

Project Reference: CTE_BBRC_Geoff_002_25_26

About the Project

This is an exciting PhD opportunity within the College of Technology and Environment (CTE) at London South Bank University (LSBU). The successful candidate will receive a tuition fee waiver beginning in September 2025 for 4 years, including the write-up year.

Project Title

The role of hydraulics for controlling the shape of wings for insects and drones

Project Overview

This PhD connects biology (insect anatomy) with engineering design (modelling and drones). The research project is inspired by studies of how insect wings change shape, including folding and unfurling. The focus is on the role of the veins that span the wing. Those veins provide a lattice framework, providing stiffness. However, there is evidence for hydraulic control of wing shape.

Recent experimental studies show that when an insect unfolds its wings, the pressure from the haemolymph (insect blood) inside the veins undergoes dramatic variation. A key point from an engineering and mathematical modelling perspective is that the walls of the insect veins are made of flexible material, and they deform under pressure. This PhD will investigate relationships between the change in shape of the vein cross section under pressure, and the change in shape of the whole wing.

The aims of this PhD are as follows:

- Contribute to understanding and insight into how insect wings work.
- Establish criteria for the design of foldable deployable drones.
- Determine conditions for triggering folding/unfurling of a wing (insect or drone).
- Establish design criteria for the development of physical models of deployable drones that can be used for experimental tests.

The methodologies for this PhD encompass the following:

- A blend of analytical and numerical methods, using engineering software and mathematical software.
- Use of actual models e.g. 3D printed models.
- Analysis: exploration of the relationships between the variables and parameters involved in the model.

Who Are We Looking For?

- Open to any UK or international candidates. Starting in September 2025.
- The candidate must meet the minimum entry requirements for our PhD programme by clicking the '[Apply](#)' link.

This PhD requires the following essential skills:

- Competence in mathematical techniques (as may be obtained through undergraduate studies in engineering, physics and mathematics).
- Ability to develop strong problem-solving skills to navigate unexpected challenges and ambiguities.
- Ability to critically evaluate existing knowledge.

Additional skills (these are nonessential, but the student will be expected to develop in these areas)

- Knowledge and understanding of structural engineering mechanics.
- Understanding of nonlinear mechanics.
- Expertise in programming using MATLAB, MAPLE or similar software.

This PhD is appropriate for a graduate in Engineering or Mathematics. Students need to be self-motivated, able to manage their time effectively, and take ownership of their research. This PhD will develop competence and critical thinking in biomimetics and advanced structural mechanics, equipping the student with expertise in an area with wide application and transferable skills.

Selection Criteria:

- Academic Qualifications - You should normally have at least a 2.1 honours degree from a UK University or an equivalent qualification in engineering, computer science, etc.
- Research and Analytical Skills – Ability to research subjects using libraries, the internet, and other information resources, ability to conduct comprehensive literature reviews, experience in qualitative and quantitative data collection and analysis, strong research design and methodology skills, ability to independently collaborate with stakeholders, and excellent academic writing and communication skills.
- **Professional Skills** - Project management and organisational skills, ability to work independently and as part of a team, problem-solving and critical thinking skills, and adaptability and willingness to learn new skills.
- Software and Modelling Experience - Experience developing and utilising spreadsheet-based models (e.g., Microsoft Excel) to an advanced level. Experience with other software packages relevant to the discipline would be an advantage.
- Communication Skills—The candidate should be highly motivated, able to collaborate, have good visual, oral, and written communication skills, and communicate the work's outcomes to commercial, industrial, and scientific audiences.
- Teamwork and Collaboration - Ability to work with industrial and academic supervisors.
- Language Proficiency - Overseas applicants must have a minimum English language IELTS score of 6.5, with at least 5.5 in any of the components.
- Understanding of Equality and Diversity - Able to demonstrate an understanding of equality and diversity and their practical applications.
- Visa and Legal Requirements - Non-EU/EEA nationals may need to apply to the Foreign and Commonwealth Office (FCO) for clearance from the Academic Technology Approval Scheme (ATAS).

Training & Development Opportunities

Doctoral students at London South Bank University ([LSBU](#)), through the London Doctoral College ([LDC](#)), benefit from a rich and structured training environment designed to support academic excellence and professional development. All PhD candidates are offered a comprehensive programme of workshops and seminars covering essential research skills, including research design, data analysis, academic writing, ethics, and project management. These sessions aim to support students through every stage of their doctoral journey—from literature review and methodology to thesis completion and viva preparation. Postgraduate researchers can access advanced, discipline-specific training aligned with their research focus. LSBU's doctoral training environment is designed

to build deep expertise in a chosen research area and the broader skills necessary for successful careers in research, industry, and beyond.

