers team support your organisation with recruitment into early career roles such as graduate jobs, work-based placement years and summer internships.

We're especially keen to support SMEs to access talent from Durham University, and we run a series of events and activities throughout the academic year allowing you to meet and recruit our students.

SPACE LEADERSHIP PROGRAMME

The global space sector is growing rapidly, creating new opportunities for innovation, investment and sustainability.

From regulation and commercial models to geopolitical risk and environmental responsibility, leaders must be equipped to make informed, strategic decisions. Durham University's Space Leadership Programme is designed for senior professionals across engineering, manufacturing, consultancy, law and digital sectors.

Whether you're preparing to enter the space economy or already working within it and want to broaden your understanding of deeper policy, governance and sustainability issues, this five-day CPD-certified course will give you the knowledge and confidence to lead effectively.

Scan the QR code to find out more

CASE STUDY

Advancing free-space optical communications networks

We're working with Viasat to understand atmospheric turbulence in free-space optical (FSO) communications.

Our unique device measures optical turbulence continuously, day and night, even in the presence of strong turbulence conditions. This state-of-the-art forecasting tool will optimise Viasat's ground station design, as well as supporting operational decision-making such as network switching between ground stations based on atmospheric conditions.

Working together with Viasat, our partnership will have a significant impact on the satellite communications industry.

"We're excited to collaborate with Durham University and their leading work on free space optics. We are committed to investing in key research and development for satellite technology, and Durham University was a clear choice, given their leading-edge work on free space optics. The results of their innovative research will be influential in the satellite communications industry, as we collaborate and bring their work from the lab to the marketplace."

Dr Anton Monk, Chief Technology Officer for Wireless Initiatives, Viasat

NORTH EAST SPACE COMMUNICATIONS ACCELERATOR

NESCA (North East Space Communications Accelerator) is a £2.5M EPSRC funded initiative advancing resilient space communications, with a focus on commercialisation and regional impact around key innovation themes including; Technologies, Space Sustainability, In-Space Opportunities, Terrestrial Applications and Smart & Resilient Networks.

NESCA is a partnership between Northumbria, Durham and Newcastle Universities, the North East Combined Authority, Space North East England and the North East Space Leadership Group.

NESCA aims to foster ties between academia and commercial sectors within the region, delivering place-based impact. The project will result in increased investment, economic growth, job opportunities and deliver lasting societal impact across the North East and beyond.

Ready to launch your idea?

Innovation: £1.4M Innovation funds will be made available through two calls per year. Funding will be open to partner university academics to work with industry, civic, and other partners to translate their research into real world applications. Funding of up to **£65k** per project will support promising ideas through the commercialisation process, from proof of concept and feasibility towards market or help to shape policy and process changes in regional businesses and local/regional government.

Place: Will focus on delivering regional and national priorities for the space sector, including informing regional policies, and promoting the North East at national and international space industry events.

People: Will focus on providing the skills required within the space sector, from student summer schools, to continued professional development for academics and those already working within the industry.

NESCA NORTH EAST SPACE COMMUNICATIONS ACCELERATOR

Academic Partners

Northumbria University NEWCASTLE · Durham University · Newcastle University

Funded by

UKRI Engineering and Physical Sciences Research Council

World-leading research
Independent insight
Global collaboration

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