About the College

The College of Technology and Environment (CTE) at London South Bank University (LSBU) is a newly formed academic college, launched in January following the university's recent reorganisation. Led by Executive Dean Professor Chris Harty, CTE brings together four schools: Architecture & Planning, Construction, Property & Surveying, Engineering & Design, and Computer Science & Digital Technologies. The college fosters a collaborative and interdisciplinary environment, addressing the complex challenges of the built and digital environments. CTE strongly emphasises research, with doctoral students playing a key role in shaping and contributing to the college's research agenda. CTE prepares students to become future leaders through innovation, industry partnerships, and a commitment to sustainability. With a focus on real-world impact and academic excellence, the college is set to drive forward LSBU's vision of delivering applied knowledge that transforms lives and communities locally and globally. The university has five centres, and any academic staff and students in the college can join. These research centres are described below.

About the Bioscience and Bioengineering (BB) Research Centre

The Bioscience and Bioengineering Research Centre advances understanding of health and disease through biological research and innovative technologies. Our interdisciplinary team focuses on improving diagnostics, treatments, and patient management across healthcare settings. Areas of expertise include cancer biology, bioinformatics, pharmacokinetics/pharmacodynamics, microwave and ultrasound sensing, and image analysis. We also explore human biomechanics and the mechanical properties of muscle and tendon in both healthy and diseased states. By integrating science and engineering, we strive to translate cutting-edge research into real-world healthcare improvements that benefit patients and practitioners alike.

About the Building Future Communities (BFC) Research Centre

The Building Future Communities Research Centre supports inclusive, participatory research on real-world transformation and social justice. We work collaboratively with diverse stakeholders—charities, community groups, local authorities, and more—to co-create research with impact. Using an intersectional approach, our work spans funded research, enterprise, consultancy, and researcher development. BFC is a creative and unifying umbrella for projects prioritising community voice and engagement. Our goal is to drive positive change through research that reflects and responds to the needs and experiences of communities, with a clear commitment to inclusion, equity, and collaborative practice.

About the Digital x Data (DD) Research Centre

Digital x Data Research Centre is a university-wide interdisciplinary research centre exploring the impact and potential of digitalisation and datafication. We focus on cutting-edge AI and data science developments, addressing opportunities and challenges through a responsible, explainable, and sustainable lens. Rooted in LSBU's commitment to social justice, our research fosters equity by integrating science, technology, the arts, and the humanities. We drive innovation through applied research and strong partnerships with industry, academia, and the public sector and ensure that our work delivers real-world, transformative outcomes. Our approach is collaborative and future-facing, aiming to inform policy, practice, and public understanding.

About the Energy, Materials and Environment (EME) Research Centre

The Energy, Materials and Environment Research Centre leads interdisciplinary research on sustainable energy systems and material innovation. We address climate change by developing whole energy systems, spanning generation, storage, distribution, and consumption. Our research

draws from materials engineering, policy, and societal impact to understand and influence the complex relationships between energy, economy, and society. With expertise in multiscale systems and cross-sector collaboration, we aim to shape policy and technology that supports the transition to a low-carbon future. Our work informs sustainable development strategies that balance environmental, economic, and social needs across local and global contexts.

About the Health and Wellbeing (HW) Research Centre

The Health and Wellbeing Research Centre promotes understanding how to protect and enhance health and wellbeing across all life stages. We focus on underserved populations and the services and professionals supporting them. Our research, grounded in social justice and inclusion, aims to reduce inequalities and improve outcomes through knowledge mobilisation and real-world application. Collaborating with academics across disciplines and health and social care partners, we explore lived experiences, service delivery, and workforce development. Our work informs policies and practices that support more effective, inclusive, and responsive health and social care systems.
For Enquiry

Contact Person

Before applying, please contact the main supervisor, **Dr Geoff Goss**, Associate Professor in Nonlinear Dynamics in the School of Engineering, College of Technology and Environment.

E-mail: gossge@lsbu.ac.uk

In your email, include:

- Details of your current level of study and academic background.
- A summary of any relevant experience.
- A brief paragraph about your motivation for pursuing this PhD project.

Fee Waiver

The fee waiver is available for 4 years (48 months), including the writing-up year, examination period, and submission of the corrected thesis.

How to apply

Applications should be submitted via the programme page using the links below:

<https://www.lsbu.ac.uk/study/course-finder/Mechanical-engineering-phd>

You should upload the problem statement, qualifications, CV, and other relevant documentation to the application portal. Remember to state the correct reference number and the appropriate supervisor.